Green Building in the US and China: A law and economics perspective

Duurzaam bouwen in de Verenigde Staten en China: een rechtseconomische benadering

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Hello to people interested in green building. I hope you find this book somewhat useful. Of course all errors remain my own.

Contents

Abbreviations

General terms

AIA	American Institute of Architects
BEE	Building Energy Efficiency
BREEAM	Building Research Establishment Environmental Assessment Method
CAC	Command-and-Control
C/D	Construction/Demolition
CGBC	China Green Building Council
CPC	Communist Party of China
COHURD	Committee on Housing, Urban-Rural Development in the Tientsin Municipality, China
CSUS	China Society for Urban Studies
CVM	Contingent Value Method
DOHURD	Department of Housing, Urban-Rural Development
ECP	Energy Conservation Product
EIA	Environmental Impacts Assessment
EID	Environmental Information Disclosure
(E)NGO	(Environmental) Non-Governmental Organization
EPC	Energy Performance Contracting
EO	Executive Order
FYP	Five Year Plan
FSC	Forest Stewardship Council
GHGs	Greenhouse Gases
GB	Green Building
GBEL	Green Building Energy Labeling
GPP	Green Public Procurement
HVAC	Heating, Ventilation and Ari-conditioning
HPM	Hedonic Pricing Method
IAQ	Indoor Air Quality
IPCC	Inter-governmental Panel on Climate Change
ISO	International Standard Organization
LCA	Life-Cycle Assessment
LEED	Leadership in Energy & Environmental Design
MEP	Ministry of Environmental Protection of the People's Republic of China
MLR	Ministry of Land Resources of the People's Republic of China
MOF	Ministry of Finance of the People's Republic of China
MOHURD	Ministry of Housing, Urban-Rural Development of the People's Republic of China
MOU	Memorandum of Understanding

NDRC	National Development and Reform Commission of the People's Republic of China
NPC	National People's Congress of the People's Republic of China
NPCSC	Standing Committee of the National People's Congress
PCSC	Standing Committee of the People's Congress
SC	State Council of the People's Republic of China
SCS	State Committee of Supervisory of the People's Republic of China
SEP	Supplemental Environmental Project
SFI	Sustainable Forestry Initiative
SPC	Supreme People's Court of the People's Republic of China
SRA	Self-regulatory agency
TEP	Tiered Electricity Pricing
USGBC	The United States Green Building Council
USEPA	The US Environmental Protection Agency
USDOE	The US Department of Energy
USGSA	The US Government Services Administration
TOU	Time-of-use (pricing)
VEA	Voluntary Environmental Agreement
VOCs	Volatile Organic Compounds

Federal/central GB laws

US

ARRA (2009)	American Recovery and Reinvestment Act of 2009
CERCLA (1986)	Comprehensive Environmental Response, Compensation, and Liability Act of 1986
CAA (1973)	Clean Air Act of 1973
CWA (1972)	Clean Water Act of 1972
EPA (2005)	Energy Policy Act of 2005
EISA (2007)	Energy Independence and Security Act of 2007
EEIA (2015)	Energy Efficiency Improvement Act of 2015
TSCA (1976)	Toxics Substances Control Act of 1976
NEPA (1969)	National Environmental Policy Act of 1969
EPCRA (1986)	Emergency Planning and Community Right-to-Know Act of 1986
RCRA (1976)	Resource Conservation and Recovery Act of 1976

PRC

EIA Law (2016)	Environmental Impact Assessment Law of the PRC
ECRCB (2006)	Rules of Energy Conservation in Residential and Commercial Buildings

EEID (2008)	Rules of Information Disclosure for the Energy Use of Residential Buildings
GBLR (2007)	Rules of Green Building Labeling
GBMLR (2014)	Rules of Green Building Materials Labeling
RECB (2008)	Regulation of the Energy Conservation of Buildings
RECPB (2008)	Regulation of the Energy Conservation of Public Buildings

Tables and figures

Chapter I Introduction

1. Background: green building (GB) as a way to environmental governance

For the time being the built environment barely draws as much attention as the self-organizing natural environment, although we humans tend to spend most of our time in buildings.[1] Buildings can pose far-reaching environmental impacts throughout the lifecycle.[2] It is reported that buildings account for 1/3 of global energy use and there lies a global lock-in risk that around 80% of 2005 energy used in buildings will be 'locked' by 2050 due to the long lifespan of buildings.[3] The other side of the ledger registers the greenhouse gases (GHGs) emissions from the building sector, which have doubled since 1970 and accounted for 19% of total global emissions in 2010.[4]

In response to the environmental concerns about buildings, GB has gained popularity for its better performance in terms of resource use (e.g. energy use), as well as of environmental impacts reductions (e.g. indoor air quality and brownfield redevelopment).[5] In early times, GB focused more on energy efficiency, as a result of the energy crisis back to the 1970s. Over time, GB performance has gone beyond energy efficiency, incorporating other elements such as land use. In its full meaning, GB is also a way to a smart city and sustainable urbanization, and not just for individual buildings.[6] Apart from making the environment better, GB in some way provides end-users with energy bill savings and a healthier

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[1] Fox, W., *A Theory of General Ethics: Human Relationships, Nature, and the Built Environment* (MIT Press, 2006), at 12-14 & 348-352.

[2] Hirokawa, K., 'At Home with Nature: Early Reflections on Green Building Laws and the Transformation of the Built Environment,' *Environmental Law* 39 (2012), at 507.

[3] Myles, A. et al., in Masson-Delmotte, V., et al. (eds.), 'Summary for Policymakers', in IPCC, Special Report: Global Warming of 1.5°C, published on 8 October 2018, at 20-21. Full text available at https://www.ipcc.ch/site/assets/uploads/sites/2/2018/07/SR15_SPM_High_Res.pdf, last visited January 2019.

[4] *Id.*, *at 678.*

[5] See *infra* Chapter II, Section 1.2.

[6] MacGraw-Hill Construction, 'World Green Building Trends: Business Benefits Driving New & Retrofit Market Opportunities in over 60 Countries', published Feb 2013, at 14, full text available at: http://naturalleader.com/wp-content/uploads/2016/04/WorldGreenBuildingTrendsSmartMarketReport-2013-Final-Full.pdf, last visited August 2018; Dodge Data & Analytics 'World Green Building Trends 2016: Developing Markets Accelerating Global Green Growth', Smart Market Report for Design and Construction Intelligence, March 2016, at 20. Full text available at https://thebimhub.com/2016/03/08/world-green-building-trends-2016-smartmarket-repor/, last visited August 2018, at 13.

indoor environment, and it is viewed as a long-term business opportunity for building professionals.[7]

Yet it is still too early to say that GB has reached its zenith worldwide, as GB is expected to grow.[8] There are still challenges slowing down the GB movement. The Smart Market Global GB market reports indicate some challenges facing GB compliance: higher first costs, the lack of incentives, unawareness and the dispersion of stakeholders.[9] Those challenges can come down to a matter of incentives and preferences. Institutional arrangements are said to affect incentives, and the law as part of the institutional framework may help to give stakeholders incentives, steer preferences and oversee GB promotion.

Various legal and policy instruments have been available for GB promotion, which can be classified into command-and-control, market-based and suasive instruments. Those instruments are put in place jointly or in isolation, and may differ in forms, costs, and effectiveness in GB promotion across jurisdictions. Yet none of those instruments is without cost. If one instrument can work, why bother putting in place all? If instrument mixes are necessary, how could the instruments work jointly to promote GB in particular?

2. Research questions

The central question of this study is how instruments can be mixed to promote GB. The following sub-questions will further answer the central question:

(i) What does it mean to build green?
(ii) Why do instrument mixes make sense?
(iii) What are the instruments working for GB compliance? How do they work?
(iv) What are the possible ways to instrument mixes for GB?

3. Concepts

3.1 GB and compliance

GB is holistic in scope and integrative in process,[10] and is akin to the idea of 'sustainable building', 'zero-net energy building' or 'sustainable housing'. Being holistic in scope, the elements of GB can come in a wide

[7] MacGraw-Hill Construction (2013), at 5.
[8] Dodge Data & Analytic (2016), *supra* note 6, at 6.
[9] More about the challenges see *infra* Chapter II, Section 1.2.
[10] USGBC, *LEED Overview*, available at http://www.usgbc.org/leed

range, including land use & sustainable sites, energy efficiency, indoor air quality, acoustic environment, water use, waste disposal, building materials, transportation network, *et cetera*. This study will focus primarily on four of the GB elements, viz energy use, land use, indoor air quality and waste disposal, as they are the most important elements addressed in some commonly-used GB rating systems.[11]

GB compliance refers to compliance with rules & standards regarding resource use and environmental impacts reduction in building activities. Those rules and standards can be made for each of the GB elements or for GB as a whole. GB compliance is defined in a broader sense in this study, concerning not only compliance with formal rules made by the authority (e.g. GB laws and policies), but also with informal rules such as industry-based standards or social norms. This corresponds to the idea that GB promotion should not only mandate parties to build green as required, but also incentivize parties to pursue GB at its best.

3.2 GB standard and rating system

The term 'standard' hereinafter can be used to describe an *ex-ante* standard in terms of rule-making, e.g. performance standards in GB regulations; as well as an *ex-post* standard in law enforcement, e.g. the level of due care in the determination of negligence.[12] GB standards in this study are mostly ex-ante standards for GB performance.

As far as the *ex-ante* standards are concerned, GB standards specify requirements for a building to be certified as green. In line with the standards, a rating system will be used to evaluate GB performance technically. In other words, a GB standard tells what should be done for GB, while a rating system shows how green a building is.

As with environmental standards in general, GB standards can be categorized into target standards, performance standards and specification standards.[13] GB standards can be made by empowered law-makers such as legislatures and governments, as is the case with the Green Building Energy Labeling (GBEL) program in China. [14] GB standards can also be

[11] More about the GB elements and the rating systems see *infra* Chapter II, Section 1.

[12] The distinction between ex-ante standards and ex-post standards can be analogous to the distinction between rules and standards in Kaplow, L, 'Rules versus Standards: an Economic analysis', 42 (1992) *Duke Law Journal*, pp.557-629.

[13] For more about environmental standard setting see *infra* Chapter III, Section 5.1.

[14] Established in 2008, the Green Building Evaluation and Labeling (GBEL) program is administered by the Ministry of Housing and Urban-Rural Development (MOHURD) in China. The GBEL is a public-authorized labeling program at the central level, based on a building's performance on land use, energy consumption, water use, resource/material efficiency, indoor environmental quality, and operational management. Buildings will be certified as 3-, 2- or 1-star GB in line with

private and industry-based, e.g. standards made by professional associations, such as the LEED system in the US, or the BREEAM program in the UK.[15]

3.3 Instrument mix

Instruments in this study are policy & legal instruments run in line with certain rules or agreements. For the purpose of this study, those instruments are classified into command-and-control, market-based, and suasive instruments. Instrument mix in this study refers to a joint use of the three types of instruments. An instrument mix may combine features of more than one (type) of the instrument. For instance, an instrument mix can be a tandem of regulation and liability, e.g. the USEPA's Supplemental Environmental Projects (SEP).[16] A mix can also combine the merits of regulation and self-regulation, as with GB regulations incorporating the industry-based GB standards.

A further point to note is that instruments are meant to cancel out the problems around regulation, liability, and self-regulation, and to give stakeholders incentives for GB. However, it is also likely that instrument mixes can lead to higher costs, or can undermine some advantages of the instruments. Simply put, instrument mixes do not guarantee desirable outcomes.[17]

3.4 GB stakeholders

GB stakeholders are parties involved in GB compliance, primarily including a) the State, composed of legislatures, judicial branches, and governments (and the bureaucrats); b) self-regulatory agencies, such as professional associations and environmental NGOs; c) public-private organizations, e.g., a state-owned enterprise; d) individuals and firms

It should be noted that not all types of GB stakeholders weigh equally in GB promotion and hence they may be addressed on different levels in this study. This study will focus more on the role of: a) governments,

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the standards.

[15] BREEAM, or the Building Research Establishment Environmental Assessment Method, is one of the world's most widely used environmental assessment methods for buildings. Usually BREEAM appliers aim at an overall rating of Pass, Good, Very Good, Excellent, or Outstanding, but a breakdown of the whole package is allowed. Both prescriptive and result-based assessment will be carried out via the rating scheme and be charted by commensurable variables, of which aesthetics or human-health related performance will not be a part. See Taylor, T., and Pineo, H., '*Health and Human Well Being in BREEAM*', BREEAM briefing paper, 2015, at.2-3. Full text available at http://www.breeam.com/filelibrary/Briefing%20Papers/99427-BREEAM-Health---Wellbeing-Briefing.pdf

[16] For more about the SEP program see *infra* Chapter IV, Section 3.5.1

[17] See *infra* Chapter VII, Section 1.2.

prominently regulators in charge of environmental governance, for instance, the EPA and DOE in the US, and the MOHURD and MEP in China; b) individuals, prominently property entitlement holders, e.g. land users, owners and end-users of buildings; c) self-regulatory agencies, particularly professional associations making GB standards and rating systems (e.g. the US Green Building Council).

4. Research method

4.1 A comparative law and economics perspective

This study conducts a legal analysis, using insights from comparative law and economics. Comparative law and economics combines the methods and the theories of both these two disciplines. In this way, comparative law is able to take a step forward in understanding and explaining the change and the interactions among different legal systems.[18] In other words, the comparative law and economics provides a dynamic way to better understand why and how the divergences or convergences of different legal alternatives take shape.[19] Therefore, the research method of this study might be slightly different from the traditional comparative law on the following fronts.

First, the study will look into the GB movement from an institutional point of view, to see how GB and its challenges take shape. The study will begin with the general process for a novel change to happen, using the idea of path-dependency. Path-dependent systems are those that cannot shake off the effects handed down from the past.[20] This could be a result of the co-evolution of the three sources of innovation: knowledge, demographics and institutional framework, and of the interaction between the rules, players and the enforcement of rules within the institutional framework.[21] In that sense, an institutional analysis emphasizes more the causes rather than foreseeing the outcomes of a legal (economic or social) change.[22] The idea of path-dependency around the change thus calls for a historical approach, as well as for empirical findings rooted in the context.[23] The historical approach also lends itself to comparative law that looks into the

[18] Mattei, U. A., Antoniolli, L., and Rossato, A., 'Comparative Law and Economics', in Bcouckaert, B., and Geest, G. D. (eds), *Encyclopedia of Law and Economics, volume I* (Edward Elgar, 2001), at 505.
[19] *Id.*, at 508.
[20] *Id.*, at 521.
[21] North, D. C, *Transaction Costs, Institutions, and Economic Performance (*International Center for Economic Growth Publication Press, 1992), at 5.
[22] Mattei, Antoniolli and Rossato (2001), at 524.
[23] *Ibid.*

convergences and divergences of different legal systems.[24] As such, each of the two country studies includes a brief history of the GB movement and a legal framework for GB compliance. In the meantime, the study will draw on findings of some empirical works to see how (well) an instrument may actually work for GB or for environmental compliance in general. The institutional analysis can be helpful, as law can be a world unto itself, but law-making should be aware of the structural background.[25] Based on the institutional analysis, this study is able to better understand why the GB movement takes place, how the challenges facing GB compliance come about, and why law matters in GB promotion.

Second, in this study, law is taken as a system of incentives,[26] as opposed to merely a system of coercion by the State. This implies that the study will not stick to the legal positivism view that law is treated as an aggregation of legal rules, and the authority has a monopoly over rule-making in line with the recognition rules.[27] Instead, legal rules at work take shape as a result of competition being a discovery procedure rather than merely of a hierarchy, [28] and the outcomes are largely determined by the institutional or structural constraints.[29] On that account, the study not only looks into rules made by authorized law-makers (e.g. legislators, governments and courts), but also takes into account the power of social norms, and standards made by self-regulatory agencies. Those informal rules are also likely to affect the making of laws and regulations. On the other hand, the study not only deals with command-and-control instruments as mandates, but also addresses market-based and persuasive instruments that provide different incentives to affect the activity levels of stakeholders, e.g. liability rules or informational programs as nudges.

Third, value judgments on fairness or justice will be less concerned with the evaluation of instruments. It can be seen from the comparison that, though with different institutional frameworks, the ways in which GB gets

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[24] Schlesinger, R. B. et al, *Comparative Law: Cases, Texts, Materials, 5th edition* (New York: Foundation Press, 1988), at 39-43.

[25] North, D. C., *Understanding the Process of Economic Changes* (Princeton University Press, 2005), *Preface*, vii.

[26] See e.g. Cooter, R., 'Law and Unified Social Theory', 22 (1995) *Law and Society*, at 51-52; North (2005), *supra* note 25, at 43.

[27] Mattei, Antoniolli and Rossato (2001), *supra* note 18, at 510.

[28] *Id.*, at 508; Cooter, R. D., and Drexl, J., 'The Logic of Power in the Emerging European Constitution: Game theory and the Division of Powers', 14 (1994) *International Review of Law and Economics*, pp. 295-313.

[29] North (1992), *supra* note 21, at 25.

This view is akin to the idea of legal formants, as opposed to the unitary theory of law. In terms of legal formants, there is a distinction between law and legislation, and the legal rule is the result of the interaction between multiple factors. See Rodolfo Sacco, 'Legal Formants: A Dynamic Approach to Comparative Law', 39 (1991) *The American Journal of Comparative Law*, pp. 1-39.

promoted in the two countries converge to co-regulation or to a joint use of instruments broadly speaking.[30] The convergence of modern legal systems could partly result from a shift to more objective goals such as efficiency or cost-effectiveness.[31] The notion of efficiency has a dynamic meaning ('adaptive efficiency'),[32] and no instrument or legal regime can be efficient in an abstract way. This legal analysis, given the methodology used, is incapable of putting an efficiency or cost-effectiveness test on all the specific instruments through modeling or empirical methods. The study can only, from the theoretical starting point and the two country studies on GB compliance, give an intuitive but relatively educated guess as to which type of instrument (mix) is able to (1) give stakeholders incentives to build green, and/or (2) cancel out the problems around regulation, liability, and self-regulation, e.g., to lower the (information or administrative) costs of regulation.

4.2 A technical definition of GB

The study starts with the definition of GB from a technical perspective, by looking into the most commonly-used GB rating systems around the world, viz the Leadership on Energy and Environmental Design (LEED), the Building Research Establishment Environmental Assessment Method (BREEAM) and the Green Globes, which are reported to be the most widely used green building rating systems worldwide.[33] As an international certification, the LEED ranks the first in terms of popularity[34] and has attracted more than 72,000 projects from 150 countries and territories.[35] The BREEAM is widely-used within the EU, taking up an 80% share of the GB rating market.[36] The Green Globes prevails mainly in

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[30] See *infra* Chapter VI, Section 5.

[31] Mattei, Antoniolli and Rossato (2001), *supra* note 18, at 508.

Increasingly, a multi-criteria evaluation (MCE) method has been available to evaluate the 'smartness' of environmental policies. The MCE method is an aggregate of all dimensions, objectives (or goals), criteria (or attributes) and criterion scores. In particular, Social Multi-Criteria Evaluation (SMCE) has a direct translation in terms of the plurality of values used in the evaluation exercise. Also, the SMCE is shown to be able to address problems in various geographical and cultural contexts. However, those who plan to use the MCE method need to work more on the robustness of results. For more about the MCE see Greco, S., and Munda, G., 'Multiple Criteria Evaluation in Environmental Policy Analysis', in Spash, C. L. (ed.), *Handbook of Ecological Economics, Nature and Society* (Routledge, 2017), at 311-320.

[32] North (2005), *supra* note 25, at 16-17.

[33] Portalatin, M. et al., 'Green Building Rating System,' IFMA Foundation Sustainability How-to-Guide Series, 2010, at 9. Full text available at http://cdn.ifma.org/sfcdn/docs/default-source/default-document-library/green-building-rating-systems.pdf?sfvrsn=0, last visited May 2016.

[34] *Id*, at 10.

[35] See USGBC, 'LEED Overview', available at http://www.usgbc.org/leed, last visited May 2016.

[36] See BREEAM, 'Why BREEAM', available at http://www.breeam.com/why-breeam, last visited May, 2016.

Canada as a self-assessment certification tool.[37] They are designed by building professionals, and hence show what GB means from a technical perspective. The LEED is an industry-based certification system established by the *United States Green Building Council* (USGBC), which **"**works with government, member businesses and allied organizations to support policies and programs that advance greener buildings and communities."[38] The BREEAM was invented by the Building Research Establishment, which used to be a government establishment devoting to research for the building sector in the UK.[39] The Green Globes system was originally developed by ECD Energy and Environmental Canada Ltd., which specializes in assessment and rating services.

In light of the three rating systems, GB is found to be holistic in scope, integrative in process. In other words, GB has a wide range of elements regarding environmental impacts reduction and efficient resource use in building activities, which cannot all be addressed in this study. In order to narrow down the scope, GB will mainly include four elements, viz energy, land, indoor air quality, and construction/demolition wastes. Those elements, on the one hand, reflect the general idea that GB by nature deals with both harmful and positive externalities. On the other hand, the elements correspond to the most important environmental reasons for GB mentioned in the global GB market reports, including energy consumption reduction, natural resources protection, water consumption reduction, indoor air quality improvement, and greenhouse gases (GHGs) mitigation.[40]

4.3 Positive analysis in light of a theoretical framework

This study includes a theoretical framework and two country studies on GB compliance in the US and China. After figuring out what it means to build green and the challenges facing GB, this study draws a theoretical framework to reason the need for instrument mixes to promote GB. The theoretical framework spells out the advantages and the disadvantages of the different instruments (mixes), and explains why some instruments or rules may work better for a particular element of GB. In this way, the theoretical framework is not only a means to analyze GB practice and

[37] See Green Globes, 'About', available at http://www.greenglobes.com/about.asp, last visited June, 2016.
[38] See USGBC, 'About LEED', available at: http://www.usgbc.org/about, last visited May 2016.
[39] Now the Building Research Establishment is owned by the BRE Trust, a charitable organization.
[40] Dodge Data & Analytic, World Green Building Trends 2018, SmartMarket Report, published on November 13, 20888, at 20. Full text available at https://www.worldgbc.org/sites/default/files/World%20Green%20Building%20Trends%202018%20SMR%20FINAL%2010-11.pdf, last visited November 2018.

evaluate instruments, but also makes up for the generality problem as a result of the very limited number of country studies.

As GB is primarily for environmental governance, the theoretical framework is formulated on the basis of literature on smart mixes, environmental law & economics, and environmental governance. Publications on the general theories about regulation, liability, and self-regulation also contribute to the shaping of this theoretical framework.

The theoretical starting point of this study is that GB may not happen to a desirable level spontaneously, due to problems of externalities or path-dependency in the process of a novel change. Therefore, there are different institutional arrangements providing incentives for GB, but no instrument in isolation suffices to give enough incentives. Based on the relevant literature, the theoretical framework firstly classifies the instruments available to command-and-control, market-based and persuasive instruments, which may rely on regulation, liability, self-regulation or the combination of one another. The failures around regulation, liability, and self-regulation pictured in the theories further confirm the starting point that no instrument is perfect by itself. The theoretical framework then in a more detailed way examines the pros and cons of the instruments for GB promotion, and proposes possible mixes that may help to cancel out the problems of one another.

In light of the theoretical framework, a comparative study is conducted to analyze GB compliance in the US and China. The comparative study corresponds to the theoretical point that an institutional matrix is at the heart of the incentive structure, and hence the smart use of instruments (mixes) can be context-based. Therefore, it would be highly relevant to see how the instruments actually work in reality, and whether or not the pros and cons in theory still make sense in GB practice.

The two countries were chosen because, firstly, they have different institutional frameworks, by which the study is able to see the extent to which institutions may affect GB promotion and what role the law can play for GB. Secondly, GB is accelerating in both countries, but they are at different stages of the GB movement. Therefore, the recommendations based on the two countries may be relevant for GB in economies of different shapes. Thirdly, laws and regulations for GB are diverse in both countries, whereby a wide range of instruments can be found and examined to answer the research questions.

The two country studies are structured similarly. Each starts with a historical look at the GB movement, corresponding to the general process of a novel change outlined in the theoretical framework. Through the

historical overview, the study is able to better understand how GB evolves as a result of the three sources necessary for a social change to happen, and why law matters in GB promotion. Given the role of law in GB, each of the country studies then describes the shape of GB laws and categorizes the instruments laid down in the laws, which lays the ground for a more in-depth analysis on the use of instruments. Instruments (mixes) available are evaluated on the basis of the pros and cons predicted in theory as well as some empirical evidence on the effectiveness of those instruments.

Based on the theoretical framework and the country studies, this study, in the end, comes up with more general conclusions and recommendations that can also inspire GB promoters in other jurisdictions than the US and China.

5. Review of legal research on GB

Increasingly GB is becoming a way to environmental impacts reduction, and there has been a lot of interest in architecture and law in this phenomenon of GB. Research has been done on the technical aspects of GB, e.g. GB evaluation and rating systems. Some studies have provided overviews of GB rating systems worldwide,[41] identifying and comparing key elements of the different GB rating systems.[42] The costs and benefits of GB also remain part of research interests.[43] In addition, opportunities and challenges facing GB have been well-discussed in some industry reports, and in studies using a behavioral approach.[44] Research on the

[41] Shan, M., and Hwang, B., 'Green building rating systems: Global reviews of practices and research efforts', 39 (2018) *Sustainable Cities and Society*, pp. 172-180.

[42] See e.g. Mattoni, B. et al., 'Critical review and methodological approach to evaluate the differences among international green building rating tools.' 82 (2018) Critical review and methodological approach to evaluate the differences among international green building rating tools', pp. 950-960; Ding, Z. et al., 'Green building evaluation system implementation', 133 (2018) *Building and Environment*, pp. 32-40; Chethana, I. M., 'Key Credit Criteria among International Green Building Rating Tools,' 164 (2017) *Journal of Cleaner Production*, pp. 209-220; Suzer, O., 'A comparative review of environmental concern prioritization: LEED vs other major certification systems', 154 (2015) *Journal of Environmental Management*, pp. 266-283.

[43] See e.g. Eichholtz, P., 'The Economics of Green Building', 95 (2013) *Review of Economics and Statistics*, pp. 50-63; Would Green Building Council (WGBC), 'The Business Case for Green Building: A Review of the Costs and Benefits for Developers, Investors and Occupants', 2013. Full text available at: https://www.ukgbc.org/wp-content/uploads/2017/09/World-GBC-Business-Case-for-Green-Buildings.pdf, last visited August 2016.

[44] See e.g. McGraw-Hill Construction (2009); McGraw-Hill Construction (2013); Dodge Data & Analytic (2016); Dodge Data & Analytic (2018); Lovins, A. B., *Energy Efficient Buildings: Institutional Barriers and Opportunities*, Report for E SOURCE Strategic Issues Paper Series, January 1994. Full text available at http://www.rmi.org/Library/1992-02_EnergyEfficientBuildingsBarriersOpportunities, last visited July 2016; Hoffman, A. J. and Henn, R., 'Overcoming the Social and Psychological Barriers to Green Building', (21) 2008 *Environment and Organizations*, pp.1-45; Lan, S. and Sheng, T., 'The Study on Key Factors of Influencing Consumers' Purchase of Green Buildings', 7 (2014) *International Business Research*, pp 49-60.

three aspects of GB lays the ground for further institutional analyses on GB.

In response to the growing phenomenon of GB, lawyers also began to think about the role of law in GB. Kibert (2004) and Hirokawa (2012) provided early reflections on law and the built environment, examining how and why the GB movement became successful in the US, and the goals and methods of green building laws.[45] Millan (2014) further digged into the gaps in environmental law for GB. Millan (2014) defined GB in terms of the five elements, and built up the link between each of the element and the US environmental law.[46] In that sense, Millan (2014) seems to touch upon the very idea of GB as a way to environmental governance.

More attention has been paid to GB standard setting as a doorstep to implementing various instruments for GB. Notably, legal scholars became more aware of the mix of private standards and GB regulations. Miller (2009), Klass (2010), Teyber (2014) and Alfano (2014) pointed out the legal concerns around co-regulation in GB standard setting, [47] e.g. violations of anti-trust laws and the delegation of regulatory power.

Legal analyses on a certain (type of) instrument for GB can also be found. For instance, Kingsley (2008) argued for impact fees imposed on land use development to encourage private parties to build green.[48] Delapaz (2013), Foy (2012) and Wolf (2011) looked into command-and-control instruments such as zoning and planning for GB.[49] Prum (2012 & 2013)

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[45] Hirokawa, K., 'At Home with Nature: Early Reflections on Green Building Laws and the Transformation of the Built Environment', (39) 2012 *Environmental Law*, pp. 507-575; Kibert, C. J., 'Green Buildings: An Overview of Progress', (19) 2004 *Land Use and Environmental Law*, pp. 491-502.

[46] Millan, S. A., 'Green Buildings and Plugging the Gaps in Environmental Laws,' (27) 2014 *Tulane Environmental Law Journal*, pp.43-59.

[47] See Alfano, J., 'Can We Trust Green Building? Anti-trust Implications for the Green Building Movement, 41 (2014) *Environmental Affairs*, pp.427-454; Klass, A. B., 'State Standards for Nationwide Products Revised: Federalism, Green building Codes, and Appliance Efficiency Standards', 34 (2010) *Harvard Environmental Law Review*, pp.335-368; Miller, S. R., 'Enforcement of Local Green Building Ordinances Integrating Third-Party Rating Systems. (27) 2009 *California Real Property Journal*, pp.54-68; Teyber, E., 'Incorporating Third-Party Green Building Rating Systems into Municipal Building and Zoning Codes,' (31) 2014 *Pace Environmental Law Review*, pp.832-843.

[48] Kingsley, B. S., 'Making It Easy to be Green: Using Impact Fees to Encourage Green Building', (83) 2008 *New York University Law Review*, pp.532-567.

[49] Delapaz, A., 'Leed Locally: How Local Governments Can Effectively Mandate Green Building Standards', 3 (2013) *University of Illinois Law Review*, pp.1211-1250.

Foy, K. C., 'The Convergence of Environmental Justice, Affordable Housing and Green Building', 30 (2012) *Pace Environmental Law Review*, pp.1-58.

Wolf, M. A., 'A Yellow Light for "Green Zoning": Some Words of Caution about Incorporating Green Building Standards into Local Land Use Law', 43 (2011) *Urban Lawyer*, pp. 949-975.

and Circo (2010) investigated how compliance with GB standards may affect contract liability. Fox (2010) reflected on the changing view on property rights and discussed whether or not the imposition of GB standards will be subject to taking claims.[50]

Apart from research on a single instrument, there are also studies that provide more comprehensive overviews of instruments for GB. Khanna et al. (2014) conducted a comparative policy study for GB in the US and China.[51] King and King (2004) reviewed incentives for sustainable buildings in the US and EU from a comparative law perspective.[52] Olubunmi et al. (2016) gave a systematic literature review on incentives for GB and the effectiveness of those incentives.[53] Reber (2008) discussed the desirable level of government intervention in the LEED-certified GB projects, arguing that mandates may work for public sectors while incentives can better encourage private stakeholders.[54] Circo (2008) also put forward a combination of incentives and mandates, emphasizing the role of local land policies in GB promotion.[55] Howe and Gerrard (2011) published a book on regulatory and legal issues regarding GB in the US. A book edited by Adshead (2011) provided an overview of GB laws in a wide range of jurisdictions, including the US, the Netherlands, China, Singapore, South Africa, Turkey, and Australia.[56]

The above review shows that, first, legal scholars have obtained a good sense of what it means to build green, and have thought of GB as a tool for environmental protection. Second, various legal and policy instruments for GB and the legal concerns around them have been investigated by legal scholars. Lastly, legal research on GB is paying more attention to the idea of instrument mixes for GB.

However, legal research on GB might go a few steps further down the road. For instance, the role of law and a need for instrument mixes for GB should

[50] Fox, S., 'A Climate of Change: Shifting Environmental Concerns and Property Law Norms through the Lens of LEED Building Standards', 28 (2010) *Virginia Environmental Law Journal*, pp.299-339.
[51] Khanna, N. et al., 'Comparative Policy Study for Green Buildings in the US and China', Lawrence Berkeley National Laboratory Report No. LBNL-6609E, April 2014, at 30. Full text available at: https://china.lbl.gov/sites/all/files/green_buildings_policy_comparison.pdf, last visited August 2016.
[52] King, N. J., and King, B. J., 'Creating Incentives for Sustainable Buildings: A comparative law approach Featuring the United States and the European Union', 23(2004) *Virginia Environmental Law Journal*, at 397.
[53] Olubunmi, O. A., Xia, P. B., and Skitmore, M., 'Green Building Incentives: a review', 59 (2016) *Renewable and Sustainable Energy Reviews*, pp. 1611-1621.
[54] Reber, P., 'Taking the Leed: Determining the Appropriate Amount of Government Regulation in Green Building Projects', (98) 2008 *Kentucky Law Journal*, pp.573-593.
[55] Circo, C. J., 'Using Mandates and Incentives to Promote Sustainable Construction and Green Building Projects in the Private Sector: A Call for More State Land Use Policy Initiatives', (112) 2008 *Penn State Law Review*, pp.732-778.
[56] Adshead, J. (ed.), *Green Buildings and the Law*. Routledge, 2011.

be further justified. Legal and policy instruments for GB have mostly been studied in isolation. Therefore, it is also relevant to identify how the instruments can be combined, and the advantages and disadvantages of the combinations. Moreover, most of the legal analyses deal with specific GB rules in a particular country, and hence may not further explain how the rules or instruments (mixes) interact with different institutional frameworks across jurisdictions.

By answering the research questions, this study will try to fill in some gaps in knowledge. The study will first provide a thorough theoretical framework to explain why instrument mixes make sense in theory, and why law is important in GB for environmental governance. The theoretical framework is based on the law and economics theories on smart mixes, regulation, liability and self-regulation, and hence may justify instrument mixes for GB regardless of context. In light of the theoretical framework, the study will then analyze GB laws and instruments in the US and China, and identify instrument mixes at work. Evaluations on the instruments (mixes) will be based not only on the theories but also on some empirical information rooted in the context. In this way, the study can further examine how the institutional framework may affect the choice of instruments (mixes) for GB.

6. Scientific relevance

So far there has not been a thorough legal analysis of instruments used to promote GB. This is precisely what this study will do. As far as the author is aware, the thesis is one of the first Ph.D. projects in which an integrated theoretical and legal analysis of green building is provided.

The study, on the one hand, provides a theoretical analysis which distinguishes between command and control instruments, market-based instruments and persuasive instruments, all as tools to promote green building. The study not only maps out instruments at work but also critically discusses the advantages and disadvantages of all those instruments. Based on the theories of regulation, liability, and self-regulation, this study reasons that no single instrument can be sufficient to promote GB, and hence it will be important to search for a smart mix of different instruments.

The study then moves to the instruments used in the US and China to promote green building. The study shows that many instruments have been available for GB, but that the intensity strongly varies. In addition to critically analyzing the instruments used, this study also looks at the available empirical evidence showing the relative effectiveness of the different instruments. The analysis of the experience with GB legal

instruments in both countries confirms the theoretical starting point that green building requires a smart mix of the various instruments.

In the end, the study comes up with policy recommendations for GB promotion. Based on the theory and the two positive analyses on GB, the study points out which type of instruments may work better for a particular element of GB compliance, and the possible ways to mix. Those recommendations may give some hints for policy- and law-makers pursuing a higher level of GB activities. However, the recommendations availed in this study may only indicate a general way ahead, and they are supposed to work on account of different settings.

7. Structure

Apart from this introduction, the study will consist of six chapters.

Chapter II defines what it means to build green, and maps out the challenges facing GB, which can come down to a matter of incentives and preferences.

Chapter III is a theoretical framework by which the study reasons the need for instrument mixes to promote GB. The theoretical framework starts with justifications for environmental law and policy making, providing an intuitive sense about why institutional arrangements are important in environmental governance. Section 2 sketches the general process of a novel change. Based on Section 2, Section 3 further points out why law matters in GB promotion. Section 4 categorizes common legal and policy instruments for environmental compliance, showing that for those instruments to work, regulators, individuals, and self-regulatory agencies are all involved. Section 5 spells out the regulatory failures, liability failures and the failures of self-regulation in environmental governance, which may also exist in GB promotion. Those failures have in some way been reflected in the use of specific instruments for GB promotion, which will be shown in Section 6. Section 7 of the theory chapter concludes that no instrument can in isolation suffice to promote GB to a desirable level.

Along the theoretical line, Chapter IV on GB compliance in the US, and Chapter V on GB compliance in China, are structured similarly. Each starts with a history of the GB movement and some general findings of the course of GB promotion, followed by a legal framework on GB compliance. Based on the legal framework, an analysis will be given to see the advantages and disadvantages of the instruments (mixes) used in the GB laws and regulations, followed by some observations on the use of instruments.

Chapter VI compares, followed by Chapter VII that concludes. In light of the theoretical framework, Chapter VI compares GB promotion in the US and China, by which some convergences can be seen in the use of instruments for GB. The concluding chapter in the first place confirms the theoretical starting point: a need of instrument mix to promote GB Then the conclusion further points out which (type of) instrument may work better for a particular GB element, as well as the possible ways to mix the instruments. In the end, the study comes up with some recommendations on GB promotion and suggestions for future research on GB.

Chapter II What it means to build green and the challenges

This chapter deals with some basics about GB. Section 1 defines what it means to build green from a technical perspective. To define GB, this section looks into the elements of GB in some commonly-used GB rating systems, prominently the LEED, the BREEAM, and the Green Globes. Based on the rating systems, GB will be defined as 'holistic in scope, integrative in process.' Section 2 of this chapter looks into challenges facing GB compliance. The top challenges include a higher first cost, a lack of incentives & split incentives, affordability and the lower awareness of building stakeholders. Certainly, there are other challenges reported, e.g., a lack of political support or corruption, which are usually context-based and will be addressed in the country studies.

1. GB is holistic in scope, integrative in process

1.1 Popular GB rating systems worldwide

The idea of GB came into being due to the energy crisis in the 1970s. However, the meaning of GB has gone beyond energy use, incorporating environmental, economic and social sustainability during the evolving process. GB may be otherwise termed as 'sustainable building', 'zero-'green construction', 'zero carbon building' or 'sustainable housing'.

More than 19 rating systems are available for GB evaluation,[57] of which the Leadership in Energy and Environmental Design (LEED), the Building Research Establishment Environmental Assessment Method (BREEAM), and the Green Globes, appear to be the most popular ones.[58]

1.2 GB elements: land, energy, the indoor environment, waste, and water

GB is said to score better in terms of energy efficiency, land use, indoor environment, construction & demolition (C/D) waste management, and water efficiency. Apart from the elements, GB also has two attributes: life-cycle performance and integrative methods. The International Organization for Standardization (ISO) has established a set of standards,

[57] Dodge Data & Analytic (2016), *supra* note 40, at 20.
[58] For a more thorough note on GB rating systems around the world see IFMA Foundation, *Green Building Rating System*, IFMA Foundation Sustainability' How-to-Guide' Series, 2010, full text available at: http://cdn.ifma.org/sfcdn/membership-documents/green-rating-systems-htg-final.pdf, last visited November 2018.

including ISO 15392,[59] ISO 21929-2,[60] ISO 21930,[61] [62] and ISO 21932,[63] to deal with the sustainability of buildings. The ISO standards show that GB performance should be achieved throughout the life cycle of buildings.[64] Equally important, GB needs a cooperative practice among different stakeholders at both the pre-occupancy and the post-occupancy stages.[65]

Land use takes into account site selection. Firstly, GB requires a building to be away from areas of vulnerable ecosystems,[66] such as wildlife habitats, wetlands, or prime farmlands. Second, GB activities should reduce soil erosion during constructions, [67] or make use of contaminated land ('brownfield') without causing harm to occupiers.[68] Lastly, GB means more efficient transportation networks and diverse use of public areas.[69]

Energy use includes energy in use and energy embodied. The energy in use can be thought of as energy on bills, e.g. energy for an HVAC system and domestic hot water, and usually can be visualized by the meters installed in buildings. The energy embodied refers to primary energy consumed by building materials from the cradle to the grave,[70] e.g. the

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[59] See ISO, 'Sustainability in Building Construction — General Principles*', ISO 15392*, 2008. Available at: https://www.iso.org/obp/ui/#iso:std:iso:15392:ed-1:v1:en, last visited May 2016.

[60] See ISO, 'Sustainability in Building Construction — Sustainability Indicators — Part 2: Framework for the Development of Indicators for Civil Engineering Works', ISO/TS 21929-2, 2015. Available at: https://www.iso.org/obp/ui/#iso:std:iso:ts:21929:-2:ed-1:v1:en, last visited June 2016.

[61] See ISO, 'Sustainability in Building Construction — Environmental Declaration of Building Products', *ISO 21930*, 2007. Available at: https://www.iso.org/obp/ui/#iso:std:40435:en, last visited May 2016.

[62] See ISO, 'Sustainability in Building Construction — Framework for Methods of Assessment of the Environmental Performance of Construction Works — Part 1: Buildings*', ISO 21931, 2010.* Available at: https://www.iso.org/obp/ui/#iso:std:iso:21931:-1:ed-1:v1:en, last visited on April 2016.

[63] See ISO, 'Sustainability in Buildings and Civil Engineering Works — A Review of Terminology*', ISO/TR 21932*, 2013, available at: https://www.iso.org/obp/ui/#iso:std:62888:en, last visited May 2016.

[64] *Ibid.*

[65] Institute for Building Sustainability, *Energy Performance Contracting in the European Union: Introduction, Barriers, and Prospects'*, An Initiative of Jonson Controls, August 2010, at 2-3. Full text available at: http://www.buildup.eu/sites/default/files/content/Institute%20BE%20-%20Energy%20Performance%20Contracting%20in%20the%20European%20Union.pdf, last visited June 2016.

[66] See USGBC, 'LEED v4 for Building Design and Construction', 5 April 2016, at 13. Full text available at: http://www.usgbc.org/sites/default/files/LEED%20v4%20BDC_04.05.16_current.pdf; The Green Building Initiative, 'Green Globes for New Construction', available at: http://www.thegbi.org/green-globes-certification/how-to-certify/new-construction/, last visited June 2016.

[67] *Id*., at 31.

[68] *Id*., at 14-15.

[69] *Id*., at 10.

[70] Haynes, R., 'Embodied Energy Calculations within Life Cycle Analysis of Residential Buildings', 2010 (2013 Revised), at 3-4. Full text available at: http://etoolglobal.com/wp-content/uploads/2012/10/Embodied-Energy-Paper-Richard-Haynes.pdf, last visited June 2016.

energy used to extract raw resources, process materials, assemble product components and deliver the products between each step. GB rating systems begin to count in the embodied energy use, as life-cycle carbon accounting has been increasingly used in calculating carbon emissions.[71]

The indoor environment takes into account indoor air quality (IAQ), acoustic environment, thermal comfort, lighting conditions, and quality view. Indoor air quality can be achieved by adequate ventilation and safe exposure to hazardous emissions. Requirements on acoustic performance take into account reductions in noise, such as background noises from the HVAC system.[72] Thermal comfort requires appropriate air temperature, radiant temperature, air speed, and humidity.[73]

Waste management for GB deals with both hazardous and non-hazardous wastes, including those as a result of construction & demolition activities.[74] Waste treatment usually includes collection and diversion. Wastes are gathered, sorted and stored before delivering to the disposal sites. In the case of waste disposal, non-recyclable wastes are processed through landfilling, incineration or waste-to-energy techniques. [75] Recovery treatment requires the re-use or recycling of wastes, whereby unwanted resources can be re-used in a manufacturing process as inputs.

Water efficiency is measured in terms of outdoor water use and indoor water use.[76] Outdoor water use mainly concerns irrigation and rainwater collection. Indoor water use refers to water consumed by building processes, appliances, and equipment, [77] which may range from small changes of showers up to an overall renovation of sanitary fittings.[78]

[71] Ibn-Mohammed, T. et al., 'Operational vs. Embodied Emissions in Buildings – A Review of Current Trend', 66 (2013) *Energy and Buildings*, pp.232–245.
[72] See Taylor, T., and Pineo, H., 'Health and Well-being in BREEAM', BREEAM Briefing Paper, 2015, at 6. Full text available at: http://www.breeam.com/filelibrary/Briefing%20Papers/99427-BREEAM-Health---Wellbeing-Briefing.pdf, last visited May 2016.
[73] See USGBC (2016), *supra* note 66, at 129.
[74] See Waste Framework Directive, 22 November 2008, Directive 2008/09/EC, ANNEX III. Full text available at: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008L0098&from=EN, last visited June 2016.
[75] Waste-to-energy (WtE) is a process for primary waste treatment, in which electricity or heat can be generated out of the wastes. See WTERT, 'Answers to FAQ', available at: http://www.seas.columbia.edu/earth/wtert/faq.html, last visited May 2016.
[76] USGBC (2016), *supra* note 66, at 51-54.
[77] *Id.*, at 53.
[78] *Id.*, at 57-59.

2. Challenges facing GB

2.1 A higher first cost and non-affordability

A higher first cost has been reported as the top challenge facing GB compliance.[79] A GB can cost more at the outset.[80] Over time, the (production) costs of GB can go down as a result of increasing knowledge about GB and a rising number of GB service providers.[81] Some studies have shown that there is no significant difference in average cost for green buildings compared to non-green buildings.[82] Despite the fact that the production costs of GB may decline, the affordability problem is becoming a major challenge reported in the SmartMarket report 2018. This may imply that the higher actual costs of GB may not be as significant as before, but the expected costs of GB might be high to the potential green builders perceiving GB as high-end projects.[83] Nevertheless, the higher first cost still tops the challenge list.

2.2 Lack of incentives to build green

A long payback period may be another reason why stakeholders do not go for GB.[84] Though GB costs more in the beginning, the first cost can be paid off over a building's life cycle.[85] However, it may take years for the payoffs to be seen,[86] in which case end-users may be indifferent to GB due to rational inattention.[87] Moreover, the costs of GB compliance may not pay off in any case, due to which GB stakeholders are likely to suffer

[79] See Dodge Data & Analytic (2018), *supra* note 40, at 14; Nina Khanna et al., 'Comparative Policy Study for Green Buildings in U.S. and China', Lawrence Berkeley National Laboratory Report No. LBNL-6609E, April 2014, at 30. Full text available at: https://china.lbl.gov/sites/all/files/green_buildings_policy_comparison.pdf, last visited August 2016.

[80] The extra costs may include payment for green facilities and materials ('hard costs'), and the cost of GB certification ('soft costs). See World Green Building Council (WGBC), 'The Business Case for Green Building: A Review of the Costs and Benefits for Developers, Investors and Occupants', 2013, at 20. Full text available at: http://www.worldgbc.org/files/1513/6608/0674/Business_Case_For_Green_Building_Report_WEB_2013-04-11.pdf, last visited August 2016.

[81] See Dodge Data & Analytic (2016), *supra* note 6, at.18.

[82] See WGBC (2013), *supra* note 80, at 7; Mathiessen, L. F., and Morris, P., *Cost of Green Revisited: Reexamining the Feasibility and Cost Impact of Sustainable Design in the Light of Increased Market Adoption* (Davis Langdon, 2007), at 3. Full text available at: http://sustainability.ucr.edu/docs/leed-cost-of-green.pdf, last visited August 2016.

[83] Dodge Data & Analytic (2018), *supra* note 40, at 14.

[84] *Id*., at 14.

[85] WGBC (2013), *supra* note 80, at.19.

[86] On the global average, the payback period of building green is 8 years, but this may differ across jurisdictions. For instance, the average payback period of a new GB in China is 5-6 years, and that in the US is around 7-8 years. Dodge Data & Analytic (2016), *supra* note 66, at 6, 37 & 43.

[87] For instance, in the case of energy use, a study has shown that "if time and effort are required to accurately ascertain the lifetime value of energy efficiency for a durable good, consumers might rationally ignore energy efficiency." See Sallee, J. M., 'Rational Inattention and Energy Efficiency', 57(2014) *The Journal of Law & Economics*, pp.781 – 820.

losses given the higher first cost. As immediate losses hurt more than long-term gains feel good, building stakeholders may go for GB compliance only if the gains are considerable and visible.[88]

Another problem could be split incentives among building stakeholders. The idea of split incentives is that those who invest in GB compliance may not immediately benefit from GB compliance. For instance, a GB developer may pay for the installation of energy efficient HVAC systems in a building. Yet it is likely that end-users of the building will actually pay for energy bills (e.g., the tenants) and hence directly benefit from the more efficient HVAC system. For developers with short-term investment horizons,[89] GB development may in the first instance bring benefits to others than the developers themselves.

2.3 Unawareness and dispersion of stakeholders

Building stakeholders may not be fully aware of GB compliance.[90] In early times, GBs might be mistaken by consumers as high-end projects.[91] The rising environmental awareness has in a way driven consumers to buy GB products.[92] However, GB compliance is still taken as add-ons rather than business as usual. Secondly, building stakeholders may not be well informed about the benefits of GB. For instance, in the case of green leasing, landlords may be less willing to undertake green renovations due to the split incentive problem. But the landlords are likely to have a go at GB if they know that GB compliance can result in a higher rent or a higher asset price of an office building.[93] The profits aside, environmental benefits have always been one of the triggers that raise GB activity level.[94] However, the environmental benefits might be valued more by

[88] A recent study has shown that occupiers living in larger rental units are willing to pay considerably more for energy efficiency improvement than those who live in smaller units. See Calcagni, G., 'Household Willingness to Pay for Improved Energy Efficiency in the US Rental Housing Market: Implications for Rocky Mountain Institute's Superefficient Housing Initiative', Prepared for James Brew and Alexis Karolides Principal Architects Rocky Mountain Institute, 20 April 2012, at 3-4. Full text available at: http://dukespace.lib.duke.edu/dspace/bitstream/handle/10161/5379/GC%20MP%20Final.pdf?sequence=1, last visited August 2016.

[89] Khanna et al. (2014), *supra* note 79, at 29. Full text available at: https://china.lbl.gov/sites/all/files/green_buildings_policy_comparison.pdf, last visited August 2016.

[90] See Dodge Data & Analytic (2018), *supra* note 40, at 14; Nina Khanna *et al.* (2014), *supra* note 79, at 29.

[91] See Dodge Data & Analytic (2018), *supra* note 40, at 14; Dodge Data & Analytic (2016), at 18.

[92] Lan, S., and Sheng, T., 'The Study on Key Factors of Influencing Consumers' Purchase of Green Buildings', 7 (2014) *International Business Research*, at 59.

[93] Eichholtz, P., 'The Economics of Green Building,' 95 (2013) *Review of Economics and Statistics*, at 60.

[94] See Dodge Data & Analytic (2018), *supra* note 40, at 20.

environmental NGOs, and less in individual decision-making due to 'causal inefficacy.[95]

The dispersion of stakeholders may also stand in the way of GB compliance. When the GB market is young, consumers may search in vain for green homes; while suppliers are likely to invest more in GB when the quantity demanded of GBs to go up. At the individual level, various building stakeholders can all affect the final performance of a GB over the life cycle.[96] The different building stakeholders may not always work in collaboration in the beginning. The dispersion of stakeholders may result in a higher cost of GB compliance and insufficient information about the risks & benefits of GB projects.[97] Besides, GB is a design-bid-use process in which GB suppliers and consumers need to communicate. However, the building industry is where the customers' feedback matters least.[98] In that case, the actual users may not use GB in its due way if the building professionals do not inform them.

[95] The idea of causal inefficacy in environmental ethics is that an individual is less likely to take green actions, e.g., fixing up the energy efficient HVAC system, when s/he knows that the action could make little difference in solving large-scale environmental problems, such as GHGs emission reduction. See Garvey, J., 'Climate Change and Causal Inefficacy: Why Go Green When It Makes No Difference?', 69 (2011) *Philosophy and the Environment*, at 157-158.

[96] The private parties here not only refer to 'internal stakeholders' such as architects, contractors, engineers, sub-contractors, product manufacturers, product distributors, developers, occupiers, but also to 'external stakeholders' like insurers. See Hoffman, A. J, and Henn, R., 'Overcoming the Social and Psychological Barriers to Green Building', (21) 2008 *Environment and Organizations*, at 395.

[97] See American Institute of Architects (AIA), 'Integrated Project Delivery: A Guide', 2007, at 2 & 5. Full text available at: http://info.aia.org/siteobjects/files/ipd_guide_2007.pdf , last visited June 2016.

[98] Lovins, A. B., 'Energy Efficient Buildings: Institutional Barriers and Opportunities', Report for E SOURCE Strategic Issues Paper Series, January 1994, at 30-31. Full text available at: http://www.rmi.org/Library/1992-02_EnergyEfficientBuildingsBarriersOpportunities, last visited July 2016.

Chapter III Why law matters and why instruments should be mixed: a theoretical framework

GB has environmental benefits, but the number of GBs might not be enough due to the challenges facing GB compliance. There are various legal and policy instruments for environmental governance, which may also work for GB. Before going for instrument mixes, the first question that should be asked is why law matters and why GB promotion cannot merely rely on the market. If law is supposed to play a role, then why does law need to use instrument mixes, given the fact that none of the instruments is free of costs.

This chapter draws a theoretical framework to reason the need of instrument mix for GB promotion. The chapter proceeds as five sections. Section 1 gives a quick look at the challenges facing GB compliance, followed by Section 2 that explains the general process of a novel change, to see where law can play a role in GB compliance. Section 3 looks into the pro-environment instruments, which are classified into command-and-control, market-based and persuasive instruments. Section 4 reasons a need for instrument mixes for GB, on account of government failure, liability failure and the failure of self-regulation in environmental governance. Section 5 looks into specific instruments and the possible combinations applicable to GB. The last section concludes.

1. Justifications for environmental law and policy making

In environmental governance, rules and standards are made in the hope that people will comply to make the environment better off. This is also the case with GB compliance as a way to environmental governance. It is possible that what plagues environmental governance in general may also impede GB in particular.

Not everyone seems to care about the environment even though all of us in some way benefit from it. Put differently, externalities become one of the most important concerns that lead to environmental non-compliance.[99] There are two general approaches to dealing with externalities, one of which is the Pigouvian approach, using instruments like subsidies or taxation. The Pigouvian approach seems more centralized and needs governments to give a visible hand.[100] Another is the Coasian approach based on the assignment and enforcement of property rights, which

[99] See Callan, S. J., and Thomas, J. M., *Environmental Economics & Management: Theory, Policy and Applications, 6th edition* (South-Western Publishing Company, 2013), at 53-54.
[100] Baumol W., J., and Oates, W. E., *The Theory of Environmental Policy* (Cambridge University Press, 1988), at 21-22.

appears to be more decentralized. The Coasian idea states that given the initial allocation of property rights, parties will bargain towards an efficient outcome if transaction costs are sufficiently low.[101] But the practice of property rights may sometimes lead to high transaction costs,[102] which become essential to address externalities. Transaction costs can come from multiple sources, including measurement, market-size (personal or impersonal transactions), ideology, protection of property rights and the integration of dispersed stakeholders.[103] Institutions affect how the transaction costs are borne, and an institutional arrangement may survive if it provides incentives or sanctions that can limit transaction costs.[104]

However, transaction costs and externalities may not suffice to map out the whole picture of a legal (social or economic) change. For instance, inefficiency can be a result of both transaction costs and path-dependency.[105] To keep a novel change right on its path, we need to first, know correctly the three sources of a novel change: an increasing stock of knowledge, demographics and the institutional matrix; [106] second, incorporate the new knowledge into the belief systems of those who in their positions can change the institutional arrangements;[107] third, alter accordingly the institutional matrix that consists of formal rules, informal constraints and the enforcement of the rules to generate the desirable outcomes.[108]

In a non-ergodic world, the three sources of a novel change can be the basis for, as well as the result of, a discovering process in which humans learn to deal with uncertainties. Those uncertainties may come on the following levels: [109] a) uncertainties that can only be reduced by increasing information given the existing stock of knowledge; b) uncertainties that can be reduced by increasing the stock of knowledge within the existing institutional framework; c) uncertainties that can only be reduced by changing the institutional framework; d) uncertainties that

[101] See Coase, R. H., 'The Problem of Social Costs', 3 (1960) *The Journal of Law & Economics*, pp. 1-44.
[102] *Ibid.*
[103] North (1992), *supra* note 21, at 5-8.
[104] *Ibid.*
[105] Mattei, Antoniolli and Rossato (2001), *supra* note 18, at 525.
[106] North (2005), *supra* note 25, at 116.
[107] *Id,* at 117.
[108] *Ibid*.
[109] *Id.*, at 17-18.

are associated with restricting beliefs; e) uncertainties that lay the ground for some non-rational beliefs such as religions.[110]

The general process of a novel change hints that, firstly, the institutional framework affects the incentive structure for a novel situation.[111] Second, institutional changes may not happen spontaneously to deal with the problems around externalities and imperfect/incomplete information. Third, institutional arrangements may sometimes go the second-best way as a result of the co-evolution of the three sources.

As law is an essential part of the institutional framework, it may also affect the incentive structure on different levels. However, lawmakers should note that, in a social dilemma, law cannot overcome all the challenges, e.g., the limit of human knowledge, or ideologies rooted in the culture. Moreover, legal alternatives should not only take into account constitutional and collective rules/actions, but also place value on operational rules that may affect decision making by individuals, whose perceptions and mental models on risks, uncertainties and information may affect the implementation of the collective rules.[112]

2. Understanding the general process of GB movement

GB recasts the way we see the built environment and hence can be viewed as a novel change in response to the environmental concerns around buildings. The GB movement as a novel change can be a result of the three sources formulated by North: a) an increasing stock of knowledge, which enables us to better know the impacts flowing from the building industry as well as the way to reduce the impacts; b) the belief systems of building stakeholders, which can affect the extent to which people are willing to build green; c) an institutional matrix consisting of rules, players and the enforcement of the rules of GB compliance. The three sources may lead the GB movement to be incremental and path-dependent, in which case law as a part of the institutional matrix may help to shape the incentive structure, integrate dispersed stakeholders, and steer preferences.

2.1 To begin with GB knowledge

First of all, knowing the environmental impacts of buildings may lead to technological innovations that bring GBs into reality. In the meantime, the knowledge about the benefits of GBs may result in a greater willingness to pay, and consequently a higher uptake of GBs. [113] However, the

[110] *Ibid.*
[111] *Id*, vii.
[112] Ostrom, E., *Understanding Institutional Diversity* (Princeton University Press, 2005), at 103.
[113] McGraw-Hill Construction (2013), *supra* note 6, at 5.

imperfect GB knowledge within the building sector can be a source of the higher first cost and uncertain outcomes. [114] Such uncertainty may discourage building stakeholders from going green, and can only be reduced by improving the knowledge of the GB industry as a whole. For individual building stakeholders, such as end-users, their lack of GB knowledge may lead GB performance to be compromised simply because they do not how to operate a GB in its due way at the post-occupancy stage. Equally noteworthy, the access to, and the distribution of, knowledge technologies may have an impact on how parties use power. Power gives rise to direct changes, which can in some way affect the whole process of change.[115]

2.2 Perceptions matter

Perceptions about GB compliance can be associated with stakeholders' experiences, social norms, and the interactions between them. Those factors may not change in the short run. [116] As with GB compliance, the rule-of-thumb handed down from some conventional building experiences[117] can result in the unawareness of GB compliance. Moreover, it is not only the information per se which matters, but what also matters is the way in which players see and address incomplete/imperfect information. [118] Put differently, information differs in its impacts on different stakeholders over time. The payoffs of a GB project may not be certain, but the payoffs perhaps matter more to companies renting larger units in GBs than to those who live in a small unit.[119] By the same token, GB may be perceived to cost more than it actually does. Yet the extra amount of money may not be as significant to some large-scale project developers as it is to the developers of medium-size or smaller projects.

2.3 Institutional framework for GB to happen

Even if GB compliance can be known and perceived correctly, the institutional matrix in a jurisdiction determines whose perceptions matter, to what extent the knowledge and perceptions could impact stakeholders' decision-making, and how to make players pursue the desirable

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[114] Chen, F. et al., *Proceedings of International Conference on Low-carbon Transportations and Logistics, and Green Buildings* (Springer Science and Business Media, 2013), at 856.
[115] Norgaard, R. B. 'Coevolutionary Social Ecological Economics,' in Clive L. Spash (ed.), *Routledge Handbook of Ecological Economics: Nature and Society* (Routledge, 2017), at 134.
[116] See Marechal, K., 'Not irrational but habitual: the importance of behavioral lock-in in energy Consumption', 69 (2010) *Ecological Economics,* at 1104–1114; Nelson, R., and Consoli, D., 'An Evolutionary Theory of Household Consumption Behavior, 20 (2010) *Journal of Evolutionary Economics,* at 665–687.
[117] Lovins (1994), *supra* note 98, at 44.
[118] North (1992), *supra* note 21, at 17.
[119] See Eichholtz (2013), *supra* note *93, at* 90.

outcomes.[120] The institutional matrix entails both rules and players in a novel situation. The rules may include formal rules, e.g. policies or laws, as well as informal rules like private rules or social norms.[121] Formal rules can be vertically classified into constitutional, collective, and operational rules based on which decisions are made. [122] For instance, in GB compliance, legislation can be collective rules that delegate the regulatory power for the making of GB regulations. Private laws and regulations applicable to each GB element are operational rules that provide different stakeholders with inducements to comply. Constitutional rules lay down the political structure that determines how legislation and policies for GB promotion are made. Some of the formal rules like regulations can be changed in the short term; whereas informal rules like social norms may take a long time to evolve.[123]

The rules may establish a set of organizations as well as the rights & obligations of different players. The players can be either public or private parties, or those in between. The different stakeholders may have different reasons to go green. For instance, governments may see GB compliance as a way to emission reduction and sustainable development, whereby GB compliance can obtain some political support. By contrast, some GB professional associations might be eager to promote GB compliance simply because they are the creators of certification programs and want their businesses to grow. Individuals may go for GB for energy savings or healthier buildings. It is also likely that individuals will act upon intrinsic motivations shaped by knowledge, experiences and the preference of the community at large.[124] External intervention through law may work for or against the intrinsic motivations. [125]

Consisting of the rules and the players, the institutional matrix helps to shape the incentive structure for a novel change to happen. The institutional matrix can be altered to deal with the attributes of public goods, externalities and information problems that cannot be fixed by the market itself.[126] The interaction and co-evolution between the rules and

[120] North (2005), *supra* note 25, at 6
[121] *Id*., at 49.
[122] Operational rules determine the provision, production, distribution, appropriation, assignment or consumption of goods and services, which may directly affect day-to-day decisions made by the parties. Collective rules, such as policies and rules about elections, determine who is eligible to be a participant and how the operational rules are changed. Constitutional rules affect the collective situations by determining who is eligible to participate as well as the rules of changing the collective rules. More about the three types of rules see Ostrom (2005), *supra* note 112, at 59.
[123] North (1992), *supra* note 21, at 13.
[124] Ostrom (2005), *supra* note 112, at 112.
[125] See *infra* Section 3.3.
[126] North (2005), *supra* note 25, at 7.

players may sometimes lead to distractions of the institutional arrangements, [127] and render GB development to be overwhelmingly incremental and path-dependent.[128]

Before GB compliance comes to its time, the formal rules (e.g. environmental laws), as well as the informal rules (e.g. customs in the building sector), have already played a role in building activities. This can mean that most of the existing buildings may be built in line with the old rules, and some of the outcomes are irreversible, e.g. land use of building project. If that were all there was about path dependency, GB compliance would be achieved by just changing the rules or retro-fitting buildings.

However, the institutional change may not take place spontaneously, and it relies largely on the players to make it happen. Different players may have different incentives to, or not to, build green. Parties who benefit from the existing rules will have a stake to keep everything *in situ*. Putting it differently, the vested interest holders will probably refuse a new change if it will cause losses and bring no benefits to them.

The delegation of power among the different players also explains why it is so hard to make a move. In a representative society, the sovereign people delegate the powers to the legislatures; the legislatures specify the details about the organizations and their rights & obligations, in which case the legislatures act as principals and the governmental organizations act as agents.[129] In that sense, it is the individuals as part of those organizations who actually engage in GB practice, and they may influence the final outcome when they become more knowledgeable and experienced.[130] It is likely that those agents will pursue their own agenda and may not always

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[127] *Id.*, at 90; Ayres, I., and Braithwaite, J., *Responsive Regulation: Transcending the Deregulation Debate* (Oxford University Press, 1992), at 13-14.

The idea of interaction also makes sense in environmental policy making. For instance, by putting energy as an input in production to the co-evolutionary demand and supply model, a study has shown a network effect on the consumer side that prevents the entrance of new firms with energy efficiency technologies. This may lead policies for energy use reduction to increase energy use. See Safarzynska, K., 'Modeling the rebound effect in two manufacturing industries,' 79 (2012) *Technological Forecasting & Social Change*, at 1135-1154.

[128] North (1992), *supra* note 21, at 10-13.

[129] Cox, G. W, and McCubbins, M. D., 'The Institutional Determinants of Economic Policy Outcomes,' in Haggard, S., and McCubbins, M. D. (eds.), *Presidents, Parliaments, and Policy* (Cambridge University Press, 2001), at 28-29.

[130] There has been an empirical study showing that regulatory outcomes vary sharply across individual regulators and appear to depend on the amount and type of training regulators receive and the frequency they participate in inspections. The study looks at how the US Food and Drug Administration (USFDA) conducts inspections on pharmacy manufacturing, revealing the marked heterogeneity among individual regulators and its importance in regulatory outcomes, where the common modeling assumption of a single homogeneous regulator may not hold. Macher, J. T., Mayo, J. W., and Nickerson, J. A., 'Regulator Heterogeneity and Endogenous Efforts to Close the Information Asymmetry Gap', (54) 2011 *The Journal of Law & Economics*, at 52-53.

act in the public interest,[131] in which case the implementation of rules may deviate from its goal as a result of rent-seeking and lobbying.

The process of a novel change hints that, firstly, left to itself, the GB movement may not necessarily evolve upward. The GB movement may fall victim to path-dependency, due to the interaction within/among the rules and the players. Secondly, apart from formal rules that determine the incentive structure, governments can also make use of social norms and nudges to steer preferences. Third, not all challenges facing GB compliance can be ascribed to externalities that often lay the ground for environmental regulation. Last but not least, law as part of the institutional framework is likely to play a role in the GB movement, in the way of providing incentives and putting checks and balances on power.

3. Why law matters in environmental governance

3.1 Law as a system of incentives

In general, law spells out the incentive structure that determines who builds green, and for what. First of all, law can be used to mandate GB compliance or to give financial support. The idea of using mandates is that building stakeholders may comply if non-compliance results in penalties. At other times, incentives can be given by tax reductions, subsidies, funds or a permits trade system that can bring parties financial benefits or losses.

Second, law can affect the incentive structure through the assignment of property rights, and the determination of liability rules.[132] On the one hand, the allocation of entitlements may affect how resources are used.[133] GB compliance requires re-use of brownfields left in the public domain. However, land reclamation is not without costs and the parties at stake may not take measures spontaneously, particularly in the face of a state property regime.[134] If the government fails to take care, a piece of land may become 'de jure state property but *de facto* open access,"[135] which may lead to the 'tragedy of the commons.' On the other hand, liability rules may have different deterrent effects on parties' behavior.[136] An

[131] North (1992), *supra* note 21, at 19-20.
[132] See Bromley, D. W., 'Property Rules, Liability Rules, and Environmental Uncertainty', 12 (1978) *Journal of Economic Issues*, at 43-60.
[133] See Bromley, D. W., 'The Commons, Common Property and Environmental Policy', 2 (1992) *Environmental and Resource Economics*, at 10.
[134] In the case of state property regime, the ownership of land resides with citizenry at large; but the actual management of the land will be in the government's hands. *Id.*, at 10.
[135] *Ibid.*
[136] See *infra* Section 5.2.

example could be the use of lender liability as a vicarious liability to promote GB compliance on brownfields.[137]

The property rules and liability rules may have different implications, taking into account who bears the transaction costs.[138] Generally, the property rules can score better than do the liability rules in protecting possessive rights, as the property rules reduce the need for bargaining.[139] Put differently, a property owner does not need to bargain with all the potential takers if s/he places more value on the property. When a taker approaches and is likely to do harm to the entitlement of the property, the owner can use injunctive remedies. By contrast, there is a prima facie case showing that liability may be superior to address harmful externalities, particularly when bargaining is impossible or when the state has imperfect information about individual acts.[140] In that case, victims tend to sue injurers for damages when the harm occurred.

This general idea can be further reflected in the following five case scenarios where the different rules interplay to assign entitlements or to address pollution:[141] (i) Party A may not interfere with B without B's consent. In this case, B is protected by a property rule; (ii) Party A may not interfere with B unless A compensates B. In this case, B is protected by a liability rule; (iii) Party A may interfere with B and cannot be stopped unless B buys off A. In this case, A is protected by a property rule; (iv) Party A may interfere with B and cannot be stopped unless B compensates A; in this case, A is protected by a liability rule. (v) Party A may not interfere with B in any case and stopping would not necessarily lead to compensation. In this case, B is protected by an inalienable rule.

Rules (i) and (iii) are similar as two property rules. In the case of (i) or (iii), the structure of entitlements defines the bargaining process between A and B, and the two rules differ in terms of transaction costs imposed on the parties affected.[142] With (i), the burden is on A to ensure no harm to B's property; by contrast, rule (iii) requires B to approach A, and to be ready to buy off A for doing harm.[143] In other words, B's income position will

[137] See Prum, D. A., 'Greenbacks for Building Green: Does a Lender for Sustainable Construction Projects Need to Make Adjustments to Its Current Practices?', 43 (2013) *Environmental Law*, at 415-453. A further discussion on lender liability in the US see *infra* Chapter IV, Section 4.3.4.
[138] For a more in-depth analysis on the implications of the two rules see Louis Kaplow and Steven Shavell, 'Property Rules v. Liability Rules: An Economic Analysis, 109 (1996) *Harvard Law Review*, at 713-719.
[139] *Ibid.*
[140] *Ibid.*
[141] See Bromley (1978), *supra* note 132, at 49.
[142] *Id.*, at 46.
[143] *Ibid.*

affect B's ability to influence the outcome. Rule (ii) and (iv) are similar as two liability rules. Under (ii), B must be compensated, in which case B's income has little impact on the bargaining. If A cannot pay, the harm must be eliminated. As opposed to rule (ii), rule (iv) requires B to compensate A in order to stop A, and everything will remain in situ if B can afford to compensate.[144] Rule (v) is an inalienable rule that decides who is to own an entitlement and what price should be paid if it is taken or destroyed. In that sense, Rule (v) can be made to stop some bargaining if the use of properties or facilities will lead to huge environmental risks to society.[145]

In environmental governance, the five rules may come in different shapes, e.g. the law of nuisance, the first-use doctrine or regulations of hazardous substances. Those rules are usually chosen on account of the bargaining power of the parties, the transaction costs imposed on the two sides, the number of parties involved and if there are irreversible effects by the pollution.[146] In that sense, those rules may affect different parties' incentives for environmental compliance. Suppose two parties are living next to each other, say a chemical manufacturer and a victim to pollution by the chemical manufacturer. Where bargaining is impossible, and the liability rules are used, neither the manufacturer nor the resident has to move off. By rule (ii), the manufacturer has to compensate the resident in order to keep the business going; while by rule (iv), the resident has to pay the manufacturer for reducing the production/harm. In the latter case, the manufacturer may have fewer incentives to improve abatement techniques. It is also likely that the manufacturer uses hazardous substances with substantial environmental risks; the manufacturer may be stopped without being compensated under rule (v).

Lastly, law may help to integrate knowledge and stakeholders, and hence affect the (information) costs of compliance. For instance, contracts are usually incomplete and parties may act opportunistically in impersonal transactions (e.g., energy performance contracting). In that case, law may on the one hand inform parties about some key clauses included in the contract, as well as the possible remedies for non-performance. On the other hand, law may enlist a third party (e.g. courts) to enforce contracts or resolve disputes. In this way, law can help to lower the transaction costs for bargaining parties.[147] Besides, law per se can be information with different costs. Law can be given contents before or after, which gives rise to a distinction between rules and standards. In the case of GB compliance,

[144] *Id.*, at 47.
[145] *Id.*, at 48.
[146] *Id.*, at 49-56.
[147] Mattei, Antoniolli and Rossato (2001), *supra* note 18, at 523.

standards and rules are both available as part of the GB laws. By and large, rules are made ex ante, e.g. regulations for safety, or the law of damages. Rules are costly to make, but they would be cheaper for individuals to be informed, in other words, the costs of legal advice will be lower. By contrast, standards take shape *ex post*, as with the negligence rule. Standards can be made at a lower cost, but it may cost more for individuals to be informed about the standards. In the light of the distinction, it would be cost-effective to give law contents ex ante ('rules') when the frequency of activity is high; in the meantime, the law as rules will lower the costs of legal advice for individuals. Certainly, the choice between rules and standards is more complicated, on account of the costs and benefits at the different stages, i.e., making, consulting and enforcement of rules. [148]

3.2 Law puts checks on power

Regulation is bound by the rule of law, whereby law can oversee the use of power and protect rights from takings. The rule of law means that the law should be general, certain and impartial.[149] Intuitively, it would go against the rule of law to allow governments who decide on particular regulatory issues to make whatever law they like.[150] Yet over time, law seems to lose its original meaning, including rules made for particular regulatory goals,[151] as with GB regulations in the US and China, which are usually taken as part of the law. In other words, there could be a distinction between 'what law is' and 'what the law is'.

It is not the source but the limitation of power which prevents it from being arbitrary.[152] In a broader sense, the law within a specific jurisdiction may have different types of secondary rules dealing with validity, change and application of the laws. [153] The secondary rules draw a line between legislation and regulation in a legal system. In this way, law is still able to put checks on power and keep regulation from infringing rights.

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[148] For more discussion about the rules versus standards see Kaplow (1992), *supra* note12.

[149] Law must be general means that law does not take shape to meet wants and needs of a particular group of people, or to stultify individual efforts by ad hoc action. To make it understandable, "there is a distinction between laying down a rule of the Road, and ordering people where to go." Being certain makes it possible to foresee with fair certainty how the authority will use its coercive powers in given circumstances. Being impartial means to have no answer to certain questions – "to the kind of questions which, if we have to decide them, we decide by tossing a coin.' See e.g. Hayek, F. A., *The Road to Serfdom* (University of Chicago Press, 1944), at 73-83.

[150] Hayek, *Law, Legislation and Liberty: A new statement of the liberal principles of justice and political economy, volume III, The Political Order of a Free People* (The University of Chicago Press, 1979), at 25.

[151] *Id.*, at 21-23.

[152] Hayek (1944), *supra* note 149, at 71.

[153] Hart, H. L.A., *The Concept of Law* (Oxford University Press, 1994), at 79-91.

GB regulation also needs to follow the rule of law. GB compliance means more than energy efficiency in government buildings, and it is becoming mandatory for private buildings in some countries. In pursuit of GB compliance, different stakeholders are involved to play out the different instruments. Some of those instruments may not sit comfortably with property rights, as is the case for planning and zoning that are not strangers to taking claims. An example in point is the Chinese government's efforts to open up residential communities, for the purpose of a more efficient transportation network.[154] In the use of taxation, it is often the case that a tax should be created by legislation and be imposed through due process. Debate abounded around the Tax Increment Financing (TIF) program for building energy efficiency renovations in the US, as the TIF in a way deviates from the way it is supposed to be.[155] The incorporation of private rules in GB regulation may be accused of creating monopolies and violating the non-delegation principle.[156] As an instrument mix, the USEPA's Supplemental Environmental Projects policy was challenged by the Miscellaneous Receipts Act (MRA), which requires all the penalties to go into the Treasury rather than to the environmental regulators.[157]

3.3 Law shapes perceptions and preferences

Law as part of the institutional framework may in a broader sense deliver knowledge to the public and steer preferences. The real world is a mix of both competitive situations and social dilemmas, in which players need to take institutions seriously as not all individuals in all situations are self-interested rational egoists.[158] Different stakeholders may have different reasons to comply, e.g., economic rationality, situational rationality, habits or reputation.[159] Norm-following individuals take into account other people's interests as well as their own.[160] It is likely that parties choose to comply with a rule simply because it is the rule. If GB compliance

[154] See *infra* Chapter V, Section 4.2.2.
[155] See *infra* Chapter IV, Section 4.3.1.
[156] *Id.,* Section 4.1.2.
[157] *Id.,* Section 4.5.1.
[158] Ostrom (2005), *supra* note 112, at 127-131.
[159] Some studies have shown that individuals, as well as firms, can have different motivations to comply with laws and regulations. Sometimes corporates are motivated by economic rationality. For instance, in a game with regulators, firms are said to cooperate in order to minimize regulatory costs. At other times, corporates or executives choose to comply because they care about their reputation, or because of a sense of social responsibilities and rule-abidingness. See Scholz, J., 'Deterrence, cooperation and the ecology of regulatory enforcement', 18 (1984) *Law and Society Review*, pp. 179-224; Marechal, K., 'Not irrational but habitual: The Importance of behavioral lock-in in energy consumption', 69 (2010) *Ecological Economics*, at 1104-1114; Braithwaite, *To punish or to persuade: Enforcement of Coal Mine Safety* (SUNY Press, 1985), at 95-101.
[160] Ostrom (2005), *supra* note 112, at 112.

becomes part of the law, we can at least make parties with a sense of law-abiding go for GBs.

Equally important, how law works with individual behavior can have impacts on the effectiveness of the legal intervention. Individuals may act upon intrinsic motivations related to how they prefer to behave.[161] In the meantime, social norms may lead players to behave in a certain way, on account of how strongly they value compliance with a norm.[162] In general, consumers' choices for green products, e.g., GBs and hybrid cars, may have more to do with social norms than changes in relative prices.[163] It has also been shown that external interventions via monetary incentives or punishments are likely to affect intrinsic motivation in two ways. On the one side, external intervention may crowd-out intrinsic motivations if the individuals affected see them as controlling, in which case self-determination and self-esteem suffer.[164] On the other side, external interventions can also crowd-in intrinsic motivation if the individuals concerned perceive it to be supportive.[165] The motivation crowding theory also has some implications in environmental governance, for which the effectiveness of pricing instruments remains in doubt.[166] This may signal that, apart from the CAC and market-based instruments as external interventions, governments can also work to the intrinsic motives of individuals, using persuasion or nudges.

4. Instruments for environmental compliance

If law does play a role in overcoming the challenges, then the question can be asked how law can be used to promote GB compliance. GB is mainly for environmental governance. In recent years, the way to environmental governance has gone beyond a top-down approach, including decentralized arrangements (e.g., multilevel governance),[167] in which case

[161] *Ibid.*
[162] *Id.*, at 127-129.
[163] Congdon, W. J., Kling, J. R., and Mullainathan, S., *Policy, and Choice: Public Finance Through the Lens of Behavioral Economics (*Brookings Institution Press, 2011), at 113.
[164] Frey, B. S., 'How Intrinsic Motivation is Crowded out and in,' 6 (1994) *Rationality and Society*, at 334-352.
[165] *Ibid.*
[166] Frey, B. S., and Jegen, R., 'Motivation Crowding Theory: A Survey of Empirical Evidence', 15 (2000) *Journal of Economic Surveys*, pp. 589-611.
[167] A case in point could be the management of common-pool resources that are rival in use but non-excludable in access. It is too often the case that formal rules like policies come up with a single solution to common problems, turning a deaf ear to "the diverse institutional arrangements work in practice and assuming that sanctioning activities can be done without errors. In this way, policies may miss an adequately specified theory of collective action by which private parties and organizations can manage themselves on a voluntary basis to "retain the residuals of their own efforts. On that account, Ostrom (1990) identifies the internal and external factors that can impede or enhance the capabilities of individuals to use and govern common-pool resources. For more about the governance of CPRs

multiple stakeholders will get involved to play out the rules of various instruments. Those instruments can be classified into command-and-control, market-based and suasive instruments. This section briefly looks at the three types of instruments and explains how they can be thought of in legal terms.

4.1 Instrument types

In this study, instruments for environmental governance are classified into command-control, market-based and suasive instrument.[168] Government intervention levels down from the CAC to the market-based, and to the suasive. More specifically, those instruments differ in time, form and enforcement. CAC instruments are the direct interventions from the government, which usually decides collectively the degree to which an activity is desirable, who should participate in it, and how the activity should be done. [169] In that sense, the CAC approach avails specific deterrence.[170] By contrast, neither the level of care nor the level of activity is predetermined in the use of market-based instruments. Instead, market-based instruments use (financial) incentives or disincentives to affect the care/activity level, yet they may not achieve both at the same time when used in isolation.[171] Suasive instruments make use of information or nudges to encourage voluntary compliance, so as to indirectly affect both the level of activity and the level of care.

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see Ostrom, E., *Governing the Commons: The Evolution of Institutions for Collective Action* (Cambridge University Press, 1990), at 13-27.

[168] Pacheco, R. and Nemetz, P. N., 'Business-Not-As-Usual: Alternative Policy Instruments for Environmental Management.' In 'Proceedings of the 5th IRE Annual Workshop: Addressing the Knowledge Crisis in Water and Energy: Linking Local and Global Communities, 2001 Vancouver, B.C., Institute for Resources and Environment, UBC, at 57. Full text available at https://www.academia.edu/3043082/Pacheco_and_Nemetz_2001_Business-Not-As-Usual_Alternative_Policy_Instruments_for_Environmental_Management, last visited April 2019.

[169] Baumol and Wallace (1988), *supra* note 100, at 156; Calabresi, G., *The Costs of Accident: A Legal and Economic Analysis* (Yale University Press, 1970), at 25.

[170] Calabresi (1970), *supra* note 169, at 25..

[171] For instance, one study compares the impacts of corrective taxes and liability on the care and activity levels. The study found that corrective taxes may score better than liability in controlling general pollution when the quantity of pollution determines the harm. The idea is that corrective taxes might not significantly affect the parties' care level since it is based on expected harm and a fixed tax rate. Once the parties get involved, there is rarely an excuse for parties not to pay. A strict liability rule can also help to reduce the level of activity by the same logic. By contrast, a negligence rule may provide the injurer with an escape as long as s/he takes due care in preventing the harm, and hence induce parties to take the due care. See Shavell, S, 'The Corrective Tax versus Liability as Solutions to the Problem of Harmful Externalities', 54 (2011) *The Journal of Law & Economics*, at 250-265.

Table 1 Fundamental Dimensions of Legal Intervention

Method	Dimensions of legal intervention		
	Time	**Form**	**Enforcement**
Tort law	After harm	Monetary	Private
Safety regulation	Before/after acts	Various	Public
Injunction	Before/after acts	Various	Private
Contract law	After harm	Various	Private
Criminal law	Before/after acts; after harm	Various	Public

(Shavell 2004, p.572)

More specifically, command-and-control ('CAC') instruments are regulation in a traditional sense, which relies largely on direct government interventions. [172] In the case of CAC instruments, the government sets standards for environmental quality or the amount of emission. Non-compliance with the standards will lead to sanctions.[173] CAC instruments are usually ex ante in character. Those standards may take the form of target standards, performance standards or specification standards. The three types of standards differ in their costs of compliance and enforcement. To set environmental standards, regulators need to think about whether or not the standards should be uniform or differentiated, and whether or not regulation should lend itself to the industry-based certifications.[174]

Market-based instruments can be thought of as financial incentives like subsidies, taxation, public procurements, funds or price systems such as emission trading systems. [175] Liability can also be a market-based instrument, as it offers general deterrence and lets parties on the market decide whether or not, how and to what extent they want to get involved in an activity, based on the given costs.[176] In this regard, the detection of injuries and information about individual behavior might be better obtained by private parties. [177] However, this may not always hold in

[172] Maloney, M. T., and McCormick, R. E., 'A Positive Theory of Environmental Quality Regulation,' (25)1982 *The Journal of Law & Economics*, at 99.
[173] Andres, A., *Environmental Economics: Theory and Policy* (Cambridge University Press, 2011), at 108.
[174] More about standard setting see *infra* Section 6.1.
[175] The idea of ETS comes from the equi-marginal principle of abatement. In the case of ETS, the abatement will be borne by those who can reduce pollution at a lower cost, and profit from selling their extra permits to parties in need. In doing so, parties in the market are encouraged to invest in abatement technologies. Callan and Thomas (2013), *supra* note 99, at 98-100.
[176] Calabresi (1970), *supra* note 169, at 25.
[177] Shavell, S., *Foundations of Economic Analysis of Law* (Harvard University Press, 2004), at 581.

environmental torts, where there were no particular victims,[178] or in long-tail environmental harm.

Suasive instruments provide neither coercion nor financial incentives, but encourage voluntary compliance via nudges or other informational tools.[179] Suasive instruments can also take the form of control over misleading information ('negative information regulation').[180] Governments can use the information to nudge voluntary compliance at the individual level, e.g., to support programs that provide real-time information about energy use in buildings. Equally important, information disclosure can help to make information evenly distributed among private stakeholders.[181] In the case of GB compliance, there are various industry-based GB certifications.[182] It is likely that the industry-based standards are watered down to greenwash building projects that do not include the environmental benefits as certified. In that case, regulations may refer to an industry-based certification, or control misleading information.[183]

Apart from informational instruments, voluntary environmental agreements (VEAs) can also be a suasive instrument. A VEA is an agreement between regulators and industries, in which the regulated will promise to comply with minimum intervention from the regulator. In this

[178] It is not uncommon to see no particular victims in environmental suits, especially in the case of citizen suits or public interest litigations. For instance, a recent case ruled by the Court in the Fujian province, China, has been taken as a 'mind-blowing victory' for the ENGOs as plaintiffs in environmental public interest litigations. In the case, the defendant company illegally disposed of solid wastes during strip mining, causing land contamination and vegetation deterioration. Before the action was brought about, the local government had fined the company. Yet the company did not stop, and no one other than the government seemed to put an end to the wrong-doing since there was not a specific victim suffering from the ecological loss. Hence the 'Friend of Nature', as an ENGO in China, filed a suit against the company almost immediately when the new environmental law came into effect. The court ruled that the defendant should pay for the clean-up and reclamation. See He, X., and Lan, L. '南平宣判一环境公益诉讼案: 为新环保法实施后首例由社会组织提起的诉' (The First Environmental Public Interest Case under the Revised Environmental Protection Law of PRC), on the ChinaCourt, 2 November 2015, available at: http://fjfy.chinacourt.org/article/detail/2015/11/id/1738577.shtml, last visited August 2016.

[179] Pacheco and Nemetz (2001), *supra* note 178, at 57.

[180] Ogus, A. I., *Regulation: Legal Form and Economic Theory (*Oxford University Press, 1994), at 145.

[181] By looking at how the USFDA works, a study has shown that regulators differ in their approach to information asymmetry (heterogeneity). Not all regulators take their hands off information asymmetry; instead, they do engage in a wide range of activities to reduce the information asymmetry. By unpacking such heterogeneity, the study further points out that information asymmetry problem can be better solved by incorporating regulators' efforts. See Macher, J., Mayo, J. W. and Nickerson, J. A., 'Regulator Heterogeneity and Endogenous Efforts to Close the Information Asymmetry Gap', 54 (2011) *The Journal of Law & Economics*, at 25-54.

[182] As shown by the GB SmartMarket report 2016, the top reason for which builders say no to the GB rating systems is that they are too "costly and time-intensive." See Dodge Data & Analytic (2016), at 20.

[183] Grodsky, J. A., 'Certified Green: the Law and Future of Environmental Labeling', (147) 1993 *Yale Journal on Regulation*, at 167-169.

way, the agreement would rely mainly on private enforcement, and the participation of a government agency is more of a way to make the agreement more credible.[184] The private-enforcement feature makes a voluntary agreement different from a public procurement contract that is legally binding, though both can be taken as a public-private partnership (PPP) in a broad sense.

4.2 The instruments in legal terms

The three types of instruments have been around in environmental law for some time. The ways in which different instruments work to induce desirable outcomes may relate to the functions of law. The law in society has both direct and indirect functions. The direct functions can be thought of as "preventing undesirable behavior and securing desirable behavior"; "the provision of services and the redistribution of goods"; "providing facilities for private arrangements between individuals"; and "settling unregulated disputes." [185] The indirect functions could be to raise the respect for authority or to embed certain beliefs and values into people's minds. The indirect functions may not stem from the obedience or application of the law, but from knowing the existence of law.[186]

More specifically, the three types of instruments can find their counterparts in both hard and soft law. In legal terms, hard-law instruments may come in the form of administrative penalties, or in the form of common law remedies (the liabilities on tort or property) that are ensured by the state coercive power. Administrative penalties are imposed by governments when there is non-compliance with pre-defined standards, which is akin to CAC instruments. While in the case of private law remedies, neither the standards nor the damages are predetermined, which is similar to the liability regime as one of the market-based instruments.

It is worth noting that lawmaking does not always follow a categorical line. Law may lay out instrument mixes on account of the different functions of law. Apart from the functions, governments may also take into account the timing in using the instruments.[187]

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[184] Connor, D. O., 'Applying Economic Instruments in Developing Countries: From Theory to Implementation,' 1 (1999) *Environment and Development Economics*, at 103.

[185] Raz, J., *The Authority of Law: Essays on Law and Morality* (Oxford University Press, 1979), at 167-168.

[186] *Id., at* 176-177.

[187] For instance, it is possible that market-based instruments like subsidies or taxation can score equally or even better than CAC instruments when the regulator uses them immediately after firms have adopted the technology. By contrast, if regulators make the first move before private parties, the use of CAC instruments (e.g., a permit) is more likely to achieve the best allocation. Requate, T., and Unold, W., 'Advanced Abatement Technology: Will the Time Ranking Please Stand Up?', (47) 2003

5. A need for instrument mixes in environmental governance

No single instrument can overcome all the challenges facing environmental governance, for which instrument mixes have been put in place.[188] Those instrument mixes may also work for GB for environmental governance. On the one hand, instrument mixes make sense because environmental issues are complex and intertwined. GB contains more than one environmental element and deals with resource use and environmental impacts reduction.

On the other hand, GB involves different types of stakeholders, e.g., governments, professional associations, and individual building stakeholders. However, regulation, liability or self-regulation on its own may not be sufficient to promote GB to a desirable level. The failures regulation, liability and self-regulation may lay the ground for smart instrument mixes for GB. This section further looks into those failures, to see why none of the instrument in isolation suffice for environmental governance and hence for GB promotion.

5.1 Regulatory failure in environmental governance

Regulatory failure can be thought of as government's over-action or inaction.[189] In the case of over-action, governments might be overzealous in regulating problems that could be solved by the market.[190] At other times, governments may not have sufficient regulation and rely too much on the market. There are also circumstances in which regulation may fail in environmental governance.

Firstly, governments may not always respond promptly to all environmental issues. This could be a result of regulatory inflexibility and environmental uncertainty. On the one hand, regulation should be subject to the rule of law and due process, which avail oversight on power and protection of rights. As such, regulation may be less flexible and responsive to atypical harm or new environmental problems.[191] On the other hand, governments may do well in environmental governance when causality is clear, outcomes are foreseeable and abatement technologies are available.[192] Yet in the case of environmental uncertainty, the precautionary principle requires more cautious regulations than made

European Economic Review, at 142.

[188] Faure, M. G., 'The Complementary Roles of Liability, Regulation, and Insurance in Safety management: Theory and Practice,' 6 (2014) *The Journal of Risk Research*, at 690.

[189] Orbach, B., 'What is Government Failure', (30) 2013 *Yale Journal on Regulation*, at 45.

[190] *Id.*, at 46.

[191] See *infra* Chapter IV, Section 4.1.2; *infra* Chapter V, Section 4.2.2.

[192] Faure (2014), *supra* note 188, at 694.

urgently. The idea is that reckless regulation per se appears to be a disease rather than a cure when the outcomes are neither foreseeable nor reversible. For instance, there has been a study showing that where the public has a very inaccurate perception of the risks posed by hazardous waste sites, the housing prices will be adversely affected.[193] On that account, governments should think about the extent to which regulation should address risks that may not be real but "have significant economic consequences where the markets may react to perceptions rather than actual risks."[194] In a less extreme case, excessive regulation would not cause adverse outcomes, but the time and the money can be spent on more urgent regulatory tasks.

Secondly, some regulatory instruments are too costly for governments with tight budgets.[195] The costs may include direct investment in subsidies or public procurements. Administrative costs are also paid to run the institutions and organizations for GB promotion, and the amount may be greater when long-term monitoring and enforcement are needed. As is the case for GB licensing, some governments may conduct on-site inspections to ensure LCA compliance. However, not all governments can afford life-cycle supervision in GB regulation.

As far as administrative costs are concerned, it is viewed in the theory that liability may generally score better than regulation. For instance, one of Shavell's studies reasons that the negligence rule can cost less than regulation in terms of enforcement.[196] The study explains that, if compliance with regulation is certain, the cost of enforcement will occur anyway under the regulation; whereas, under the negligence rule, the enforcement cost will occur with the possibility that harm occurs.[197] In this case, the enforcement cost of regulation will be greater than that of the negligence rule. If compliance with regulation is not certain and compliance with regulation can eliminate accidents, the enforcement cost of regulation will be positive, and that of the negligence rule will be zero since there will be no accident.[198] All else being equal in the second case, if compliance with regulation cannot eliminate accidents, the negligence rule can reduce the number of instances in which behavior is examined; regulation, however, may not reduce the instances in which behavior is

[193] Viscusi, W. K., 'Regulation of Health, Safety, and Environmental Risks,' in Polinsky, M. A., and Shavell, S. (eds.), *Handbook of Law and Economics*, *Volume1* (Elsevier, 2007), at 599.
[194] *Ibid.*
[195] Wolf, C., 'A Theory of Nonmarket Failure: Framework for Implementation Analysis', 22 (1979) *The Journal of Law & Economics*, at 124-126.
[196] Shavell, S., 'A Fundamental Enforcement Cost Advantage of the Negligence Rule over Regulation.' 42 (2013) *The Journal of Legal Studies*, at 275.
[197] *Id*, at 276-277.
[198] *Id*., at 277-278.

examined.[199] In either case, the negligence rule will be cheaper than regulation in terms of enforcement. Particularly, Shavell compares liability with taxation in another study, which finds that in dealing with harmful externalities, liability is in general superior to the corrective taxes in terms of administrative costs.[200] It should be noted that in Shavell's studies, liability and regulation are compared on a theoretical basis, and it remains to be seen whether or not those findings may hold in reality.

Third, governments may not have enough information about the desirable level of intervention. Some GB regulations may still focus on energy use, missing out other significant concerns about land use or construction wastes, which is at odds with the full meaning of GB. Yet this may not be a big information problem if the government carefully draws on industry expertise. More importantly, governments may not know the desirable level of intervention. In that case, governmental intervention to provide financial incentives may fail. For instance, with too much government spending for subsidies, governments may lose the market as a lens through which the socially desirable volume of goods can be seen.[201] In that case, it could be hard for the government to decide when to end the subsidy program, and whether or not the GB market could go well without subsidies. After all, a subsidy is just a means to an end and not an end in itself. In another case, incomplete information may also lead to inaccuracy in determining variables for a tax based on expected outcomes.[202]As a result, the revenue collected may be less than the loss of actual harm, and the expected harm will be excessive when the untaxed variables also contribute to the harm.[203]

Last but not least, it could be illusory to say that government will act in the public interest in any case. On the one hand, public interest can be interpreted differently.[204] Apart from environmental quality, there are

[199] *Ibid.*

[200] Shavell (2011), *supra* note 171, at 251-253. Apart from the administrative costs, Shavell's study also looks into how liability and the corrective tax differ in their impacts on care levels and activity levels. The study points out that liability should on the whole be superior to the corrective tax in dealing with most harmful externalities, except for general pollution; and puts forward a joint use of liability and the corrective tax. For an in-depth discussion see Shavell (2011), *supra* note 171, at 249-266.

[201] Grand, J., 'The Theory of Government Failure,' (21) 1991 *British Journal of Political Science*, at 438.

[202] See Shavell (2011), *supra* note 171, at 261-262.

[203] *Ibid.*

[204] For instance, Cox views public interest as the interest of the majority in a democratic polity; Scholars like Cochran hold a procedural view on which public interest is conceptualized three-fold: a) an aggregative conception, meaning that public interest is the sum of individual interests; b) the pluralist conception that see public interest as the competition among interests; c) the 'procedural public interest' that see the public interest as interest reconciliation and fair procedure. See John

other types of public interest that may clash with each other over time. Tearing down the walls of a residential community may help to build a more efficient public transportation network, which is also part of GB compliance. Yet GB in this way may do harm to the homeowners' right to use the common area in the community. On the other hand, regulation could in some way be led astray by self-interested agents. Though the government as an organization is the actor, it is the individuals as part of the organization who actually make decisions. For those individuals, however, "the public interest is mixed with, and is often put at odds with their private and special interest."[205] The chances are that the outcomes of government intervention may deviate from the intent when the individual agents pursue their own agenda,[206] in which case "a market failure is simply replaced by a regulatory failure."[207] This could be the case when some strong interest groups lobby around to water down GB standards. There are plenty of GB certification programs competing with each other. In order to boost their business, some professional associations may make the certification easier to get, which may lead to compliance with lower GB standards. In the meantime, the professional associations may lobby around government agents to get their certification incorporated into GB regulations. In that case, GB rating systems providing easier points may succeed when "the voices of those who benefit from lax regulation is strong."[208]

To sum up, GB promotion needs government, but government regulation has limits. Sometimes the government may fail when it needs to take a due process to intervene while the problem comes urgently. At other times, the government may not have information about the desirable level of intervention. Though the government is the actor, it is the individuals as part of the government that actually make the decision, in which case regulation may fall victim to private interest. The regulatory failure hints that we may also need parties other than the governments, such as victims to environmental harm or NGOs, to keep an eye on GB compliance. [209]

Dewey, 'The Public and Its Problems', in Boydston, J. A. (ed.), *The Later Works of John Dewey* (Carbondale: Southern Illinois University Press, 1988), Vol.2, at 238-372; Cox, J. W. R., 'The Appeal to the Public Interest', (4)1973 *British Journal of Political Science*, at 229-241; Cochran, C. E., 'Political Science and the Public Interest', (36) 1974 *Journal of Politics*, at 339.

[205] Lippmann, W., *The Public Philosophy* (London: Hamish Hamilton, 1955), at 42.

[206] Grand (1991), *supra* note 201, at 435.

[207] Faure (2014), *supra* note 188, at 695

[208] Stiglitz, J., 'Regulation and Failure,' in Moss, D., and Cisternino, J. (eds.), *New Perspectives on Regulation* (Tobin Project, 2009), at 18.

[209] There has been a study showing that the intervention from NGOs can pose influences on standards level, and can fight against the industry lobbying. See Binder, S., and Neumayer, E., 'Environmental Pressure Group Strength and Air Pollution: An Empirical Analysis', (55) 2005 *Ecological Economics*,

5.2 Liability failure in environmental governance

Liability can deter and compensate for environmental harm but not always to a desirable level.[210] On the one hand, being held liable ex post may provide parties with incentives to take the desirable care and/or activity levels. On the other hand, compensation is possible when liable parties can afford damages. However, in the case of environmental torts, the liability regime may fail to provide correct inducements where it under-deters, or under-compensates. Besides, deterrence or compensation in individual cases may not provide overall control over environmental quality.

First of all, not all environmental harm can be detected, especially when there is no particular victim. Governments are likely to file public suits against massive environmental harm. However, governments' standing to sue may remain in doubt in some legal systems. Moreover, governments may not have enough information about the injurers or harm.

Even though particular parties at stake can be found, the liability regime is not free from administrative costs imposed on the litigants.[211] It is likely that the plaintiffs will pay more than the damages they get in the end.[212] As such, the caseload may fall behind the desirable level when the victims do not take into account spillovers generated from the environmental litigation, e.g., the deterrent effects on harmful activities, or payment for ecological losses.[213]

Second, liability may well not address environmental uncertainty. It is not uncommon in environmental torts that there is a lag in time between act and harm ('long-tail damage').[214] The causation between acts and harm may be hard to prove. However, the care level can be too high in the short run, or the activity level can fall behind the desirable if law holds parties liable for the harm they do not cause, or for the harm to which they only

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pp. 527-538.

[210] Usually, liability might be less workable to promote GB that generates positive externalities, e.g., energy efficiency. Positive externalities are more of a reason for public goods provision, subsidies or regulation rather than for liability.

A recent study put forward the idea of 'negative liability', whereby the gainers would pay those who produce benefits a compensatory award. In that sense, the negative liability may deal with positive externalities. The 'negative liability' has been there in the law of restitution, and in the way of liability on non-feasance to punish parties that fail to produce a positive externality. For an in-depth discussion on negative liability see Dari-Mattiacci, G., 'Negative Liability,' 38 (2009) *The Journal of Legal Studies*, pp. 21-56.

[211] Shavell, S., 'Liability for Accidents', in Polinsky, A M., and Shavell, S. (eds.), *Handbook of Law and Economics* (Elsevier, 2007), at 151.

[212] *Ibid.*

[213] *Id., at* 152.

[214] Faure (2014), *supra* note 188, at 696.

contribute a minimal part.[215] Given the difficulty around causation, the liability regime may provide some rules that reflect such uncertainty, e.g., a preponderance-of-evidence standard of proof. The preponderance rule is when a defendant is held liable only if the probability that the defendant causes loss is over 50%. However, the preponderance rule may dilute the deterrent effects of liability rules, especially when combined with proportionate damages.[216] The reason behind this is that the injurer may have no incentive to take more care if he knows that the possibility that he is the cause of loss will not reach 50% anyway. In a similar vein, if the injurer finds that by no means can he reduce the possibility of being liable, he may not take optimal care, or choose to increase prices to cover the potential legal costs.[217]

Moreover, being ex-post in character, liability may be less capable of addressing risks. The liability regime is mostly harm-based, and causation should be built up to hold parties liable. However, ex-post sanctions or damages may be far from enough to compensate for irreversible harm; and the causation and outcomes of acts may sometime be scientifically uncertain. [218] In that case, preventive measures other than ex-post remedies will be more desirable.

Even when environmental harm can be well detected and proved, the remedies might not always cover the actual losses ('under-compensation'). In part, the under-compensation can be a result of inaccurate measurement of environmental harm. Recoveries and monetary damages are common

[215] Shavell (2007), *supra* note 211, at 162.

[216] Proportionate damages here means reduced damages that reflect uncertainty. For instance, if there is a 70% chance that an injurer is liable, the damages ruled will be discounted by 30%. There is a study showing that all else being equal, all-or-nothing damages would not water down the deterrence of liability as proportionate damages do. This is why the all-or-nothing damages are more common in most of the legal systems. See Leshem, S., and Miller, G. P., 'All-or-Nothing versus Proportionate Damages,' 38 (2009) *The Journal of Legal Studies*, at 345-372.

[217] As an aside, uncertainty about causation may also provide injurers with an escape hatch when proximate causation is applied. Injurers will be more likely to escape from liability if there are atypical or unforeseeable factors and hence the proof of proximate causation becomes difficult. However, what is foreseeable and what is not will be up to the courts' decision, in which case injurers may not have enough incentives to get themselves informed. See Shavell (2007), *supra* note 211, at 162-164.

[218] In 2016, almost 500 students at a high school near Shanghai, China, had been diagnosed with sickness as the school's new campus was located close to three chemical plants that produced pesticides. The diagnoses ranged from bronchitis, dermatitis to lymphoma and leukemia. The building permit was granted before the environmental risk assessment was done, and the documents submitted for the permit did not show factors that would result in severe health risks. However, a separate survey done afterward discovered some toxic substances, including the chlorobenzene level that was 78,899 times the safe level in soil, as well as a cocktail of heavy metals such as mercury, cadmium, and lead. See Zhang, C., 'Changzhou pollution scandal highlights holes in China's environmental enforcement,' coverage on Chinadialogue, full text available at: https://www.chinadialogue.net/article/show/single/en/8892-Changzhou-pollution-scandal-highlights-holes-in-China-s-environmental-enforcement, last visited October 2016.

remedies for environmental harm. In the case of recoveries, parties are required to bring the damaged property or environment back to what it used to be. Recoveries might not be possible when it comes to irreversible harm. For instance, the cadmium found in a piece of contaminated land may harm the fauna and flora nearby, the groundwater underneath, and in the end human health.[219] Calculating monetary damages will be difficult when it comes to ecological losses. Some measurement tools, such as the hedonic pricing method (HPM) or the contingent value method (CVM), may not take into account the intrinsic value of ecosystems.[220]

Under-compensation may also occur when liable parties cannot fully pay the damages ('judgment proof').[221] One of the solutions may be a vicarious liability, by which parties other than the actual injurers will be liable for harm in some circumstances. The idea is that the party behind might be wealthier ('deep-pockets'), and they can act as gatekeepers to prevent the injurers from participating in harmful activities, in the way of financing supervision or providing information.[222] However, vicarious liability may lead to moral hazard[223] and make the activity level too high.[224] Moreover, limitations on damages may also lead to under-compensation. Such

[219] Around 260 hectares of farmland were reported too polluted for crops in a village in the Hunan Province, an area that ranks first in rice output in China. In 2012, 208 people from the village were diagnosed with cadmium poisoning. Greenpeace East Asia sampled soil and rice crops in villages close to a cluster of heavy metals smelters in Hunan Province. The testing of the samples showed that heavy metals such as lead have contaminated both the rice and the soil found near the industrial complex. 12 out of all 13 rice samples contained excessive levels of cadmium. See Brigden, K. et al., 'Distribution of Metals in Soils from Uncultivated land, soils from rice fields and in Rice Grown in the Area of an Industrial Complex with Metal Smelting and Processing Facilities in Hunan Province, China,' Greenpeace Research Laboratories Technical Report 04/2014, April 2014, at 9-13. Full text available at: http://issuu.com/greenpeacechina/docs/heavy_metal_pollution_of_china_s_ri/1?e=1191242/7587763, last visited October 2016.

[220] For instance, the HPM only captures people's willingness to pay for perceived differences in environmental attributes, and their direct consequences. Yet if people are not aware of the linkages between the environmental attribute and benefits to them or their property, the value will not be reflected in home prices. In the case of CVM, the measurement may also fall victim to bias when individuals do not necessarily have a strong incentive to think seriously about their answer, or there is a lack of detailed information framing within the contingent scenario the component of WTP questions. See Callan and Thomas (2013), at 160-165.

However, whether not the intrinsic value should be taken into account in environmental governance depends on the choice of paradigms. It goes beyond this study to go further into the value judgment.

[221] Polinsky, A. M., and Shavell, S., 'A Note on Optimal Cleanup and Liability after Environmental Harmful Discharges,' 16 (1994) *Research in Law and Economics*, at 22.

[222] Shavell (2007), *supra* note 211, at 171-172.

[223] Katzman, M. T., 'Pollution Liability Insurance and Catastrophic Environmental Risk,' 55 (1988) *The Journal of Risk and Insurance*, at 80.

[224] For instance, the lender liability under the CERCLA has been shown to "have the unintended effect of increasing the frequency of accidents" in some circumstances. See Pitchford, R., 'How Liable Should a Lender be? The Case of Judgment-proof Firms and Environmental Risk', 85 (1995) *American Economic Review*, at 1183.

limitation can be a cap or an exemption of damages, either written down in statues or a contract. For instance, some building professionals would add an exemption clause to the contract to exclude a higher level of care required by GB standards. As such, the liability regime may not provide incentives for parties to take optimal care.[225] Apart from limitations on damages, there are also limitations on the period during which a suit can be filed, where the claimant may miss the chance to sue the injurer against the long-tail harm.

The under-compensation problem can to some extent be solved by liability insurance, which may compromise the deterrence of liability. In liability insurance, the insurer will pay for the damages once the injurer is held liable for the harm, in the light of the coverage written down in the insurance policy. Recently liability insurance for GB professionals has come into the picture to encourage risk-averse building professionals to apply GB standards.[226]

As far as the maximum of social welfare is concerned, liability insurance is desirable in tandem with liability, especially when parties are risk-averse.[227] For instance, in the case of strict liability with liability insurance, victims are implicitly insured by a strict liability rule and hence do not bear risks. In the meantime, insured injurers do not bear risks, and will be induced to take the optimal care and activity level if the insurers can observe the insured's acts. In this case liability insurance is desirable, because it increases the well-being of the injurers without affecting the victims implicitly insured by a strict liability rule.[228] However, whether or not the efficient outcome will be achieved may depend on how insurance policies are formulated, and how much insurers know about the insured's behavior.[229]

Setting aside the question of insurability, shifting the burden to parties other than the actual injurers may lead to moral hazard.[230] Actual injurers may have fewer incentives to take optimal care given the fact that the insurers will pay the damages. In that case, liability may fail to pose ex-

[225] Shavell (2007), *supra* note 211, at 165.
[226] See Hatem, D. J., 'Green and Sustainable Design Part I: Professional Liability Risk and Insurability Issues for Design Professionals", Design and Construction Management Professional Reporter, April 2010; Prum, D. A., 'Green Building Liability: Considering the Applicable Standard of Care and Strategies for Establishing a Different Level by Agreement', (8) 2012 *Hastings Business Law Journal*, at 61-62.
[227] In the case of parties being risk-averse, social welfare is a function of expected utilities, which not only include utilities from the activities but also depends on whether risk-averse parties bear risks. More about how liability insurance and liability rules see Shavell (2004), *supra* note 177, at 257-280.
[228] *Id.*, at 262-264.
[229] *Ibid.*
[230] Shavell (2007), *supra* note 211, at 150.

ante deterrence on the potential wrongdoers. Certainly, the insurers can adapt insurance premiums to affect the injurers' care and activity level. However, it may be too costly for the insurers to obtain information about the injurers' behavior. In that case, insurers will choose flat insurance premiums regardless of the risk potential at the individual level.[231]

Moreover, a study has shown that liability insurance is likely to become a de facto element of tort litigation, especially when liability insurance becomes business as usual. There is a tendency that lawyers may pay more attention to collectivity, i.e., defendants' ability to pay, than the damages and proof of causation. Liability insurance may have significant impacts on collectivity, on account of the escape hatch made available by the liability regime, the liquidation of assets in bankruptcy proceedings, and the huge costs of mass environmental harm. [232] As a result, the liability regime will be fettered by liability insurance in terms of damages and coverage.[233] In practice, damages ruled by courts rarely exceed those written down in insurance policies, and the insurers become the only party that pays the damages. In that case, the negligence rule may not work to induce optimal care, and moral hazard exacerbates. On the other hand, it is likely that only suits against the insured injurer are worth filing when compensation is the only concern of the plaintiff. In the 'no-insurance-no-claim' situation, parties may be less likely to file suits against atypical harm or environmental harm that goes beyond the insurance coverage. [234]

Lastly, liability deters and compensates on an *ad hoc* basis and hence may not provide total control over environmental quality. For instance, if GHGs reduction is supposed to be one of the goals in GB compliance, there must be some minimum standards for energy efficiency. Absent a bottom line, emission reduction achieved in one building will probably be cancelled out by emissions from other less energy-efficient buildings, as GHGs can go all over the place. Besides, being ex-post in character, the standard of care determined by the court can be applied only to specific situations.[235] In the common law system, it is possible that the standard of care written down in a precedent can be applied in similar cases later. However, defendants may prove the differences between the precedent

[231] Schwartz, G. T., 'The Ethics and the Economics of Tort Liability Insurance ', 75 (1990) *Cornell Law Review*, at 319.
[232] See Baker, T., 'Liability Insurance as Tort Regulation: Six Ways that Liability Insurance Shapes Tort Law in Action,' (12) 2005 *Tort Law and Liability Insurance*, at 4-5.
[233] *Id*., at 5-10.
[234] *Id*., at 9-10.
[235] Lukas, M., 'The Function of Regulatory Law in the Context of Tort Law – Conclusions', in van Boom, W H., Lukas, M., and Kissling, C. (eds.), *Tort and Regulatory Law, Tort and Insurance Law, Vol. 19* (Springer, 2008), at 453.

and the case at stake, in which case in courts the standard of care in the precedent may be denied.

Furthermore, in theory, there is not a liability rule that can lead both injurers and victims to optimal care and activity levels. The liability regime has two primary rules, viz strict liability and negligence. The two rules can be combined with a contributory/comparative negligence defense in bilateral cases.[236] Those liability rules differ in their deterrent effects on parties' behavior.[237] In Shavell's basic model, as far as maximizing the utility function is concerned, different liability rules are likely to provide incentives for injurers to take the optimal level of care and/or the optimal level of activity. In bilateral cases, the different liability rules will also lead victims to take the optimal level of care and/or the optimal level of activity.[238]

If one assumes that injurers and victims are *mutual strangers* and *risk-neutral*, which may be more often the case in environmental torts, then in unilateral cases, a strict liability rule will be efficient in dealing with environmental harm.[239] In bilateral cases, environmental liability is often suggested to be a strict liability with a contributory negligence defense,[240] as it may give injurers incentives to take optimal care and activity levels, meanwhile inducing victims to take optimal care.[241] However, in Shavell's basic model, none of the liability rules can lead to the optimal care and activity levels on both sides.[242]

5.3 Self-regulation failure in inducing environmental compliance

Self-regulation is when organizations other than public agencies specify and enforce the rules. Self-regulation may take different shapes, ranging from private ordering independent of government,[243] to enforced self-

[236] *Ibid.*
[237] *Ibid.*
[238] Shavell, S., *Economic Analysis of Accident Law* (Harvard University Press, 1987), at 5-32.
[239] Faure, M. G., 'Environmental Liability,' in Faure, M. G. (ed.), *Encyclopedia of Law and Economics, Second Edition, Volume I, Tort Law and Economics* (Edward Elgar, 2009), at 252-53.
[240] *Ibid.*
[241] Shavell (1987), *supra* note 238, at 26-31.
[242] For the proof see Shavell (1987), *supra* note 238, at 33-46
The basic model was further discussed by relaxing some of the assumptions. Accordingly, the optimal care/activity levels achieved will differ, taking into account factors such as the determination of negligence, causation, the judgment proof, parties being producers and customers, cases involving more than one injurers, or parties being risk-averse (and hence seeking insurance).
[243] In practice, self-regulation can take the following forms: a) a co-operation between regulator and the regulated on a particular regulatory matter; b) delegation of regulatory power to self-regulatory bodies; c) self-regulation against statutory backdrop, i.e. to specify self-regulatory schemes in statutes; d) facilitated self-regulation, where the government openly lends some support to self-regulators, but not through statutes; e) pure self-regulation, with the government playing an implicit but influential role.243 The category above shows that the role of government differs in different types of self-

regulation with some oversight by governments and public interest groups in enforcement.[244]

Self-regulation may score better than governmental regulation in terms of expertise (information), flexibility, cost-effectiveness,[245] and encouraging innovation with reduced red tape.[246] In the meantime, it may score better than no regulation when the market fails, and cooperative practice among parties is hard to achieve. But not all the forms of self-regulation provide those benefits.[247] It is likely that the ways in which self-regulation works may result in different failures.

First of all, better information does not guarantee better information processing. It is possible that private parties can have better expertise than the government. But not all of them will act to their best knowledge, nor will the information always be evenly distributed among private parties with different levels of expertise. Those problems may also happen to self-regulation in GB compliance. There are different certifications and standards for GB compliance, which differ in their requirements on GB performances. Without a minimum bar on what qualifies as a GB, green builders are likely to choose certifications with laxer standards to 'greenwash' their projects more easily. [248] In that case, a 'race-to-the-

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regulation, and the more formal the self-regulation is, the greater the government participation and the statutory characteristics will be. See Bartle, I., and Vass, P., 'Self-regulation and the Regulatory State – A Survey of Policy and Practice', Center for the Study of Regulated Industries Research Report No. 17, 1 January, 2005, at 3; Baggott, R, 'Regulatory Reform in Britain, the Changing Face of Self-regulation, 67 (1989) *Public Administration*, at 438.

[244] The enforced self-regulation makes use of negotiations between a government and an individual firm, which seems to be different from co-regulation. In this way, the making and the enforcement of standards become flexible and customized to the firm's need. While in the case of co-regulation, voluntary standards are usually made by professional associations, and apply to the industry as a whole. Ayres, I., and Braithwaite, J., *Responsive Regulation: Transcending the Deregulation Debate (*Oxford University Press, 1992), at 102-106.

[245] Ogus, A. I., 'Self-regulation.' in Alain, M., and Ramello, G. B. (eds.), *Encyclopedia of Law and Economics, Volume IX* (Edward Elgar, 2000), at 591.

[246] Stefanadis, C., 'Self-regulation, Innovation, and the Financial Industry', 23 (2003) *Journal of Regulatory Economics*, at 5-25.

[247] For instance, Maxwell et al. have shown that industries may comply with environmental standards voluntarily, so as to ward off more stringent regulation-to-come. In other words, self-regulatory agencies are more likely to behave well under the threat of regulation. See Maxwell, J. W., Lyon, T. P., and Hackett, S. C., 'Self-regulation and Social Welfare: The Political Economy of Corporate Environmentalism', (2000) *The Journal of Law & Economics*, pp. 583-617.

There are other conditions in which self-regulation may work. An empirical study has shown that, in pursuit of social welfare, "self-regulation is more likely to do a better job when uncertainty is higher, when the divergence of interests between producers and consumers is less, or when the government is more populist; by contrast, when uncertainty is low, when the society is polarized on the regulatory issue, or when the producer lobby is strong, social welfare is higher under regulation than under self-regulation". See Grajzl, P., and Murrell, P., 'Allocating Lawmaking Powers: Self-regulation vs. Government Regulation,' 35 (2007) *Journal of Comparative Economics*, pp. 520-545.

[248] As the most-commonly used GB rating system, the LEED has been accused of manipulating and making available easy points in GB certification. See USA Today, 'In U.S Building Industry: Is it

bottom' may happen.[249] Moreover, opportunistic behavior such as cheating or manipulating may occur in granting certifications. In that case, a certified GB falls below what consumers expect and ruins the credibility of a GB certification.

Second, self-regulation is no stranger to private interest concerns and may not induce competition in a positive way. There are different interest groups as self-regulators, some of which take shape in response to a public problem, as with those environmental NGOs. While on some occasions self-regulation may consist overwhelmingly of the industry or professionals, who can gather as influential lobbies. Those lobbies may use delegated power to curb competition in the interest of their members, rather than to pursue the public interest goals.[250] When governments incorporate industry-based standards into mandates, it could also be the case that rent-seeking can create perverse incentives through regulation.[251] Once the lobbying succeeds, those vested-interest holders are able to create entry barriers for newcomers who may offer more efficient standards.[252] As a result, standards might turn out to be too lower than the desirable level; or they are so high that goes beyond the needs of solving market failures.[253]

Self-regulation may also be abused due to a lack of transparency and accountability. Self-regulation is collective and regulatory, whereby it

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Too Easy to be Green?', published on 24 October, 2012, full text available at: https://www.usatoday.com/story/news/nation/2012/10/24/green-building-leed-certification/1650517/, last visited August 2017.

[249] Klass, A. B., 'State Standards for Nationwide Products Revised: Federalism, Green building Codes, and Appliance Efficiency Standards', 34(2010) *Harvard Environmental Law Review*, at 335.

[250] Ogus (2000), *supra* note 245, at 591-592.

[251] For instance, in an old version of the LEED system, the USGBC required that the wood used in a LEED project should be verified by the Forest Stewardship Council (FSC), which has given rise to a battle between the FSC and another wood certification run by the Sustainable Forestry Initiative (SFI) program. The LEED's exclusive use of the FSC rating system has been accused of violating anti-trust laws when incorporated in municipal GB regulations. See Del Percio, S., 'Revisiting Allied Tube and Noerr: The Antitrust Implications of Green Building Legislation and Case Law Considerations for Policymakers, (34) 2009 *William & Mary Environmental Law and Policy Review*, at 239-342.

The USGBC itself has tried to fix the problem. As of 2016, the USGBC seems to open the door to wood certification programs other than the FSC. The USGBC introduced the Alternative Compliance Path (ACP) pilot to close a loophole in the current raw materials credit that required only a certain percentage of wood be FSC-certified. The ACP pilot would require that 100 percent of the wood in a project is verified by a legal source, as defined by ASTM D7612-10. See USGBC, 'USGBC Announces New LEED Pilot ACP Designed to Help Eliminate Irresponsibly Sourced Materials—Like Illegal Wood—From the Building Material Supply Chain', Published on 5 Apr 2016, available at: http://www.usgbc.org/articles/usgbc-announces-new-leed-pilot-acp-designed-help-eliminate-irresponsibly-sourced-materials—, last visited March 2017.

[252] Ogus (2000), *supra* note 245, at 591.

[253] Roger Van den Bergh, 'Self-regulation of the Medical and Legal Professions: Remaining Barriers to Competition and EC-law,' in Bortolotti, B., and Fiorentini G., (eds.), *Organized Interests and Self-regulation – An Economic Approach* (Oxford University Press, 1999), at 113.

enables professional associations to control both entry (license) and performance.[254] This is slightly different from the situation in which a regulator acts as a gatekeeper to approve entries, and the regulated set or enforce the specific standards on performance. Self-regulation in a full sense can at times be a closed system "subject to less external supervision and control than it ought to be," [255] in which case rules and the enforcement may not go through a due process with legal scrutiny and public participation. As a result, there are weak constraints to prevent professional associations from preying on the market. Moreover, nobody other than the self-regulator will be responsible for the consequences, as opposed to the co-regulation where the government will be held liable for the involvement of self-regulation.[256]

The disadvantages of self-regulation, however, may not be the reason for the government to overly exclude industry parties. In environmental governance, co-regulation in different forms may help to cancel out the concerns concerning self-regulation. In theory, governments can make the most of self-regulation through bargaining, without significant externalities,[257] as is the case with voluntary compliance agreements.

In the case of GB standard setting, governments can let different self-regulatory agencies compete with each other. [258] Governments can require those self-regulatory agencies to submit proposed regulatory rules, e.g., GB standards.[259] Alternatively, governments can choose a public agency as a proxy for consumers to opt for reliable GB certifications.[260] In either case, the government needs to have sufficient information to tell what is good or not.

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[254] Moore, T. G., ''The Purpose of Licensing,' 4 (1961*) The Journal of Law & Economics*, at 97.
[255] Page, A. C., 'Self-regulation: The Constitutional Dimension,' 49 (1986) *Modern Law Review*, at 143.
[256] *Id.*, at 166-167.
[257] Ogus (1994), *supra* note 180, at 110.
[258] Rent-creation can happen in societies of limited access orders or those of open access orders. However, in a world of open access orders, competition can help to erode the rents. In ways that help them to compete with each other, the industry players might be motivated to provide better services. As opposed to limited access orders, open access orders support a robust civil society with various organizations competing with each other. In the meantime, open access orders provide a set of institutions that will impose costs on an incumbent party who seeks to keep everything in situ through rent-creation and limiting accesses. Under open access orders, regulation tends to be more decentralized, and the governments' actions and policies are more complementary to markets. See North, D. C., Wallis J. J., and Weingast, B. R., *Violence and Social Orders* (Cambridge University Press, 2009), at 12-6, 111-12, 253-55.
[259] *Ibid.*
[260] *Ibid.*

Enforced self-regulation will have individual firms bearing the costs of rule-making and rule-enforcement.[261] Using enforced self-regulation, each firm will be required by the government to make a set of rules tailored to the firm's situation, at which point public interest groups may step in to evaluate the rules.[262] The firm itself will enforce those rules, non-compliance with which will can lead to punishment by law.[263] On the flip side, enforced self-regulation may lead to higher administrative costs, as governments have to approve a vast number of personalized rules.[264] In the meantime, enforced self-regulation may travel with constitutional challenges, as it uses regulatory power to enforce private-made rules.[265]

5.4 A summary: no instrument in isolation is sufficient

The three types of instruments, i.e., the CAC, market-based and persuasive instruments, have been in place for environmental compliance. Those instruments have to rely on government regulation, liability, self-regulation, or combinations of one another. None of those instruments should be singled out as being subject to the failures caused by imperfect or incomplete information, private interest, inaccurate measurement, and ineffectiveness.

More specifically, those instruments differ in time (i.e., before or after), form (i.e., monetary or non-monetary sanctions), and enforcement level (i.e., public or private enforcement).[266] CAC instruments primarily provide ex-ante incentives via mandates and sanctions, and hence can be taken as traditional regulation that relies largely on direct government interventions. Regulation may at times be less desirable as a result of high administrative costs, regulatory inflexibility, and imperfect/incomplete information about individual behavior.

Market-based instruments include liability and other instruments providing financial incentives, e.g., taxes, subsidies, or public procurements. Neither the level of care nor the level of activity is

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[261] Ayres and Braithwaite (1992), *supra* note 244, at 106.
The idea of enforced self-regulation is inspired by Coase's work "The Nature of the Firm," which suggested that firms would be producing goods and services when internal production was cheaper than the external market transaction. In a similar vein, governments should only internally produce 'public goods' if it is cheaper to do so than to subcontract regulatory tasks. Though regulations or standards as public goods differ from private goods on so many levels, at root Coase's insight in a way backs up the whole idea of enforced self-regulation. See Ayres and Braithwaite (1992), *supra* note 244, at 103; Coase, R. H., 'The Nature of the Firm', 5 (1937) *Economica*, at 386-405.
[262] *Ibid.*
[263] *Ibid.*
[264] Ayres and Braithwaite (1992), *supra* note 244, at 120.
[265] *Id.*, at 122-123.
[266] Shavell (2004), *supra* note 177, at 572-574.

mandatorily determined in the case of market-based instruments. Liability is said to deter and compensate for harm detected by private parties. Being *ad hoc*, liability may score better than the regulation in getting information about violations and in responding to atypical environmental harm. Yet given its ex-post character, liability may fail to prevent irreversible environmental harm before it is too late; and because it relies on private parties to detect and compensate, environmental losses may not be fully covered where there is not *a* particular victim or where there is a judgment proof problem. As opposed to the liability regime, instruments offering financial incentives, such as tax reductions, subsidies or public procurements, are primarily administered by governments. In that sense, they are implemented in a more centralized way, and they may help to induce desirable activities by stakeholders. Those instruments can be expensive, and governments may need sufficient information to determine the proper variables.

Suasive instruments usually make use of informational programs or private enforcement, so as to nudge voluntary compliance and change behaviors. Persuasive instruments can be cheap, compared to regulation. Persuasive instruments can be effective by crowding in intrinsic motivations and affect behaviors at the individual level. Besides, persuasive instruments may face a lower level of opposition from stakeholders. However, persuasive instruments may provide fewer external incentives for compliance. Instruments like voluntary environmental agreements may be subject to free-ridership, and would probably be over-promising, under-delivering due to a lack of oversight and accountabilities. Informational programs such as real-time information for efficient energy use need to last over the long term to have real impacts on end-users' behavior.

Therefore, it is not far from the truth to say that no instrument in isolation can score better in any case, which may provide a reason for the need for instrument mixes for environmental compliance. Different types of instruments are mixed to cancel out the problems around each other.

However, the failures concerning regulation, liability, and self-regulation in theory only shows that different instruments should be working jointly. It remains to be seen how the instruments can be effectively combined, and which type of instrument can score better than the other in a given setting.[267]

[267] For instance, in theory, a 'pyramid of enforcement strategies on regulatory approaches' hints that compliance is more likely if the least interventionary forms of regulation (the bottom) are the normal

6. Legal & policy instruments for GB compliance

The previous section classified the instruments for environmental governance and explained why they need to be mixed. This section will first introduce the different types of environmental standards, as they are often combined with the instruments. Then it will look into the pros and cons of specific instruments that will possibly work for GB, whereby the failures of regulation, liability, and self-regulation can be further reflected.

6.1 Environmental standard setting

For environmental compliance, standard makers need to take into account, firstly the types of standards, prominently target standard, performance standard and/or specification standard; secondly, whether standards should be uniform or differentiated, and if differentiation is preferable in some cases, what would be the optimal degree of specificity;[268] lastly, whether or not regulations should draw on the industry-based standards, and if yes, how the industry-based standards could be incorporated into mandates.

6.1.1 Target, performance and specification standard

Environmental standards can be classified into target standard, performance standard and specification standard. A target standard often requires reductions to a certain degree of concentration of substances controlled in the environment, which has little to say about the specific requirements on an individual level.[269] A performance standard requires certain conditions of quality to be met, which is pitched at the firm level meanwhile allowing firms to decide how to meet the quality.[270] A specification standard would require the regulated firms to use, or not to use, certain types of production methods or materials, in other words, the specification standard focuses more on the inputs used by firms.[271]

The three types of standards feature different levels of government intervention.[272] A choice between them would be made on account of the

approach with the clear threat of stronger intervention further up the pyramid if the less interventionary forms fail. See Ian Ayres (1992), at 39.

Empirically, a study has shown that firms are most likely to participate in public voluntary programs, while the regulator would be better off by imposing a tax rather than a VEA when political opposition to the tax is low. See Lyon, T. P., and Maxwell, J. W., 'Self-regulation, Taxation, and Public Voluntary Environmental Agreements,' 87 (2003) *Journal of Public Economics*, at 1455.

[268] Ogus (1994), *supra* note 180, at 166-171.

[269] *Id.*, at 151 & 166.

[270] *Ibid.*

[271] *Id.*, at 167.

[272] *Id.*, at 151.

information needed to make the standard and the enforcement costs.[273] In principle, target and performance standards are more common in environmental standard setting.[274] Target standards seem to be the most cost-effective, and it may be workable when the causation of harm is complex in terms of time and space; or when the harm is massive in scale, but a suit for compensating all victims would be too costly for one victim to proceed.[275] Yet target standards usually do not specify performance at the individual level, and it would be very costly for firms to determine how they should perform to meet the targets.

Performance standards are likely to solve the problem by requiring performance at an individual level. A performance standard often works with a permit for monitoring at a firm's place, which could make the proof of causation much easier.[276] However, performance standards are usually more costly to formulate, compared to target standards.[277] Moreover, it could be difficult for regulators to determine a number of fines that are high enough to deter, meanwhile not being too high to lead violators to insolvency ('deterrence trap').[278]

Specification standards require/prohibit the use of a specific production method, which may provide firms with more legal certainty. On the flip side, a specification standard gives firms no choice as to the methods used for compliance, which may reduce the incentives for firms to develop or adopt better abatement technologies.[279]

Table 2 Different types of standards and the levels of government intervention

Degrees of intervention				
Low ⟸			⟹ High	
Information	Standards			Prior approval
	Target	Performance	Specification	

(Ogus, 1994)

[273] *Id.,* at 166.
[274] *Ibid.*
[275] *Ibid.*
[276] *Id.*, at 166 & 170.
[277] *Id.*, at 167.
[278] *Ibid.*
[279] *Id.*, at 168.

6.1.2 Uniform or differentiated standard

Uniform standards are formulated based on general circumstances, which do not differ across regions, industries or firms.[280] They are cheaper to make and enforce, and less likely to be subject to private interest. However, uniform standards may not take care much about different settings. On the one hand, environmental harm may vary from place to place.[281] For instance, the same volume of acid deposition may differ in its impacts on a sparsely-populated area and on a densely-populated one. On the other hand, the costs of abatement can differ across firms. On that account, it may go against the equi-marginal principle of abatement to have firms that can abate at a lower cost and those cannot bear the same abatement obligation. In that case, differentiated standards would be desirable.

Then the question can be asked concerning the extent to which standards should be differentiated, and whether or not they should go with a 'grandfather clause.' Standards with specificity are said to reduce uncertainty and discretion, and to lower the administrative costs for regulators and the information costs for the regulated.[282] Too much specificity, however, can lead to inflexibility. On that account, standards can be made in a more general way, so that they can be tailored to local needs. Yet doing so may confer too much discretion on the regulator, and make standards uncertain and less transparent to the public.[283] It is then proposed that standards can be "de jure uniform, de facto differentiated," in which case legislation lays out uniform standards, leaving regulators the leeway to make and enforce differentiated standards.[284] In this case, differentiated standards can in a way work as performance standards.

In some cases, a choice between the uniform and differentiated standards may take into account the level of standard setting. In theory, a minimum standard at a higher level may work against a race to the bottom.[285] Without a bottom line, local regulators may relax environmental regulation in order to be business-friendly. But whether or not there is a

[280] *Ibid.*
[281] *Ibid.*
[282] *Id.*, at 169.
[283] *Id.*, at 169-170.
[284] *Id.*, at 171.
[285] Baumol, W. J., and Oates, W. E., 'National or Local Standards for Environmental Quality,' in Baumol, W. J., and Oates, W. E. (eds.), *The Theory of Environmental Policy* (Cambridge University Press, 1988), at 284-296.

race and whether or not it goes to the bottom, are more empirical questions.[286]

Sometimes a race to the bottom does exist, but the reason may have little to do with regulators attempting to attract business. A study has shown that the stringency of environmental standards is of little to no importance to industries in choosing site location.[287] Elsewhere, the race to the bottom is viewed as an economic fiction in theory,[288] and has in a way been evidenced in Schwab's model on environmental standards-setting.[289]

Another reason to set a minimum standard is to overcome transboundary externalities.[290] The idea is that some environmental problems, such as the GHG emissions, may go beyond the borders, and there might be a gap or an overlap between local regulations. A uniform standard at the central level may fill in the gap or coordinate the different local standards and environment agencies.

6.1.3 Regulation with/without private standards

In GB standard setting, there are multiple ways in which regulation can use inputs from the industry, including, but not limited to, the following scenarios:

(i) The government designs and enforces GB standards laid down in regulations, taking no account of private standards;

(ii) The government borrows the contents of private standards[291] and tailors them to local needs.[292] But still private standard makers barely have a role in the making of GB regulation and certification;

(iii) The government incorporates an industry-based rating system into its GB regulation. In this case, the government does not specify

[286] There has been a study showing that the race may not always go to the bottom. In the US, many states have adopted clean air standards and programs that are more stringent than the USEPA requirements, which could be the result of strong environmental lobbies and the 'greener politics.' See Potoski, M., 'Clean Air Federalism: Do States Race to the Bottom?', (61) 2001 *Public Administration Review*, at 335.

[287] Saleska, S. R., and Engel, K. H., 'Facts are Stubborn Things: An Empirical Reality Check in the Theoretical Debate over the Race-to-the-Bottom in State Environmental Standard-setting,' 8 (1998) *Cornell Journal of Law and Public Policy*, at 86.

[288] Revesz, R., 'Rehabilitating Interstate Competition: Rethinking the Race-to-the-Bottom Rationale for Federal Environmental Regulation, 67 (1992) *New York University Law Review*, at 1244.

[289] Oates W. E., and Schwab, R. M., 'Economic Competition Among Jurisdictions: Efficiency Enhancing or Distortion Inducing?', 35 (1988) *Journal of Public Economics,* pp.333-354.

[290] Baumol and Oates (1988), *supra* note 285, at 295-296.

[291] Schinder, S. B., 'Following Industry's LEED: Municipal Adoption of Private Green Building Standards', 62 (2010) *Florida Law Review*, at 317.

[292] Miller, S. R., 'Enforcement of Local Green Building Ordinances Integrating Third-Party Rating Systems,' 27 (2009) *California Real Property Journal*, at 57.

the standards but requires the regulated to get a GB certification referred to in the GB regulation. The incorporation can be achieved by different means. For instance, GB regulations can refer to a fixed version of a GB rating system, any change of which should be approved by the regulator. [293] Alternatively, the regulation can require stakeholders to comply with the latest version of the referred private standard or rating system.

(iv) The government designs a set of GB standards, and lends it to a third-party for enforcement.[294]

The multiple ways of GB standard setting may differ in terms of making and enforcement. In the case of (i), (ii) and (iii), GB standards are all enforced by governments. The difference between (i) and (ii)/ (iii) is whether or not the government will draw on private standards made by the industry. Some government tends to set their GB standards and certification programs, which can be workable if the government possesses better expertise on GB than does the industry. At other times, the government may enlist private standards made by the industry if it is cheaper to do so.

(ii) and (iii) differ in their flexibility and the uniformity of standards. Way (ii) can avail tailored standards on account of local needs; by contrast, standards set via (iii) may feature less flexibility if the referred rating system, such as the LEED, is designed for a global use without taking into account local settings. But in the (iii) scenario, the standards are likely to be changed by self-regulatory agencies, as no fixed version of the referred rating system is written down in the regulations. In this way, the government is delegating its regulatory power to private parties without a *pro forma* vote.[295] In that case, GB regulations might face constitutional challenges, as it allows private-made rules to be enforced by public law.

Standard-setting in scenario (iv) will be enforced by a private party under the supervision of the government, as opposed to those enforced merely by the governments through way (i), (ii) and (iii). This way can also be taken as a delegation of regulatory power to private parties in terms of standard enforcement, in which case professionals may play an essential role in determining the final performance of buildings.

[293] Schindler (2010), *supra* note 291, at 318.
[294] Shapiro, S. A., 'Outsourcing Government Regulation', 53 (2003) *Duke Law Journal*, at 400-405.
[295] Wolf, M. A., 'A Yellow Light for "Green Zoning": Some Words of Caution About Incorporating Green Building Standards into Local Land Use Law,' 43 (2011) *Urban Lawyer*, at 951.

6.2 Command-and-control instruments

6.2.1 Permitting

Building activities with potential or actual impacts on the environment are often subject to regulation, prominently in the form of permitting. A common way to GB compliance is to require a GB certification or an environmental impacts assessment (EIA) in building permits. Sometimes the government may require a GB project to be certified as a whole, so as to get a land use entitlement or a construction permit.[296] At other times, GB performance may be broken down into the different GB elements, and be reviewed during the issue of different permits, e.g. a permit for producing tolerable construction noise, a license to dispose of chemical wastes,[297] or an annual license for C/D wastes landfill.[298]

However, compliance may not be ensured after the issue of a permit. As GB performance is supposed to be life-cycle, the government may take follow-up measures to monitor how a project goes. For instance, some local governments may carry out an on-site inspection on the implementation of GB standards, imposing sanctions such as fines when non-compliance is detected.[299] Refundable deposits can also be used to oversee throughout the life cycle of a project, in which case an applier will hand in some money at the time of issuance. The applier will then get the deposits back from the government if s/he acts in line with the documented requirements.[300]

Apart from inspections and deposits, reducing red tape may lead to a higher level of compliance even when the inspections and fines are low. Decker (2006) has investigated the relationship between environmental compliance, corporate voluntary environmental activities and environmental permitting process.[301] Decker (2006) found that firms having good records on compliance can get construction or pollution

[296] Miller (2009), *supra* note 292, at 61.
[297] See Environmental Protection Department of the Government of the Hongkong Special Administrative Region, 'Guidance Notes for License Application, available at: http://www.epd.gov.hk/epd/english/application_for_licences/guidance/qkguidepermits.html, last visited August 2016.
[298] See Ohio Environmental Protection Agency, 'Construction and Demolition Debris (C&DD)', available at: http://www.epa.ohio.gov/dmwm/Home/CDD.aspx, last visited August 2016.
[299] Miller (2009), *supra* note 292, at 62.
[300] The idea of the refundable deposit is not new in promoting GB compliance. In California, the U.S., projects of two-tiers or higher would not be permitted unless the developers pay the GB refundable deposit fees. See Ordinance No. 29765 (Supp. No. 34), adopted August 2, 2016. Full text available at: https://www.municode.com/library/ca/san_jose/codes/code_of_ordinances?nodeId=14367, last visited April 2019.
[301] Decker, C. S., 'Corporate Environmentalism and Environmental Statutory Permitting', (46) 2003 *The Journal of Law & Economics*, at 126.

discharge permits more quickly. The expedited permits then became administrative incentives for the firms to invest in compliance in the future.[302]

Perhaps on that account, some governments may provide developers with expedited permits or application fee waivers. [303] Administrative procedures can take time due to red tape. For a permit to be issued, regulators may send appliers a request for additional information about the project. Repeated requests are often made for large-scale projects, especially when the law does not put a limit on the number of information requests that the government can make. It could get even more complicated for appliers if a one-stop application is not available, in which case the appliers have to collect more than one permit from different governmental departments. Therefore, an expedited and integrated permit for a GB project could nudge compliance.

6.2.2 Land use planning

As opposed to building permits for GB compliance at the individual level, land use planning can serve target standards for GB. There are two ways in which GB compliance can affect land use planning. On the one hand, the government may require more new GBs or more GB renovations, in pursuit of positive environmental externalities generated by GB, e.g., the protection of underground water, or the efficient transportation network that reduces GHG emissions. Land use for GB development can be planned within the local boundary, or be incorporated into an 'extra-local' urban development.[304]

On the other hand, GB planning also means to keep buildings off a particular area, on account of the environmental impacts of building activities. It could be the case that, land use planning may keep buildings away from areas of critical ecological concern, which is often required by the law of natural resource conservation.[305] It could also be the case in

[302] *Ibid.*

[303] One of the examples could be the Green Permit Projects instituted in Chicago, the US. A project will be given the Green Permit if it is certified by the LEED system, or if it applies green technologies such as green roofs, solar panels, and wind turbine. For more information see the City of Chicago, 'Overview of the Green Permit Program', available at http://www.cityofchicago.org/city/en/depts/bldgs/supp_info/overview_of_the_greenpermitprogram.html, last visited August 2016.

[304] See, e.g., the Singapore Government, 'Sino-Singapore Tianjin Eco-city: A Model for Sustainable Development – Background - Introduction', available at: http://www.tianjinecocity.gov.sg/bg_intro.htm, last visited August 2016.

[305] The protection of ecological systems in GB promotion has been reflected in the requirements on site selection in the LEED system. For instance, in light of the US Endangered Species Act, the wildlife habitats need to be protected from the brown constructions to preserve endangered species.

which a chemical factory polluting the air in an upwind area needs to move away from a residential community, so as to ensure residents a safe exposure to the air. It could be the other way around when the polluters get the first use of a place according to the land use planning. In that case, the liability rules and property rules may come into play to decide who can make the most of the land. If the nuisance law enlists the first use doctrine, then a question arises as to whether or not compliance with regulations can exempt polluters from liability.

Given the different situations, GB compliance needs to deal with conflicts among various land uses. For instance, GB renovations sometimes need to put in place wind power panels, which will be challenged by the law of cultural heritage protection when the panels affect a cultural or historic site.[306]

Equally noteworthy, GB planning may have impacts on private rights. GB compliance appears to restrict the utility properties at first blush. GB compliance may go too far when it allows the government to exercise takings without just compensation haphazardly.[307] GB planning requires that buildings do not affect areas where endangered species are living. However, the law sometimes might not grant property owners the standing to sue against takings.

At other times, the government may require green renovations in a community through planning. However, planning should take into account local incomes. GB planning may bring environmental benefits to society at large, but they might not be affordable to all individuals. The higher first cost challenge may get GB nowhere close to a city's slums or destitution. If GB compliance becomes mandatory in those areas, residents who cannot afford to build green may lose places to live.[308] A possible solution

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See Ruhl, J. B., 'Cities, Green Construction, and the Endangered Species Act,' 27 (2009) *Virginia Environmental Law Journal*, at 153-154.

[306] Wolf (2011), *supra* note 295, at 962.

[307] For instance, in Lucas v. South Carolina Coastal Council, the claimant Lucas purchased beachfront properties in the Beachwood East Subdivision of the Wild Dunes Charleston County, South Carolina. The Beachfront Management Act effectively prevented Petitioner Lucas from building houses on properties due to the effects it will have on the public beach. Lucas filed a suit, claiming that the restrictions on the use of his lots constituted takings of his property without just compensation. The court ruled that the Act deprived the owners' overall economic utility of the property. The 'total taking' test was born to evaluate whether or not the government regulation constitutes a taking that should be done through due process and just compensation. Later than the Lucas case, property owners won again in the *Palazzolo v. Rbhode*, which indicates that judges now become more cautious in the zoning and land-use decisions than before. See *Lucas v. South Carolina Coastal Council*, 505 U.S.1003 (1992); *Palazzolo v. Rhode Island*, 533 U.S. 606 (2001).

[308] It is reported that people tend to see GBs as high-end homes that low-income families may not afford. Such perception has been one of the challenges facing a wider uptake of GB compliance. See Dodge & Analytic (2016), *supra* note 6, at 18.

is to make the government pay part of the costs through affordable green housing scheme, whereby a right to live can be respected.[309] However, this study is not meant to go into a debate on environmental justice; instead, it focuses more on making the pie bigger rather than dividing the pie.[310]

6.3 Market-based instruments

6.3.1 Subsidies

The government may provide building stakeholders with subsidies to pay the higher first cost of GB. Subsidies can be given for new GBs or GB renovations. In some cases, a subsidy will be given in proportion to the floor-space area of a GB. In another way, a subsidy can be given to a certified GB, or to buildings that meet standards regarding one of the GB elements, e.g., the amount of energy-in-use.[311]

It is likely that subsidies for GB compliance may not work simply because the money provided is not enough to induce GB activities. The cost of GB compliance occurs at the different stages of a building, including construction, maintenance, and demolition. In that case, the higher first cost is not the only bill a green builder need to pay. However, such a life-cycle cost may sometimes be overlooked by a GB subsidy program.[312] There are also soft costs of GB compliance, e.g., the cost of certification. Some environmental programs tend to give financial support if a building is certified by a required GB rating system. [313] In that case, developers may give up on GB compliance if the financial incentives do not cover the cost of certification. In practice, some local governments have taken into account the soft costs, e.g., the certification costs.[314] Yet it could still be too much to ask the governments to cover all the costs of GB compliance in the face of a constrained budget.

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[309] Foy, K. C., 'The Convergence of Environmental Justice, Affordable Housing and Green Building,' 30 (2012) *Pace Environmental Law Review*, at 34-35.
[310] See Chapter I, Section 4.1.
[311] Khanna et al. (2014), *supra* note 51, at 44.
[312] Bradshaw, W. et al., 'The Costs and Benefits of Green Affordable Housing,' A Publication of New Ecology &The Green CDCs Initiative, January 2005, at 163. Full text available at: http://www.dcat.net/workshoptoolkit/Workshop_Toolkit/Affordable_Housing_files/green_affordable_housing.pdf, last visited August 2016.
[313] See Dodge & Analytic (2016), *supra* note 6, at 20.
[314] For instance, in the State of Pennsylvania, the U.S., a subsidy scheme for schools has been programmed by the government to cover the soft costs of building information modeling, green consultancy & designing, and the certification of the LEED. For more information about the program see the U.S. Department of Energy, 'High-Performance Green School Planning Grant,' http://www.portal.state.pa.us/portal/server.pt/community/schools/13838/funding_opportunities/588215, last visited August 2016.

Moreover, a subsidy program may not be desirable due to an additionality problem,[315] in which case the subsidy may be given to parties who will build green anyway. In the long run, green features may become business-as-usual and companies are willing to invest in the development of GB technologies. In that case subsidies from governments could make little difference in actually changing behavior, as building stakeholders will comply without the subsidies.

Lastly, subsidies may create perverse incentives, in which case the money will be given to others than those in need.[316] For instance, if GB subsidies are granted in proportion to the areas of floor-space or to the size of a project. However, those who invest in a large scale project could be the wealthiest enterprises on the market. As a result, most of the subsidies will probably be delivered to the wealthiest, and not to the middle-size or smaller developers who are willing to build green but cannot afford to.

Also, the perverse incentive created by subsidies is likely to increase the total environmental impacts at large even if it reduces emissions at an individual level, as it may attract more parties to enter the market.[317] By definition, a GB is green compared to the one that would have otherwise been built. In that sense, GB compliance aims to build greener and not to build more. Poorly designed, a subsidy scheme can create perverse incentives for which developers tend to build more new buildings. As a result, the GB industry at large will contribute to more emissions, even though each of the GB projects can score better in emission reduction.

Some of the problems with subsidies can be solved by simply changing the design of a subsidy program. The government can calibrate the baseline or the procedure on which the subsidies are granted. Alternatively, subsidies may be granted to parties other than the polluters. For instance, the money can be given to a consultant, who will invest in GB technology

[315] Baumol and Wallace (1988), *supra* note 100, at 211-230.

[316] North, D. C., *Economics of Public Issues* (Harper Publishing Company, 1976), at 187.

[317] Baumol, W. J., and Wallace E. Oates, W. E., 'Taxes versus Subsidies: A Partial Analysis,' in in Baumol, W. J., and Oates, W. E. (eds.), *The Theory of Environmental Policy* (Cambridge University Press, 1988), at 223-24.

There has also been some empirical evidence showing that subsidies or tax incentives may not pay off, or even worsen the situation. For instance, in the US, policies at the federal and state levels set out to give tax incentives and subsidies to lower GHG emissions. However, those financial incentives have a minimal impact on GHG emissions; in some cases, they even increase emissions and result in tax revenue losses of $ 10 billion per year in 2010. Among other incentives, subsidies destined for more extensive use of biofuel, did increase the uptake of the subsidized products, but they failed to lower the carbon intensity of fuel use due to the life-cycle emissions from the feedstock, and transportation and production of the fuel. Elsewhere, the subsidies for biofuel somehow made gasoline prices go down and led to a rebound effect that may lead to more emissions. See Murray, B. C. et al., 'How Effective are US Renewable Energy Subsidies in Cutting Greenhouse Gases?', 104 (2014) *The American Economic Review*, at 569-574.

innovations and not just in emission reduction.[318] While some of the problems, such as the inadequacy of money as a result of a tight budget, or the total amount of emissions increased by the GB sector as a whole, need to be solved by other means than subsidies.

6.3.2 Taxes and fees

There are different ways of taxation to encourage GB compliance.[319] To internalize harmful externalities, a corrective tax imposed on emissions may help, e.g., a tax on construction wastes disposal. When it comes to the adoption of new technologies, sales tax waivers can lead to a higher adoption than do income tax credits.[320]

Governments at a lower level may tend to give tax reductions for green properties. One of the reasons could be that the power to create a new tax may often reside with legislatures at a higher level. A new tax will probably depreciate properties or reduce citizens' disposable income. Therefore, new taxes should be justified with legality & legitimacy, and should be approved by legislatures. However, legislation can easily get bogged down in politics. It may take years to create a new tax or change the variables of a tax through legislative processes. On that account, taxation may be less flexible and responsive to a novel change like GB compliance.

Legality issues aside, deadweight losses may be another reason to choose tax reductions over new taxes. A deadweight loss is a net loss of supplier surplus/ consumer surplus. Imposing a tax can break the tax-free equilibrium of supply and demand.[321] In the case of GB development, the

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[318] Georg, S. *et al.*, 'Clean Technology – Innovation and Environmental Regulation,' (2)1992 *Environmental and Resource Economics*, at 534.

A recent study also argues that subsidies can gain more when given to the R&Ds of abatement technologies (upstream subsidies). The study on the other side shows that downstream subsidies, viz those made for pollution abatement, tend to increase global abatement technology prices and increase emission leakage. If this is also true within the country border and subsidies would not be put out as a means against pollution, it might be better for the government to back technology innovations rather than the abatement of end-of-pipe pollution. See Fischer, C., Greaker, M., and Rosendahl, K. E., 'Robust Technology Policy against Emission Leakage: the Case of Upstream Subsidies', 84 (2017) *Journal of Environmental Economics and Management*, pp. 44-61.

[319] For instance, in the U.S., the Baltimore county council passed a bill stating that new residential construction projects would earn 40%, 60%, and 100% property tax credits for Silver, Gold, and Platinum buildings respectively. For more information see the Baltimore County Government, 'High-Performance Tax Credit,' available at: http://www.baltimorecountymd.gov/Agencies/budfin/customerservice/taxpayerservices/taxcredits/performancehomes.html, last visited August 2016.

[320] Gallagher, K., S., and Muehlegger, E., 'Giving Green to Get Green? Incentives and Consumer adoption of Hybrid Vehicle Technology', 61 (2011) *Journal of Environmental Economics and Management*, pp. 1-15.

[321] Gaudet, G., and Lasserre, P., 'The Taxation of Non-renewable Natural Resources', in Halvorsen, R., and Layton, D. F. (eds.), *Handbook on the Economics of Natural Resources* (Edward Elgar

long-term benefits and savings of GB compliance may not interest developers who are not willing to comply with GB standards. The tax imposed on the non-green properties would probably increase the cost of buildings. In the short run, these costs will be borne by both producers and consumers through pricing. While in the long run, some developers may pull out of the market and the quantity supplied may fall below the optimal level that would have been achieved without the tax.[322] In the end, the consumer will have to pay a higher price for GB.

In addition to taxation, impact fees can be an alternative to get the environmental price paid. Impact fees can be imposed on new development projects in a stratified manner, in which case the higher the level of certification granted for a building, the lower the fees charged.[323] Impact fees can also be imposed on the use of energy, water, transportation. The fees can later be inputs for a subsidy program for the green. The idea of payment for resource use came from exactions imposed on real estate developers who would like to get permission for building projects.[324]

6.3.3 Liability

Holding parties liable for the harm can provide ex-ante incentives for compliance. When GB compliance becomes part of a building project, it is likely that building professionals,[325] or other building stakeholders like

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Publishing, 2015), at 71-72.

[322] Philip, R.P. C., 'Polluters' Profits and Political Response: Direct Control with Taxes Comment', 66 (1976) *The American Economic Review*, at 976

[323] Kingsley, B. S., 'Making It Easy to be Green: Using Impact Fees to Encourage Green Building', 83 (2008) *New York University Law Review*, at 555.

[324] An exaction can come in the forms of in-kind provision infrastructure and cash payments. In the former case, the developer will be required to build public infrastructure as a condition of carrying out a development project. Alternative, developers can choose to invest in an off-site public infrastructure with cash payment, which is known as 'impact fees.' See Brueckner, J. K., 'Infrastructure Financing and Urban Development: The Economics of Impact Fees', 66 (1997) *Journal of Public Economics*, at 384.

[325] For instance, in 2007, Shaw Development, L.L.C. (Shaw Development), who purchased property in Somerset County, Maryland and contracted with Southern Builders, Inc. (S. Builders) to construct a condominium project on the property. At that point, the Maryland Energy Administration issued a tax credit certificate. Later Shaw Development filed a counter-complaint against S. Builders in a mechanic lien action for S. Builders failed to make the project LEED-certified, which caused Shaw Development a loss of tax credit amounting to $635,000.00. The case ended up with an out-of-court settlement, while as the first 'LEEDtigation', the Shaw Development case hints at the potential Claims for damages for a breach of contract against the LEED professional, contractor, particularly when the government makes an industry-based certificate a requirement for issuing a permit or for granting tax credits. For more information about the Shaw Development case and a further discussion on GB contract liability see Circo, C. J., 'Will Green Building Contracts Transform Construction and Design Law?', 43 (2011) *Urban Lawyer*, at 483-527.

lenders, will face a higher level of due care. [326] However, contracting parties can keep the standard of care in situ and exclude GB compliance. This has been the case for some standard GB contracts in which liability for a failure to achieve certification can be waived or limited.[327] Also, surety bonds through a contract may work as a financial incentive to induce performance. In the meantime, surety bonds provide parties with an 'escape hatch' when compliance with GB standards is technically or economically not feasible.

However, it might be difficult for lawmakers to generalize the optimal terms of the contract. [328] Instead, law usually defines what type of bargaining behaviors are legal[329] and may introduce a third party for the enforcement of contracts. Simply put, law should not overstep against the freedom of contract. Therefore, this study focuses more on tort liability where lawmaking can have more to say in giving incentives to build green.

Liability related to the built environment mostly deals with personal injuries or with property damage. For instance, the IAQ of the built environment may be influenced by the emissions from building materials. Poor IAQ may lead to sick building syndromes that will cause personal injuries. Those who are suffering from the exposure can file a suit against companies supplying the materials. Yet the IAQ-related liability may be understated in environmental law that governs only the outdoor air quality.

Another concern revolves around torts regarding land pollution or waste disposal. The transportation, storage, usage and disposal of construction/demolition (C/D) wastes are likely to cause land contamination. Apart from liability for the actual injurers, the idea of vicarious liability may also have some implications in GB compliance, as has been the case with lender liability in the US. In the US law, lenders who grant loans for building projects will be seen as potentially

[326] In recent years, many lenders started to finance green projects due to government policies that encourage private developers to build green. Usually, a lender will carry out an underwriting review to see whether the project is worth investing. However, some lenders may not be aware that a GB project can differ from a traditional one in terms of mitigation techniques, conditions for disbursement, and the environmental lien that is superior to any other mortgage liens. See Prum, D. A., 'Greenbacks for Building Green: Does a Lender for Sustainable Construction Projects Need to Make Adjustments to Its Current Practices?' 43 (2013) *Environmental Law*, at 415-17.

[327] See AIA, 'General Conditions of the Contract for Construction,' the AIA Document A-201, 2007, sec. 15.1.6. Full text available at http://www.hba.org/wp-content/uploads/2014/11/B-2-AIA-Doc-A201-2007.pdf, last visited March 2017.

[328] Scott, R. E., 'A Relational Theory of Default Rules for Commercial Contracts', 19 (1990) *The Journal of Legal Studies*, at 597-616.

[329] Schwartz, A., and Scott, R. E., 'The Common Law of Contract and The Default Rule Project', 102 (2016) *Virginia Law Review*, at 1524.

responsible parties for land reclamation.[330] In response to the long-lasting brownfield problem, lender liability in the US is a strict and retrospective liability for owners and operators of facilities and substances.[331] Lender liability in the US seems to solve the judgment proof problem by involving more liable parties. Lender liability in the US law not only takes into account the actual injurers liable but also parties who supervise the actual injurers and benefit from harmful activities. It is worth heeding that different lender liability rules may have different impacts on the level of activity and on the level of care.[332]

In theory, liability could be cheaper than subsidies or taxes in terms of administrative costs,[333] and can serve as a supply of private information about behavior that may not be observed by the regulator.[334] Yet the liability regime may not be well-suited for GB compliance. First of all, liability is more of a way to deal with harmful externalities. For the time being GB focuses more on energy efficiency that provides private parties with energy savings, and hence can hardly be associated with harmful externalities. Even if building energy efficiency may reduce the GHG emissions, positive externalities often set the grounds for regulation and not for liability. Second, the causation for liability could be complicated and hard to prove, as is too often the case with environmental harm. For instance, the sick building syndrome can be a synergy effect of poor IAQ, outdoor air quality, building materials and the operation of the HVAC system in a building. Third, the compensation of harm might still face the judgment proof problem. In that case, the harm would not be adequately compensated in reality when the liable parties are insolvent.[335] Moreover, the amount of damages is so high that no private party can afford. It is also likely that the actual harm is irreversible or is difficult to be measured in terms of money. Those problems have all been present in the case of brownfield remedies as a requirement of GB.[336]

Liability can also work with property rules to deal with pollution or incompatible property uses, which may also indirectly help GB compliance.[337] A case in point is the law of nuisance. The law of nuisance

[330] Prum (2013), *supra* note 326, at 432-436.
[331] See *infra* Chapter IV, Section 4.3.4
[332] *Ibid.*
[333] Shavell (2013), *supra* note 196, at 275-278.
[334] Shavell (2004), *supra* note 177, at 579.
[335] See, e.g. Polinsky and Shavell (1994), *supra* note 221, at 20; Shavell, S., 'The Judgement Proof Problem,' 6 (1986) *International Review of Law and Economics*, pp. 43-58.
[336] More about the brownfield reclamation see infra Chapter IV, Section 4.3.4 & 4.5.1, and Chapter V, Section 5.
[337] Polinsky, A. M., 'Resolving Nuisance Disputes: Injunctive and Damage Remedies', 32 (1980) *Stanford Law Review*, at 1075.

is said to help achieve more efficient use of resources and distributive justice under the liability and property rules.[338] As nuisance law is more concerned with the Pareto-relevant externalities,[339] it often requires that harmful acts should be unreasonable, or to put it another way, owners of properties in the vicinity should have a certain degree of tolerance to each other. In that sense, courts may refuse to compensate victims when the harm mainly results from the hypersensitivity of the plaintiff.[340] Moreover, the law of nuisance offers a means to foresee how property rights change over time, where the law recognizes that property rights are properly assigned before, but this assignment may only hold in the foreseeable future.[341] In a world with imperfect information, high transaction costs and parties preying on each other, damages and injunction remedies may not be equally desirable.[342] To make the most of resources, damages as a remedy would be better if the parties act strategically and the court knows the victim's damages but not the injurer's benefits. By contrast, if the court does not have enough information about both damages and benefits, then the injunction remedy may be preferable.[343]

Imagine a buyer who purchases a house in an area where industrialization is about to take place, and the noise/pollution caused by the railways can be expected. In this situation, judges cannot simply rule that dirty firms or projects should be moved away at all costs. Instead, courts need to take into account the primary assignment of the entitlements, meanwhile weighing the gains from the railways against losses to the buyers and the society as a whole. Then courts can accordingly choose between injunctive and damage remedies.[344] In this case, intuitively, if the railway project may lead to growth in an area and make the majority better off, it would be sensible to keep the railways running. This means that the homeowner has to tolerate the nuisance or to relocate. If the entitlement was given to the railways firm at first, and the homeowner could have foreseen the nuisance,

[338] As opposed to the efficiency and distributive justice aim, the law of nuisance is otherwise said to protect entitlements. In that sense, when a nuisance is claimed, the first thing courts should do is to tell if there is an infringement on property rights, and not to tell which party is able to make the dollar-profit-maximizing use of the property. Simply put, the law of nuisance is meant for corrective justice. See White, L. H., 'Economics and Nuisance Law: Comment on Manson', 8 (1985) *Harvard Journal of Law and Public Policy*, at 213-214; Manson, W. D., 'A Reexamination of Nuisance Law, 8 (1985) Harvard Journal of Law and Public Policy, pp. 185-212.

[339] An externality is Pareto-relevant when the party affected can improve his situation without making the acting party worse off. See Manson (1985), *supra* note 338, at 193-194.

[340] See, e.g. Rogers v. Elliot, 135 F. Supp. 2d 1312 (N.D. Ga. 2001); Amphitheaters, Inc. v. Portland Meadows, 198 P.2d 847, 184 Or. 336.

[341] Manson (1985), *supra* note 338, at 198-199.

[342] Polinsky (1980), *supra* note 337, at 1080.

[343] *Id.*, at 1111-1112. Manson's work also spells out four possible ways to choose remedies given different situations, See Manson (1985), *supra* note 338, at 198-203.

[344] Manson (1985), *supra* note 338, at 200-202.

courts may play the property rule to stop the homeowner interfering with the firm. If the homeowner got the entitlement first, courts could use a liability rule to compensate the homeowner meanwhile keeping the railways going.

6.3.4 Green public procurement (GPP)

The government can buy building services or products with less environmental impacts, which may help to jump-start GB compliance.[345] GPP can be used for government building projects or for residential buildings to help reduce the front cost of green products. [346] For the GPP to run, government and private parties usually reach a contract, and the parties' obligations and risks may vary across different project delivery methods. **[347]**

GPP can be taken as a market-based approach as it allows the government to affect the supply and the demand in a green market. On the one hand, a GPP per se can directly increase the quantity demanded in the short run.[348] In the long run, GPP might indirectly boost the demand of private parties when GPP goes beyond public infrastructures.[349] The idea is that GPP can make both building professionals and customers better aware of GB compliance.[350] As noted before, a building process is where customers' feedback matters least. A lack of communication can lead to a wait-and-see strategy, where customers are searching in vain for affordable green homes, while developers are waiting for the demand to go up.[351] With neither the customers nor the developers making the first move, building professionals may have no acquisition for GB skills and knowledge.

On the other hand, GPP can partly ease the higher first cost concern and may attract more developers towards GB compliance. As the uptake of GB

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[345] United Nations Environment Programme *(*UNEP), 'Sustainable Public Procurement: a Global Review,' UNEP Final Report, December 2013, at 16-24. Full text available at: http://www.unep.org/resourceefficiency/Portals/24147/SPP_Full_Report_Dec2013_v2%20NEW%20(2).pdf, last visited August 2013.

[346]For instance, the EU Commission has set out a directive, requiring that as of 2019 all the buildings occupied or owned by the public authorities within EU member states should be nearly zero-energy**.** See Directive 2010/31/EU, 19 May 2010**.**

[347] See Alexandru v. Roman et al., 'A Guide to Public-private Partnerships: What Public Procurement Specialists Need to Know, 2015 Research Report for NIGP, at 1-6.

[348] See Commission of the European Communities, 'Buying Green: A Handbook on Green Public Procurement', 2016, at 4. Full text available at: http://ec.europa.eu/environment/gpp/pdf/Buying-Green-Handbook-3rd-Edition.pdf, last visited August 2016.

[349] Marron, D., 'Greener Public Purchasing as an Environmental Policy Instrument', (3) 2003 *OECD Journal on Budgeting,* at 82.

[350] Simcoe, T., and Toffel, M. W., 'Government Green Procurement Spillovers: Evidence from Municipal Building Policies in California', (68) 2014 *Journal of Environmental Economics and Management*, at 413.

[351] *Id.*, at 418.

increases, building professionals would be willing to invest more in GB technologies, whereby the cost of a GB project may go down due to technological improvements and repeating practices. Nevertheless, a crowd-out effect may appear when there is too much government spending in the market.[352] In that case, private parties, such as lenders who are eager to grant green loans for GB projects, will probably pull out. Public procurement for GB has only been available for a few decades with most of them coming as long-term projects. Hence there might not be much empirical evidence on the actual impacts of GPPs on the GB market.

There may also be some legal concerns about GPP. GPP by definition should get involved with at least one public party. Then the question arises as to who may qualify as a public entity in the GPP contract. In the context of collaborative governance, public agencies can be governments or other entities who can influence public interest, e.g., a state-owned utility company. This could also be the case in the GB development.[353] However, the scope of public parties sometimes appears to be equivocal.[354]

Moreover, GPP may be short of transparency and long-term monitoring. Not all parties in a GPP contract act in a *bona fide* manner, particularly in the face of information asymmetry. Public agencies might in some circumstances be seen as powerful actors who can manipulate and exert unfair deals.[355] It should also be noted that governments may not always

[352] Marron (2003), *supra* note 349, at 85-86.

[353] There are three types of public agencies in the GB movement, one of which could be government agencies who may rent or buy GBs for their use. For instance, the General Services Administration (GSA) in the US federal government has been a leader in LEED adoption and general sustainable building practices. The GSA has implemented an innovative program called the Green Proving Ground (GPG), wherein a large amount of floor space is used as a laboratory for new green building technologies and practices. See USGSA, 'What is GPG', available at: http://www.gsa.gov/portal/category/102575, last visited August 2016.

The second type could be enterprises jointly financed by governments; or those providing public services, such as a state-owned enterprise that runs the state grid. The third type of public entities could be international financial institutes such as the World Bank or the Asian Development Bank, who may invest in GB projects within a country. The investment as such might be contracted as a GPP when it has the government of the country as its surety. See Ke, J. '我国绿色政府采购的立法构想'(Law-making for GPP in China), (33) 2006 四川师范大学学报（社会科学版) (Journal of Sichuan Normal University, Social Science Edition), at 68

[354] For instance, the meaning of public procurement is narrowed to 'government procurement' in China. The law defines the public parties in public procurement as "government departments, institutions, and public organizations at all levels", putting out those state-owned enterprises and international financial institutes as potential purchasers. See National People's Congress Standing Committee of the People's Republic of China (NPCSC), 中华人民共和国政府采购法 (The Government Procurement Law of the People's Republic of China),第十四号主席令 (Order No. 14) of the President of the People's Republic of China), 31 August 2014, Article 2.

[355] The OECD has pointed out six sectors where mismanagement and corruption are very likely to happen in public procurement: the extractive, construction, transportation and storage, and information and communication sectors. In the US, malpractices in GPP has led to, as the Construction Sector Transparency Initiative (COST) estimated, a loss of USD 2.5 trillion by 2020 in the global construction

have the advantage in terms of information in GPP. In some cases, private parties may have better information as to whether or not the project proceeds along the timeline, what the risks are, where the money goes or what materials and technologies are actually used.[356]

In a GPP contract, the government may invoke a performance bond in the development of a public building project to ensure compliance with GB standards.[357] The performance bond would offer a financial guarantee on which the project will be carried out by the principal in line with GB regulations. Where there is non-compliance, the surety would be liable for ensuring that the problem will be solved by the principal, which usually comes with monetary compensation.

6.4 Suasive instruments

6.4.1 Environmental information disclosure

Environmental information disclosure (EID) can be required from or provided for building stakeholders to encourage voluntary compliance and private enforcement. In legal terms, access to environmental information is a fundamental right laid down in international environmental conventions.[358] In a practical sense, governments may sometimes put regulation in the background and go for persuasion first.[359] One of the reasons is that persuasion can be effective and cheap, compared to

industry. See OECD (2016), at 6; COST, 'Openness and Accountability in Public Infrastructure Could Save $2.5 Trillion by 2020', the COST Press Release, 22 October 2012, available at: http://www.constructiontransparency.org/documentdownload.axd?documentresourceid=8, last visited August 2016

[356] See, e.g., MOF, '关于报送政府采购严重违法失信行为信息记录的通知**'** (Record on corporate misconduct in government public procurements**,** Announcement No.526 of the General Office of Ministry of Finance of the People's Republic of China).

[357] For instance, in 2006 the Washington D.C. City Council passed legislation that requires green performance bonds to be used on construction projects beginning in 2012. See D.C. Official Code § 1-206.02 (5 December 2006).

[358] As stated in Principle 10 of the Rio Declaration on Environment and Development states: "Environmental issues are best handled with the participation of all concerned citizens, at the relevant level. At the national level, each individual shall have appropriate access to information concerning the environment that is held by public authorities, including information on hazardous materials and activities in their communities, and the opportunity to participate in decision-making processes. States shall facilitate and encourage public awareness and participation by making information widely available. Effective access to judicial and administrative proceedings, including redress and remedy, shall be provided." See the United Nations (UN), 'Rio Declaration on Environment and Development 1992', United Nations Conference on Environment and Development, 3 June 1992. Full Text available at: http://www.jus.uio.no/lm/environmental.development.rio.declaration.1992/portrait.a4.pdf, last visited August 2016.

[359] World Bank, 'Getting to Green—A Sourcebook of Pollution Management Policy Tools for Growth and Competitiveness', (Washington D.C.: The World Bank, 2012), at 123-124. Full text available at: http://documents.worldbank.org/curated/en/560021468330349857/pdf/716080WP0Box370Getting0to0Green0web.pdf, last visited August 2016.

regulation.[360] Another reason is that persuasion and information may better crowd in an individual's intrinsic motivation for compliance,[361] and hence change behavior[362]

Usually, the law of EID should clarify what type of information should be delivered, by who and by what means. As an instrument in isolation, EID can be done in the following four ways. First, governments may encourage private parties to provide information. In that case, EID can be achieved by labeling or reporting. By making the information available to the public, EID can encourage stakeholders to enhance their environmental performances.[363] In the case of GB compliance, EID by firms has already been present to keep track of the energy performance of buildings.[364] Second, the government itself may make some information available by creating a database that collects and releases environmental information. For instance, concerning the land use of a GB, the government may create an inventory to identify endangered and vulnerable species. [365] Elsewhere, governments may also use an environmental catalogue or a registration system to provide stakeholders with guidance on environmental compliance, e.g., an inventory of hazardous and toxic substances. In recent years, the EID has also been community-based in GB compliance, which could be a result of collaborative environmental governance.[366] Lastly,

[360] Ayres and Braithwaite (1992), *supra* note 244, at 26.

[361] See Frey, B. S., 'How Intrinsic Motivation is Crowded out and in,' 6 (1994) *Rationality and Society*, pp.334-352; Frey, B.S. and Jegen, R., Motivation Crowding Theory: A Survey of Empirical Evidence,' 15 (2000) *Journal of Economic Surveys*, pp.589-611.

[362] Stephen, M., "Environmental Information Disclosure Programs: They Work, But Why?" 83 (2002) *Social Science Quarterly*, pp.190-205; Jin, Y., Wang, H., and Wheeler, D., 'Environmental Performance Rating and Disclosure: An Empirical Investigation of China's Green Watch Program,' Policy Research Working Paper No.5420, 1 September 2010, World Bank publishing, Washington, DC. Full text available at: http://documents.worldbank.org/curated/en/497841468011137982/pdf/WPS5420.pdf, last visited August 2016.

[363] An empirical study has shown that information disclosure concerning a firm's toxic emissions can pose a significant effect on market valuation, where the firm will probably be induced to reduce subsequent emissions. Konar, S., 'Information as Regulation: The Effect of Community Right to Know Laws on Toxic Emissions,' 32 (1997) *Journal of Environmental Economics and Management*, at 123.

[364] Weil, D., Fung, A., Graham, M., and Fagotto, E., 'The Effectiveness of Regulatory Disclosure Policies', (25) 2006 *Journal of Policy Analysis and Management*, pp. 155–181.

[365] The idea is that if a green project aims to minimize the loss of habitats, governmental agencies could inform the project stakeholders of the outcomes of using GB technologies, as well as how the GB technologies could be tailored to meet the needs of species protection. See Ruhl, J. B., 'Cities, Green Construction, and the Endangered Species Act,' 27 (2009) *Virginia Environmental Law Journal*, at 151-159.

[366] Such a novel approach has been followed by the U.S. National Institute of Environmental Health Science (NIEHS) for studying connections between the built environment and human health, focusing both on gathering and disseminating information. Foy, K. C, 'Home is Where the Health is: The Convergence of Environmental Justice, Affordable Housing and Green Building', 30 (2013) *Pace Environmental Law Review*, at 53-54.

instead of making information available to the public in general, governments may choose to provide data at the request of a qualifying party, so as to protect confidential or proprietary information.

Furthermore, EID law should provide some transparency. On the one hand, a voluntary EID scheme should take shape through public participation to better reveal the stakeholders' preferences, the objectives, and the details of management. Otherwise, EID would be difficult to implement and might do little help in providing incentives.[367] The reason behind is that not only the information but also the processing of information matters. Information processing determines to whom and by what means the information will be delivered. In general, EID can be achieved at a firm, community or state level, where the number of parties increases when moving up through the different levels.[368] In that sense, governments would play a pivotal role in raising the awareness of GB compliance. Another role for government to play is to integrate the dispersed knowledge about compliance and green technologies. There are various standards and rating systems run by the building industry, some of which may be watered down to 'greenwash' projects that barely have any environmental benefits. In that case, the government can provide stakeholders with some guidance, say, an online compliance assistance system, to tease out some credible certifications schemes for consumers.

With transparency, EID may at times clash with the protection of proprietary information. Governments should be aware of the confidentiality of the information disclosed. A possible way to ensure confidentiality could be disclosure within a group, or disclosure on request. For instance, some governments encourage the use of the Environmental Management Systems (EMS) by companies, where proprietary information as part of the EMS may help firms to find cost-effective opportunities or technologies for environmental improvement.[369]Another example would be EID for the release of chemicals, where the government requires facilities to track what chemicals are coming into a facility, how they are transformed into waste and products, and what is coming out of facilities at the end. In neither case will the information disclosure undermine confidentiality, as the information would merely be known by the government or by a limited number of stakeholders.

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[367] World Bank (2012), *supra* note 359, at 121.

[368] Beierle, T. C., 'The Benefits and Costs of Environmental Information Disclosure: What Do We Know About Right-to-Know?', (24) 2004 *Risk Analysis*, at 341-343.

[369] Davies, T., 'Reforming Permitting,' Resources for the Future (RFF) Report, December 2001, at 86-87, available at: http://www.rff.org/files/sharepoint/WorkImages/Download/RFF-RPT-reformperm-exec-sum.pdf, last visited August 2016.

6.4.2 Voluntary environmental agreement (VEA)

VEA is "an agreement or an action of self-regulation which is voluntary in character and involves stakeholders of which at least one is the state."[370] VEAs can be used in isolation or conjunction with other instruments.[371] By its definition, VEA has four features that distinguish it from other instruments. First and foremost, a VEA is voluntary,[372] in which case the enforcement of a VEA may largely rely on self-regulation with a minimal amount of governmental intervention.[373] In that sense, VEAs are not legally binding, as opposed to a GPP contract. Second, in a VEA, at least one of the negotiated parties should be a public agency.[374] For instance, a VEA can be reached between a regulator and the industry, with environmental NGOs getting involved as a third-party.[375] Third, a VEA is a formal document, but it may at times incorporate some 'informal understandings,' such as a delay or an exemption from regulation provided by the government.[376] Lastly, VEAs can assist in environmental regulations. A VEA can be based on some objectives and instruments laid down in environmental laws and policies. Meanwhile, a VEA can be an experimental response to a new environmental issue, whereby it may form the basis for the regulation to come.[377]

VEAs have played a part in support of GB compliance.[378] The reason to participate in a VEA may differ across parties. Regulators may seek VEAs when the CAC or the market-based instruments are too costly to put in place.[379] At other times, regulators may go for a VEA in the face of

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[370] Gebers, B., 'The Diversity of Environmental Agreements: An International Overview,' in Glasbergen, P. (eds.), *Co-operative Environmental Governance: Public-Private Agreements as a Policy Strategy* (Kluwer Academic Publishers, 1998), at 91.

[371] See OECD, 'Voluntary Approaches for Environmental Policy: Effectiveness, Efficiency, and Usage in Policy Mixes,' OECD Report, 18 June 2003, p.12. Full text available at: http://www.peacepalacelibrary.nl/ebooks/files/C08-0098-OECD-Voluntary.pdf, last visited August 2016.

[372] *Id.*, at 93.

[373] Karamanos, P., 'Voluntary Environmental Agreements: Evolution and Definition of a New Environmental Policy Approach', (44) 2001 *Journal of Environmental Planning and Management*, at 68.

[374] Gebers (1998), *supra* note 370, at 93-94.

[375] Karamanos (2001), *supra* note 373, at 68-75.

[376] Glachant, M., 'The Setting of Voluntary Agreements between Industry and Government: Bargaining and Efficiency,' (3) 1994 *Business Strategy and the Environment*, pp. 43–49.

[377] There has been a study showing that the 'reg-negs' ('negotiated rule-making') between various groups led to the design of administrative rules based on the involvement and consensus between the interested parties. Wallace, D., *Environmental Policy and Industrial Innovation: Strategies in Europe, the US, and Japan* (Brookings Institution Press, 1995), at 112-115.

[378] One of the examples could be the Sustainable Buildings of Memorandum of Understanding (MOU) in the US, which is an agreement among federal agencies, in coordination with complementary efforts in the private and public sectors. For more see Chapter IV, Section 4.4.1.

[379] A study shows that lower administrative costs of the VEA had been one of the reasons that the

scientific uncertainty or a lack of political support in dealing with an environmental issue.[380] Moreover, VEAs sometimes get involved with environmental NGOs as a third-party, where the 'tripartite' cooperation takes shape between government, the building industry, and some public interest groups. Such tripartite is able to create extra-regulation compliance by the industry, in which case companies may act on higher performance standards, and not just scant efforts.[381]

From a private party's perspective, compliance with VEA may cost less compared to that with mandates. The costs may be even lower if a VEA is combined with other incentives such as subsidies, tax breaks or relief from regulations. Another reason for private parties to participate in a VEA could be that, some companies need to brand themselves with a green image to satisfy environmentalists, [382] and attract customers with environmentally friendly preferences. A study has found that compliance with a VEA can mean more than a burden on private parties, sometimes it even provides long-term benefits for a company, such as a lower cost in production resulting from pollution control.[383]

A VEA also has some flaws in terms of enforcement and free-ridership. First, the voluntary character may lead the VEA to be subject to free-ridership. The free-ridership may arise when parties who cannot afford the abatement cheat, leave the parties who perform bona fide to bear the costs. It is also likely that parties who can abate at a lower cost do not make a real effort, in which case the total costs of abatement may turn out to be higher than that in line with the equi-marginal principle. A possible solution to the free-ridership problem is to define some quantitative targets for the parties clearly.[384] However, doing so may prolong the negotiation process and lower the flexibility of a VEA.

Secondly, a VEA relies largely on self-regulation, which can be short of external oversight in the long run. Certainly, governments can impose

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USEPA wanted to start the XL Projects. See Delmas, M., and Montes-Sancho, M., 'Voluntary agreements to improve environmental quality: Symbolic and substantive cooperation,' 31(2010) *Strategic Management Journal*, at 575–601; OECD (2003), *supra* note 371, at 62.

[380] Kerret, D., and Tal, A., 'Greenwash or green gain? Predicting the success and evaluating the effectiveness of environmental voluntary agreements. 14 (2005) *Penn State Law Review*, pp. 31–84.

[381] Ayres and Braithwaite (1992), *supra* note 244, at 57 & 70.

[382] For example, Innes and Sam (2008) found that boycott threats made by the Sierra Club, a U.S. environmental NGO, spurred participation in a voluntary program in support of emissions reductions of toxic chemicals. See Innes, R., and Sam, A. G., 'Voluntary Pollution Reductions and the Enforcement of Environmental Law: An Empirical Study of the 33/50 Program. (51) 2008 *The Journal of Law & Economics*, at 271–296.

[383] Reinhardt, F., Stavins, R., and Vietor, R., 'Corporate Social Responsibility through an Economic Lens', (2) 2008 *Review of Environmental Economics and Policy*, at 219–239.

[384] OECD (2003), *supra* note 371, at 16.

sanctions or penalties on non-compliance,[385] which may, however, cancel out the advantages around VEAs being voluntary. A possible solution might be to get a third party involved, e.g., an environmental NGO, to conduct verifications or investigations.[386]

Lastly, VEAs may be misused as a shield from regulations. A relief from regulation turns out to be one of the drivers for industry's participation,[387] for which a VEA will probably exclude other more effective instruments laid down in regulations. Particularly when the government commits not to induce new mandates as long as the private parties comply, a VEA could be a stumbling block for regulations-to-come.

6.5 Instrument mixes for GB

6.5.1 Command-and-control instruments meet liability rules

The CAC instruments and liability seem quite different at first blush, but they actually lie next to each other.[388] The CAC and liability may differ in terms of regulatory levels, deterrent or remedial effects, the extent to which the standard of conduct will be determined and the enforcement party. The CAC instruments usually fall into the realm of public law, and they tend to predetermine the standard of conduct, in which case governments play a central role in enforcement. By contrast, liability is taken as a part of private law and relies largely on the private parties to detect harm.

Despite the differences, the CAC and liability can be jointly used to make use of the advantages of one another. For instance, the CAC instrument can serve as the minimum standard in liability, in which case non-compliance with mandates can be taken as wrongfulness in tort law (e.g. the 'negligence' per se).[389] But this does not mean that compliance with mandates can free tortfeasors from liability in any case. Liability should be a useful complement to the CAC instruments because, on the one hand,

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[385] *Id.*, at 15,

[386] The idea is that companies may get into a VEA to brand themselves green, which will be appreciated by the public and some environmental groups. This has been one of the reasons why the French construction materials company Lafarge chose to be in partnership with WWF on greenhouse gas emission reductions. *Id.*, at 85.

[387] One of the main drivers of industry's participation in the U.S. Environmental Protection Agency's Project XL was relief from burdensome hazardous waste regulation. But such relief is available for some of the projects, and not granted in an all-round manner. For instance, in one of the XL projects regarding the hazardous waste treatment in the laboratories at universities, the participants are not seeking regulatory relief from compliance with RCRA in other areas beyond university laboratories. See the USEPA, 'Project XL- New England Universities Laboratories', available at https://archive.epa.gov/projectxl/web/html/index-66.html, last visited September 2016.

[388] Lukas (2007), *supra* note 235, at 458.

[389] *Id.*, at 455.

liability is more flexible in addressing an atypical case or environmental uncertainty.[390] On the other hand, liability makes it possible to apply higher standards of conduct than those laid down in mandates, being *ad hoc* in character; whereas mandates can only provide the minimum standards in deference to the proportionality rule, and can be out-of-date given the changing technologies.[391]

The 'CAC - liability' mix may also be used for GB compliance. For instance, most of the GB mandates may require the use of a specific type of new building material or an HVAC system, where it has little to say about indoor air quality. Those building materials are likely to release toxic substances that expose the end-users of buildings to health risks. It could be hard to foresee the synergic effects of those materials and technologies, and hence may take time for the government to make ex-ante regulations. In that case, product liability may compensate or deter harm caused by unregulated indoor pollutants.

Apart from tort liability, mandates can also lead to a higher standard of care for building professionals in a contract. The government may mandate that all the buildings should meet a certain standard of GHG emissions; otherwise owners of the buildings will get fined. In that case, it is likely that if building professionals do not build the project in its due way, the developers (owners)' can sue them for losses caused by the fines.

6.5.2 Regulations working with private GB standards

GB regulations may refer to private standards or industry-based certifications. In this way, governments can draw on expertise from the industry, so as to reduce the costs of standard-making. In the meantime, regulators can keep an eye on compliance, which may overcome the problems of under-enforcement and monitoring in self-regulation. For instance, regulators can define the obligations and accountabilities of stakeholders in regulations, so as to make self-regulatory agencies act in the public interest. By taking control over the entry into an industry (e.g. the licensing), governments can have those self-regulatory agents to compete with each other. Governments can create competition for the right to supply through bidding, where different self-regulatory agents are required to submit the proposed regulatory rules. Alternatively, governments can act as a proxy for consumers, in which case the

[390] *Id.*, at 458.
[391] *Id.*, at 464.

government will have the final say about the service supplier or the rules to be put into force.[392]

In GB promotion, governments may incorporate the industry-based GB standards (or certifications) into mandates.[393] In light of the ways in which regulation works with self-regulation, governments should consider whether or not they should provide those regulated with more choices of rating systems; and whether or not a fixed version of a rating system should be applied. If the regulation sets in stone a particular version of a rating system, it may not keep pace with the GB in the best available GB practices. If no fixed version of the rating system is required, building professional associations in charge of the rating system will be for the rule makers. In that case, the government is *de facto* delegating its regulatory power to the self-regulatory agencies. Traditional jurisprudence may challenge the delegation of the lawmaking power, on account of the constitutionality or due process requirement in legislation.[394] Those legal concerns may challenge the implementation of private standards, but that does not mean that the delegation cannot be justified. Regulatory tasks can still be delegated to industry associations when they are backed up with a certain degree of regulatory intervention and public participation.[395] One possible way to keep the delegation right in the path is to have private standards ratified by a 'tripartite committee,' in which the regulated make the rules, regulators approve, and public interest groups oversee.[396]

Moreover, building projects may last over a long period, in which case new standards can come into effect at the point when the projects are being built in line with old rules. The rule of law requires that law should be reasonably certain and known to the public. Nevertheless, in environmental governance, new legislation may sometimes be applied retrospectively, in order to deal with long-hanging environmental problems.[397] This could also be the case for GB compliance being life-

[392] See Section 5.3.
[393] See *infra* Chapter IV, Section 4.1.2.
[394] Those legal concerns can be seen in GB standard setting in the US. See *infra* Chapter IV, Section 4.1.2.

As public-private cooperation becomes popular, the implementation of private-written rules appears to be less blatant from a legal point of view. This can be seen through the judicial recognition of private-written rules. See Ayres and Braithwaite (1992), *supra* note 244, at 123.
[395] *Id*., at 158.
[396] *Id*.., at 159-161.
[397] For example, the U.S. Congress enacted the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) in 1980, in an attempt to clean up the leaking inactive or abandoned sites, namely the 'brownfields'. Under the CERCLA, a secured lender (the creditor) is likely to be held liable for land reclamation as an "owner or operator." Ever since its birth, the lender liability has been fleshed out in some judicial decisions, one of which ruled that CERCLA's response cost liability can as well be applied to the releases of hazardous substances occurring before

cycle. In GB practice, some regulators allow applicants to choose either version of the LEED system at the time the project is submitted to the authorities during the first several months of the release of a new version. The applicants need to pay fees for not complying with the newest standards.[398] In this way, it is possible to use new rules without causing unforeseeable losses to the developer.

6.5.3 Voluntary environmental agreements with financial incentives

VEAs can be used in conjunction with financial incentives provided by governments. As noted before, VEAs may be subject to free-ridership and under-enforcement. If the enforcement of VEAs relies on the state's coercive power, it will lose its voluntary character. On that account, combining VEAs with financial incentives can induce more industry parties into VEAs. In the meantime, regulators may less opposition from the industry[399]

In theory, the combination may also help to solve the problems around subsidies or tax reductions implemented in isolation. Limited by a VEA, subsidies would only be granted to parties engaged in the VEA, which makes it possible to limit the number of new subsidy appliers who pursue GB compliance to get perverse incentives. In that case, the subsidies may induce abatement at the individual level without increasing the total amount of emissions. Furthermore, if the subsidies are given based on performance standards at the individual level, parties in the VEA may be better incentivized to fulfill their obligations, instead of being a free-rider. Similarly, VEAs can in a way limit the application of tax reductions to a group of parties. In this way, governments will not face an enduring loss of revenues. In the meantime, by its voluntary feature, a VEA may feature more flexibility and less political opposition.

6.5.4 Self-policing

Self-policing can be seen as a mix of the CAC instruments and voluntary environmental information disclosure. The idea is to make firms

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CERCLA's enactment. In other words, the lender liability is retrospective. See United States v. Olin Corp., 107 F.3d 1506, 1513-14 (11th Cir. 1997), quoting Burke, R., 'Sailing in Safe Harbors: Recent Developments Regarding Lender Liability under CERCLA,' 16 (1999) *Pace Environmental Law Review*, at 149. More about the lender liability see *infra* Chapter IV, Section 4.3.4.

[398] Miller (2009), *supra* note 292, at 56-57.

[399] In environmental governance, VEAs with financial incentives have been available in practice. For instance, the British authorities invited companies to participate in an auction, thus voluntarily committing to absolute levels of emission reductions at progressively lower prices. Over the five years of the scheme, the participating companies have pledged to reduce their annual greenhouse gas emissions by more than four million tons of CO2. Also in the UK, Climate Change Levy and the Climate Change Agreements set a target for sectors, saying that if a sector fails to meet its overall target, they will lose the 80% tax discount for the next three years.

voluntarily disclose their harmful acts to the regulator, by which the regulator can get more information about individual behavior.[400] With private parties involved, self-policing may reduce the administrative cost of inspections.[401]

Then the question can be asked about what the incentives are for the regulated to seek self-policing. At first blush self-policing may not bring the regulated benefits; in some cases, the information disclosed will be used against the regulated themselves. Harrington has told us a paradox in environmental regulation, that compliance rate can still be high when sanctions are low, and violators barely get fined.[402] The Harrington paradox may not hold in every case, but it implies that there might be incentives other than sanctions for the regulated to comply. One of the incentives could be an abatement on penalty or a regulatory award.[403] Therefore, combining voluntary information disclosure with penalty abatement may provide incentives for self-policing of harmful acts. However, the benefits of self-policing may not be fully realized where "the reduction in penalties for parties who admit harmful behavior is often modest."[404]

Self-policing has been seen in environmental regulation, which can also have a place in GB promotion. Usually, regulators can tell whether or not a building is green through a GB rating system or an environmental impacts assessment. However, a major problem with the two methods is that they may not take into account the building's performance over the projected lifecycle.[405] In that case, governments need to pay more for

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[400] See Kaplow, L., and Shavell, S., 'Optimal Law Enforcement with Self-Reporting of Behavior', 102 (1994) *Journal of Political Economy*, at 583.

There might a difference between self-reporting and self-policing in a legal sense. Self-reporting usually refers to mandatory information disclosure required by regulators, for instance in the CERCLA, the failure to report the release of hazardous substances may result in fines or imprisonment. By contrast, in the case of self-policing, the regulated voluntarily expose their non-compliance to the authorities. See 42 U.S.C., Sec 9603 (b); Stafford, S., 'Does Self-Policing Help the Environment? EPA's Audit Policy and Hazardous Waste Compliance,' 6 (2006) *Vermont Journal of Environmental Law*, at 2-3.

[401] Kaplow and Shavell (1994), *supra* note 400, at 607.

[402] Harrington, W., 'Enforcement Leverage When Penalties are Restricted,' 37 (1988) *Journal of Public Economics*, at 29-30.

[403] There has been some empirical evidence that confirms the Harrington Paradox. For instance, firms with a good compliance record can get expedited permits, which seems to be an administrative incentive for compliance. Decker, C. S., 'Corporate Environmentalism and Environmental Statutory Permitting', (46) 2003 *The Journal of Law and Economics*, at 126.

[404] Kaplow and Shavell (1994), *supra* note 400, at 609. There has been evidence showing that jurisdictions that grant privilege to audit documents but do not provide immunity for violations disclosed as a result of the audit, have a lower probability of inspections, and vice versa. See Stafford (2005), *supra* note 400, at 4.

[405] Denzer, A. S., and Hedges, K. E., 'The Limitations of LEED: A Case Study,' 6 (2011) *Journal of Green Building*, pp. 25-33.

follow-up oversight, in which case self-policing may help to reduce the information costs.

To put in place self-policing for GB, governments need to specify the conditions in which violators are eligible to get a penalty abatement. Those conditions may vary with different institutional arrangements, but in general, they should make clear the following points:

(i) Disclosure should be voluntary, which means that the disclosure has not been a regulatory obligation;

(ii) Types of acts or harm that can be taken as violations;

(iii) The timing of disclosure, requiring that the regulated should report their non-compliance shortly after the harm occurs (a 'prompt disclosure'), or before an inspection (or examination) is conducted;

(iv) Measures to prevent re-offences;

(v) Exceptions, based on which a penalty abatement might be rejected when the non-compliance is likely to cause severe or irreversible harm to the environment or human health.

7. A remark: instrument mixes make sense, but need to be smart

GB has environmental benefits, yet the level of GB activities may not be enough due to the challenges facing GB. Those challenges can be a result of the three sources of a novel change: knowledge, demographics, and the institutional framework in which the rules and the players of GB co-evolve. Law as a part of the institutional arrangements helps to provide incentives, shape perceptions and preferences, integrate dispersed stakeholders & knowledge, and put checks on the use of power.

A wide range of legal and policy instruments are available for environmental governance, which can also be used to promote GB. Those instruments differ in their forms, time and enforcement parties. In this study, instruments for environmental governance are classified into CAC instruments (e.g., mandatory standards or licensing or planning), market-based instruments (e.g., subsidies or public procurement), and suasive instruments (e.g., voluntary environmental information disclosure).

Nevertheless, no instrument can be singled out as a perfect solution to all the challenges, given the failures around regulation, liability, and self-regulation. Therefore, GB promotion needs an instrument mix that may cancel out the problems of each (type) of the instruments.

An instrument mix can take different forms. It could be a mix of the CAC instruments and the liability or a mix of the CAC and voluntary

information disclosure. Both allow regulators to make use of private information to spot non-compliance. Also, GB regulations can get involved in the industry-based GB certifications, in ways that regulation and self-regulation can make use of each other's advantages. In addition, regulators can make use of suasive instruments, as persuasion and information can be cheap, but also effective to encourage private enforcement and voluntary compliance.

It should be noted that instrument mixes do not guarantee desirable outcomes, as they may work with different institutional arrangements. It remains to be seen whether or not the instrument mix has been available in GB practice, and how those instruments work together in different settings. The following chapters on GB in the US and China will further look into what is going on in reality.

Chapter IV GB compliance in the United States of America (US)

The number of GBs in the US has increased as of 2008, which hints that the US GB movement is not just a fad.[406] The US GB movement appears to be incremental over time. In early times, most of the GBs were loosely-knit projects, by which building professionals were able to stock GB knowledge and created industry-based standards. Those standards not only told different stakeholders how to build a GB but also showcased the environmental benefits of a GB. As GB became better known, GB compliance became part of the US government agenda, in response to the rising environmental concerns in the building sector. The US government began to mandate, incentivize, or nudge GB compliance through laws and policies, whereby GBs not only survived but also thrived.

Despite the growth, there are still challenges that may weigh down the GB movement, which can boil down to a matter of preferences and incentives. As noted in the theory, law as part of the institutional framework can provide incentives and steer preferences. Along the theoretical line, a question can be asked how the US law in its current form promotes GB compliance, whether or not instrument mixes have been present in the US law, and what (type of) instruments may work better for GB.

This chapter presents the US GB law and the instruments (mixes) used. The chapter proceeds as four sections. Before mapping out the legal framework on GB compliance, Section 1 briefly looks into the course of the GB movement in the US, to see what the GB movement has gone through and what makes the GB movement happen. As GB is mainly for the environment, Section 2 maps out the US environmental law system in a nutshell, explaining how the US law takes shape and how different players can influence the making of law. Section 3 sketches out the legal framework for GB in the US, investigating the most relevant laws applicable to GB compliance at the federal, state and local level. Section 4 delves into the instruments that have been used by the U.S. law, to see how the different instruments work in isolation or together.

1. The US GB movement

The US GB movement appears to be an incremental change happening to the building industry.[407] GBs sprouted up in the 1970s as a response to the

[406] Dodge Data & Analytic (2016), *supra* note 6, at 35
[407] Kibert, C. J., 'Green Buildings: An Overview of Progress,' 19 (2004) *Land Use and Environmental Law*, at 492.

energy crisis back then. In the 1990s, the GB movement progressed by virtue of the creation of industry-based standards and policies for building energy efficiency. In the 2000s, the number of GBs increased as a result of market demands and environmental regulations.

There are also challenges facing GB in the US. The higher first cost and split incentives appear to top the challenge list. Concerns about public awareness, the lack of professionals and the availability of GB products and technologies, matter less in the way of GB compliance in the US than they do globally.

Section 1 gives a brief look at the US GB evolution. It can be seen from the history that, first, in early times GB owed its survival to informal rules in the US, prominently the LEED system. Second, the GB movement thrives as the country's environmental law evolves. Third, both private and public parties play a role in GB, in which case individuals, the US government, professional associations, and public interests groups, all to some extent influenced the GB movement. By and large, GB in the US evolves the way in which a novel change happens, as pictured in the theory chapter.

1.1 GB milestones

1.1.1 1970 – 1989: the first move on building energy efficiency

The idea of GB came up as a result of the energy crisis back to the 1970s. A reorganization of the US government took place to coordinate federal energy policies and programs. The Federal Energy Administration was established in 1974 to ensure the national energy targets would be met in the foreseeable future.[408] Established in 1977, the US Department of Energy (USDOE) formulated a comprehensive national energy plan for most of the federal energy programs. Those programs all in a way deal with the production, conservation, and allocation of all forms of energy. The federal efforts in energy use, e.g., providing tax credits or funding for renewable energy technologies, also led homeowners to install solar energy panels.[409]

Correspondingly, GB at that point focused more on building energy efficiency. However, the US GB movement seemed to slow down as the energy crisis fell out of the top public concerns.[410] The Reagan

[408] See Federal Energy Administration Act of 1974, Pub.L. No. 93-275, 88 STAT. H.R. 11793 (93rd), sec. 3.
[409] Kubasek, N. K., and Silverman, G. S., *Environmental Law, 8th Edition* (Pearson Education, Inc., 2014), at 312.
[410] *Id*., at 313.

administration even tried to shut down the USDOE and put out some of the energy efficiency programs.[411] By the end of the 1980s, building developers seemed to lose interest in energy-efficient homes due to low demands for GB.

1.1.2 1990-1999: the federal leadership in GB

The 1990s saw a GB growth. In the early 1990s, the US GB movement started with the "Greening of the White House" as the first public GB.[412] The U.S. Post Office, the Pentagon, the USDOE, and the US Government Services Administration (USGSA), all made moves to improve the environmental performance in their buildings. The National Park Service also opened green facilities at several national parks, including the Grand Canyon, Yellowstone, and Denali. At the local level, GB began to spring up ever since the city of Austin in Texas launched a GB program.[413] Local residential GBs grew in cities like Denver, Colorado; Kitsap County, Washington; Clark County, Washington; and the Baltimore Suburban Builders Association. At that time, most of the GB projects were not built in line with the LEED standards, which were not present until 1998.

Shortly after the 'Greening the White House' project, the US government laws and policies for a wider uptake of GB. The U.S. Environmental Protection Agency (USEPA) introduced the Energy Star as a voluntary labeling program, part of which provided building owners with guidance on energy efficiency since 1992.[414] In 1996, the USDOE signed a memorandum of understanding with the American Institute of Architects (AIA). The USDOE and the AIA worked together to develop GB technologies and set GB targets for the coming 21s.

Apart from the federal administration, the executive branch also helped GB with a set of executive orders (EOs). EO 12852 established the

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[411] See Howell Raines, 'Reagan Adopts Plan to End Energy Dept. and Shift its Duties', article on the New York Times, published on December 17, 1981, available at http://www.nytimes.com/1981/12/17/us/reagan-adopts-plan-to-end-energy-dept-and-shift-its-duties.html, last visited February 2017.

[412] The "Greening of the White House," is the first highly publicized green building project in the US. It started in 1993 and included a renovation of the Old Executive Office Building, the 600,000-square-foot structure across from the White House. The project involved a wide range of building professionals and environmentalists, and brought remarkable environmental benefits, including energy cost savings (about $300,000 per year), emissions reductions (845 tons of carbon per year), and reductions in water and solid waste associated costs. For more information see 'Greening of the White House,' available at https://clinton5.nara.gov/WH/html/tips.html#formats, last visited February 2017.

[413] Kibert (2004), *supra* note 407, at 497.

[414] For more information see Energy Star, 'Green Buildings and Energy Star', available at https://www.energystar.gov/buildings/about-us/how-can-we-help-you/energy-star-action/green-buildings-and-energy-star, last visited February 2017.

President's Council on Sustainable Development, which put forward more than a hundred actions to improve the country's environment in 1999, including those related to building sustainability.[415] EO 13101 was signed into law by President Clinton, in which the Federal government was required to use recycled building products.[416] EO 13123 likewise encouraged government agencies to enhance building energy efficiency and reduce emissions.[417]

Meanwhile in the building industry, building professionals also began to pursue environmental sustainability. The US Green Building Council (USGBC) is one of the most influential professional associations in the GB movement.[418] In 1993, Rick Fedrizzi, David Gottfried, and Mike Italiano established the USGBC as an attempt to pursue sustainability in the building industry. Shortly thereafter, the USGBC created the LEED as one of the most commonly-used GB rating systems worldwide.[419] Apart from standard making, the USGBC also took its responsibilities seriously for raising awareness, developing skills and capacity, delivering policies and making building green a lucrative business.[420]

In addition to the USGBC, other organizations also contribute to building sustainability. For instance, the American Institute of Architects (AIA) established its Committee on the Environment in 1990, which "reflects the profession's commitment to providing a healthy and safe environments for people and is dedicated to preserving the earth's capability of sustaining a shared high quality of life."[421]

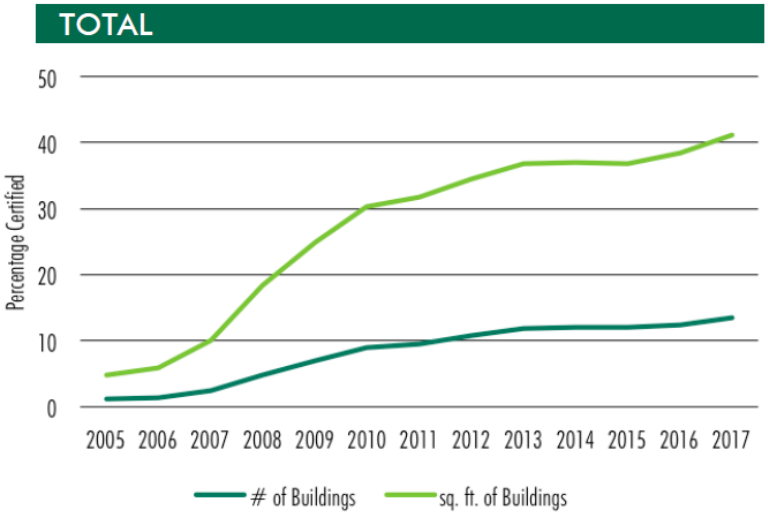
1.1.3 The 21st century: growth continues, challenges remain

For the time being the US GB movement is still alive.[422] In 2006, The SmartMarket Report found that "the US construction market in all sectors has entered the GB market in force and is expected to account for five to

[415] Exec. Order No. 12852(1999), amended by Exec. Order No. 13114, 64 Federal Register, at 10099.
[416] Exec. Order No. 13101(1998), 63 Federal Register, at 49643-49651.
[417] Exec. Order No. 13123(1999), 64 Federal Register, at 30851-30860.
[418] Building Design + Construction (BD+C), "A report on the Green Building Movement', BD+C White Paper on Sustainability, 23 November 2003, pp.6-7. Full text available at https://archive.epa.gov/greenbuilding/web/pdf/bdcwhitepaperr2.pdf, last visited February 2017.
[419] See USGBC, 'History,' available at http://www.usgbc.org/about, last visited February 2017.
[420] World Green Building Council (WGBC), WorldGBC Annual Report 2015/2016, 6 December 2016, at 6-7. Full text available at http://www.worldgbc.org/news-media/worldgbc-annual-report-20152016, last visited February 2017.
[421] See AIA, 'COTE Mission,' available at https://network.aia.org/committeeontheenvironment/home/new-item2, last visited February 2017.
[422] Building Design + Construction, 'Green Buildings and the Bottom Line,' BD+C Annual Report on the GB Movement November 2006, at 1. Full text available at http://www.lafarge-na.com/BD&C%20White%20Paper%2006.pdf, last visited February 2017.

ten percent of all new construction starts in the year 2010."[423] Even in the face of a downturn and in time of transition for the US economy, the number of GBs still increased between 2008 and 2011.[424] To date, "a strong shift to green is still evident in the US,"[425]The Green Building Adoption Index, developed by the CBRE and Maastricht University, has been tracking the adoption of green building certifications in the US as of 2014. Over the past decade, GB has seen a significant increase across the US. The 2014 index indicated that, by the end of 2013, 13.2% of the commercial building stock had an Energy Star label, LEED certification, or both, compared to 1.5% at the end of 2005.[426] The 2018 Green Building Adoption Index shows that across the 30 largest U.S. office markets, more than 41% of commercial space in those markets, has now been certified as "green," the highest total in the index' history.[427]

Figure 1 Percentage of GB in the 30 largest U.S. office markets



(Source: CBRE 2018)

[423] McGraw-Hill Construction, 'Commercial and Institutional Green Building: Green Trends Driving Market Changes,' SmarktMarket Report, published in 2008, at 2. Full text available at: http://mts.sustainableproducts.com/Capital_Markets_Partnership/BusinessCase/MHC%20Commercial%20%26%20Institutional%20Green%20Building%20SMR%20(2008).pdf.
[424] *Ibid.*
[425] Dodge Data & Analytic (2016), *supra* note 6, at 35.
[426] CBRE, 'U.S. Green Building Adoption Index 2014', at 3. Full text available at https://www.cbre.com/-/media/files/corporate%20responsibility/green-building-adoption-index-2014.pdf?la=en, last visited April 2019.
[427] CBRE, 'U.S. Green Building Adoption Index 2018', at 3. Full text available at https://cbre.ent.box.com/s/5yj9vdpks4qhmhgjq7kbiiou5o99xp2b, last visited April 2019.

GB in the US may continue to grow, but at a lower rate than before. In the latest GB SmartMarket report 2018, nearly 60% of respondents from the US show that they will be doing their projects green to some extent, of which 32% report that they will make the majority of their projects green.[428] Based on the projection, it might be safe to say the growth of GB will go on and across different sectors. Sectors with expected growth selected by the respondents include new institutional buildings (selected by 45%), retrofits of existing buildings (selected by 50%), new commercial buildings (selected by 45%), and green low-rise residential projects (selected by 21%).[429]

There are various triggers for GB activities. Some of the triggers matter all the time, while some may differ in their significance over time. By far, client demands remain the most crucial trigger driving the US GB market,[430] which implies that homeowners may play a critical role to stimulate the GB market. Market demands and a lower operating cost are second to client demands as the most important triggers over time.[431] The right-thing-to-do reason to build green has been increasingly important from the year 2013 to 2018.[432] The same goes with environmental regulations, which have become a major driver for GB as of 2013.

Internal corporate commitment used to be the second important trigger, as corporates are major owners of buildings in the US and the corporates view that going green would not clash with their profitability.[433] However, this trigger appears to pale to insignificance in recent years, as shown in the SmartMarket report 2016.[434] In the latest report 2018, healthier buildings, the right thing to do and lower operating costs become the rest of the main triggers of GB in the US.[435]

There are also challenges slowing down the GB movement in the US. The higher first cost remains the top challenge in the recent decade.[436] Affordability associated with a perceived higher cost of GB is coming into the picture as one of the barriers.[437] The split incentives problem is also present, in which case the operation cost reductions of GB may not always

[428] Dodge Data & Analytic (2018), *supra* note 40, at 62.
[429] *Id*., at 63.
[430] McGraw-Hill Construction (2013), *supra* note 6, at 41; Dodge Data & Analytic (2016), *supra* note 6, at 36; Dodge Data & Analytic (2018), *supra* note 40, at 63.
[431] *Ibid.*
[432] *Ibid.*
[433]McGraw-Hill Construction (2013), *supra* note 6, at 41.
[434] Dodge Data & Analytic (2016), *supra* note 6, at 36.
[435] Dodge Data & Analytic (2018), *supra* note 40, at 63.
[436] McGraw-Hill Construction (2013), *supra* note 6, at 41; Dodge Data & Analytic (2016), *supra* note 6, at.36.
[437] Dodge Data & Analytic (2018), *supra* note 40, at 64.

offset the fixed costs at the outset.[438] The split incentive problem gets worse with an average long payback period of 6-8 years.[439] By contrast, a lack of public awareness and professionals, as well as the availability of GB products and technologies concerns weigh less as challenges facing the US GB promotion.[440] The reason can be that the US GB market appears to be more developed than those in other countries, whereby the increasing knowledge and awareness of GB have taken shape over the long term.

1.2 GB in early times owed its survival to the industry

GB in the US was based on self-regulation in early times. This somewhat corresponds to the theoretical point that, as part of the institutional matrix, informal rules (e.g., professional conventions and self-imposed standards) can play a role to make a novel change happen.[441] The US Green Building Council (USGBC) created one of the most important industry-based standards, the LEED system, which helped to increases the stock of knowledge about building green. Building professionals by their experiences and knowledge from GB projects created the earliest version of the LEED system. Updated continuously, the LEED system became better categorized and easier to understand.

The LEED certification led to competition and comparison in the real estate market and hence made GB also popular in the commercial world.[442] Buildings with the LEED Silver, Gold or Platinum certificates may on the different levels be environmentally superior to those without certificates. In that case, the LEED certification may create a marketing distinction for the certified projects. It is likely that more property owners will consider the LEED standards as they do not want to lose the competitive edge.

Though the LEED system is industry-based, it also works well for government agencies and makes governments better aware of GB.[443] Also, the LEED helps the US governments to define what qualifies as a GB, in which case the LEED system to some degree lays the foundation for regulations on GB compliance.

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[438] *Ibid.*
[439] *Id.*, at 64.
[440] Dodge Data & Analytic (2016), *supra* note 6, at 37.
[441] See Chapter III, Section 2.3.
[442] *Ibid.*
[443] It is reported that in the early adoption of GB, the US federal, state and local government buildings made up half the LEED registry. See BD+C (2003), *supra* note 422, at 8.

1.3 GB thrived as the US environmental law evolved; laws and policies drive GB

The establishment of the US Environmental Protection Agency (USEPA) and the passage of the National Environmental Policy Act (NEPA) led the US towards environmental protection. It was during this decade that environmental concerns about buildings were put on the government's agenda. The 1980s saw a decline in environmental regulation in the US.[444] Concurrently, the GB movement cooled down in the late 1980s.

Given the recession, environmental governance in the US somewhat tipped the balance from the end-of-pipe regulation to the use of more preventive and cost-effective regulatory tools.445 It was at this point that the USEPA put in place the Energy Star label, which is still working to promote building energy efficiency. In the late 1990s, the three important executives for GB, namely EO 12852, EO 13101, and EO 13123, came into effect. However, some of the pro-environment executive orders were signed by the Clinton administration not long before Clinton stepped down as the president.

At the beginning of the 21st century, the US environmental movement was challenged by the federal law. [446] Given the hardship at the federal level, environmental protection began to rely more on the states and localities in the mid-2000s.[447] A similar shift can also be seen in the GB movement, where the state and local governments began to play a more active role than their federal counterparts.[448]

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[444] By 1980, the country's economy was not in good shape, and correspondingly, environmental regulation was reduced due to the high costs. By the time President Reagan was elected with his 'deregulation' philosophy, the EPA was headed by officials coming from businesses and firms. The Reagan administration also cut down the EPA's budget by more than 1/3, which led to the under-enforcement of environmental regulations. Vig, N., 'Presidential leadership and the environment: from Reagan and Bush to Clinton, in Norman Vig, N., and Kraft, M. (eds.), *Environmental Policy in the 1990s: Toward a New Agenda* (Congressional Quarterly, 1990), at 86-117.

[445] Kubasek and Silverman (2014), *supra* note 409, at 128.

[446] Citizen's standing to sue in environmental litigations had ever been denied on the different levels. For instance, the court denied a citizen group's standing to enforce the Clean Water Act, because the group failed to prove that the water bodies at stake were affected by pollution from the regulated activity. See Texas Independent Producers & Royalty Owners Association v. EPA (410 F.3d 964 7th Cir. 2005); In another case, the court held that the plaintiff did not have the standing to challenge EPA's approval of a state's Clean Air Act Title V program, since it failed to show that it or its members would suffer an 'injury in fact' as a result. See Legal Environmental Assistance Foundation, Inc. v. U.S.EPA (400 F. 3d 1278, 1281 11th Cir. 2005); Elsewhere, the court held the plaintiff lacks associational standing to bring a NEPA claim because its purposes are economical and not environmental. See Ranchers-Cattlemen Action Legal Fund United Stockgrowers of America v. U.S. Department of Agriculture (415 F.3d 1078, 1103-05, 2005 WL 1731761, 9th Cir. 2005)

[447] Kubasek and Silverman (2014), *supra* note 409, at 134

[448] See Section 3.2.

Building energy efficiency was a centerpiece of the Obama administration's energy policy. The American Recovery and Reinvestment Act 2009 (ARRA) was supported by the Obama administration and has provided billions of dollars for building energy efficiency programs. In the same year, the Obama administration signed EO 13514 that set targets for energy performance in the federal agencies. With the support of those environmental laws and policies, the number of GBs has increased as of 2009.[449]

Apart from the historical track, some industry reports and academic studies also confirm that the impact of laws and policies on GB. Environmental regulation was not one of the significant triggers in the 2013 SmartMarket report on GB market, yet it became a top trigger of GB activities in the SmartMarket Report 2016 and the latest SmartMarket report 2018.[450] The CBRE likewise suggested in its 2014 report that GB grew partly because of governmental policy, as over the period several cities and the state of California, have enacted legislation requiring various degrees of energy benchmarking.[451] Choi (2010) shows that municipal regulatory policies have been a powerful tool to promote green office building designations as expected, but incentive-based policies have not been effective except for administrative incentives. [452]

1.4 Both private and public parties play a part in GB

In the very beginning, the US GB movement evolved as a result of the knowledge and experiences of professionals.[453] The loosely-knit GB projects in the 1990s were barely built in line with any systematic rating system. However, building professionals accumulated knowledge from those projects, which contributed to the making of the LEED standard. The idea to build a GB professional association did not come up until David Gottfried, a real estate developer, and Michael Italiano, an environmental lawyer, met each other. Over the next few years, Gottfried and Italiano organized meetings with people interested in GB promotion, including Robert Berkebile, chair of the AIA Committee on the

[449] McGraw-Hill Construction (2013), *supra* note 6, at 40.
[450] Dodge Data & Analytic (2016), *supra* note 6, at 36; Dodge Data & Analytic (2018), *supra* note 40, at 63.
[451] CBRE (2018), *supra* note 427, at 5.
[452] Using American central cities as the unit of analysis, Choi (2010) conducted OLS regression analyses. In the regression models, the municipal regulatory policies, the municipal administrative incentive, the municipal financial incentive, and the municipal technical support were coded as four distinct dummy variables. The model controlled for the effects of various external factors driven by the literature review. Choi, E., 'Green on Buildings: The Effect of Municipal Policy on Green Building Designations in America's Central Cities,' 2 (2010) *The Journal of Sustainable Real Estate*, at 18.
[453] Hirokawa (2012), *supra* note 45, at 522.

Environment, and some officials from the USDOE.[454] In 1993, the USGBC was established by those professionals, who also created the LEED system.

In the next few decades, the GB movement went upward by the efforts from both public and private organizations. Individual activities might not be influential enough to boost the GB industry as a whole. GB thrives as the US government, professional associations and public interest groups all made moves towards GB. The US governments made their own buildings green on the one hand. On the other hand, the federal environmental regulators, prominently the USEPA and the USDOE, tried to phase in regulations for GB compliance. Those environmental regulations became one of the triggers of GB activities, as indicated in the SmartMarket report.[455] The USGBC as an industry association made the LEED system and continuously updated the standards in light of the frontier GB technologies. The USGBC also makes available education programs to train building professionals on GB techniques.

The public and private players also cooperate in some circumstances. For instance, the AIA established the COTE with funding from the USEPA. The USDOE signed a memorandum of understanding with the AIA to work on the research and development of GB technologies jointly.

Nevertheless, the situation might sometimes become confrontational among the different players, particularly when some interest groups get involved. The USGBC in its infancy did not allow any trade associations to join, lest those trade associations as strong lobbies would take over the USGBC and water down the GB standards.[456] The USGBC had a meeting with environmental groups, seeking help from them to oppose the membership of the trade associations.[457]

As with the USGBC, the US government also needs to deal with different interest groups a green movement. In 1993, The Clinton Administration published the *Climate Change Action Plan*, which provided subsidies and voluntary programs for energy-efficient technologies.[458] However, some environmental groups were not happy with the Action Plan, viewing it as

[454] BD+C (2003), *supra* note 422, at 9-10.
[455] Dodge Data & Analytic (2016), *supra* note 6, at 36.
[456] BD+C (2003), *supra* note 422, at 8. Now trade associations are no longer excluded given the USGBC's current lineup of membership.
[457] *Ibid.*
[458] Lippman, T. W., "Energy Tax Proposal Has 'Green' Tint: Environmentalists Back Plan They Helped to Draft," Washington Post, 2 March 1993. Available at: https://www.washingtonpost.com/archive/business/1993/03/02/energy-tax-proposal-has-green-tint/a638b16b-45d8-4473-bc91-4cad55da6538/?utm_term=.b4a5ba1e920e, last visited February 2017.

"no prospect of hammers or sticks to bring us into compliance if those do not work."[459] Besides, the Clinton' administration also proposed to tax non-renewable energy. The proposal gave rise to a political backlash from lobbies standing for the National Association of Manufacturers, the US Chamber of Commerce, and the American Petroleum Institute. Consequently, the Clinton administration withdrew the proposal.[460]

2. The US legal system in a nutshell

As GB compliance is mainly for environmental governance,[461] it is necessary to have a brief look at the source of the US law. Deeply influenced by John Locke's philosophy, the US federal machinery consists of a legislative branch that makes the statutory law, an administrative branch that enforces the law, and a judicial branch that interprets the law.[462] But legislation is not the only source of law. In exercise of their authority enshrined in the Constitution, the administrative branch can make regulations, and the judicial branch makes case law. Both can be a source of the US law.[463]

Statutory laws take shape through a legislative process, where "all legislative powers granted shall be vested in a US Congress that consists of a Senate and House of Representatives."[464] The legislative process at the federal level is similar to that at the state or local level. Statutory environmental law is primarily federal since environmental problems are often cross-border and thus call for nationwide initiatives.[465]

At the federal level, it takes some steps for a bill to become law through a legislative process.[466] First of all, a bill will be delivered to the House or the Senate by a member.[467] The bill is likely to be drafted by a lobbyist, where environmental groups and business groups may compete with each other. [468] Once introduced, the bill will be submitted to a subcommittee of the House or the Senate that is entitled to give hearings on the forwarded

[459] Lyon and Maxwell (2003), *supra* note 267, at 1457-1458.
[460] David E. Rosenbaum, 'Clinton Backs Off Plan for New Tax on Heat in Fuels,' The New York Times, June 9, 1993, available at http://www.nytimes.com/1993/06/09/us/clinton-backs-off-plan-for-new-tax-on-heat-in-fuels.html?pagewanted=all, last visited February 2017.
[461] Environmental law in the US is primarily taken as part of the administrative law. In this study, environmental law broadly refers to any law that works for environmental governance, e.g., legislation for energy efficiency, regulations of wastes disposal, or the liability rules in environmental torts.
[462] US Constitution, Article I, II and III.
[463] US Constitution, Article I, Section 2 & 3.
[464] US Constitution, Article I, Section 1.
[465] Kubasek and Silverman (2014), *supra* note 409, at 7.
[466] US Constitution, Article 1, Section 7.
[467] *Ibid.*
[468] Kubasek and Silverman (2014), *supra* note 409, at 7-8.

bill.[469] For instance, a bill giving subsidies for the use of clean energy will be delivered to the House Committee on Energy and Commerce.[470] The proposed bill will then be reviewed and commented on by different stakeholders, in which case lobbies can be active in the testimony.[471] After the hearings, the subcommittee will forward the bill to the full committee of the House or the Senate for a vote. In order to get passed, the bill might be amended at this stage.[472] By the time the House and the Senate pass the bill, different versions of the proposed bill will enter a Senate-House Conference Committee, which will integrate the different versions into a single bill for the full House and the Senate to vote. If passed, the bill then will be sent to the US president, who may choose either to sign or not to sign the bill. If the president signs the bill, it becomes law; if not, the bill still has a chance to become law as long as two-thirds of the Senate and the House vote to overturn the decision made by the president.[473] Since Congress is in charge of making environmental laws, it is crucial for those who want pro-environment laws to keep an eye on the voting records of their congressional representatives.

The judicial branch makes interpretations and precedents, which are also a source of US law.[474] The federal courts and most of the state courts are responsible for the interpretation of the US Constitution and statutes case-by-case.[475] The cases interpreting laws will be shelved into volumes of reports, which shape the federal or state case laws. The court interprets laws with different methods. Usually, the court may first look into the plain wording of statutes, meaning that they will explain the statutes as what they literally appear to be. Sometimes the Congress may make the wording of statutes vague and leave room for judicial interpretations. In that case, the court will further look up the intent of the legislature in hearing records.[476] In the case of precedents, a common law doctrine pinned down in former cases can be applied to the similar cases ruled later *('stare decisis')*.[477] The precedents are legally binding only on courts at a lower level within the same system.[478] Neither is the *stare decisis* rule that easy to use. Even if lawyers could claim the similarities between the precedent and the case at stake, the courts are allowed to ignore or overrule

[469] *Ibid.*
[470] US Constitution, Article I, Section 7.
[471] Kubasek and Silverman (2014), at 8-9.
[472] *Ibid.*
[473] US Constitution, Article I, Section 7.
[474] US Constitution, Article III
[475] Kubasek and Silverman (2014), *supra* note 409, at 13.
[476] *Id.*, at 9.
[477] *Id.*, at10.
[478] *Ibid.*

the precedent referred. Such overruling can be reasoned by quoting precedents with conflicting arguments, or by saying that the premises on which the precedent works have been significantly changed.[479]

The executive and administrative agencies also act as lawmakers. The executive branch consists of the president, the president's staff, and the cabinet.[480] They have the power to choose to enter a treaty that supersedes any federal law; to issue executive orders that may be undone by the next president; to sign statements to revise the laws passed by Congress.[481] Administrative agencies are delegated by the US Congress to make laws and regulations in specific areas, as is the case for the US Environmental Protection Agency (USEPA). Environmental laws and regulations in the US are mostly administrative law; hence the USEPA and other administrative agencies are at the heart of environmental lawmaking and hence will probably become promoters of GB.[482]

Separation of powers can be seen among the three branches, based on which the US federal system can put checks and balances on power. The legislature itself makes laws meanwhile delegating to the administrative agencies the power to make rules for specific regulatory matters. The legislative body can amend the law to overturn judicial interpretations.

Sometimes the law passed by the legislature can be changed or watered down by the other two branches. On the one hand, apart from the right to veto, the U.S. president can sign statements to "revise, interpret, or disregard legislative measures on national security or constitutional grounds."[483] On the other hand, the judicial review gives the court the power to check whether or not the existing statutes are in harmony with the Constitution, whereby the judicial branch can restrict the legislative and executive activities. [484]

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[479] Moschzisker, R. 'Stare Decisis in Courts of Last Resort,' 37 (1924) *Harvard Law Review*, at 414-415.

[480] US Constitution, Article II.

[481] *Ibid.*

[482] Kubasek and Silverman (2014), *supra* note 409, at 12-13.

[483] During his incumbency, President George W. Bush issued 800 statements, which watered down the laws passed by Congress; some other presidents may not use this power that often, for instance, during his first term in office, President Obama used signing statements 17 times to stop the unconstitutional statutes from enforcement. See Kubasek and Silverman (2014), *supra* note 409, at 12.

[484] The judicial review is not explicitly written in the constitution; instead, it was established in the landmark case Marbury v. Madison, where the Supreme Court makes itself the final arbiter to determine whether or not a statute is constitutionally valid. See *Marbury v. Madison*, 5 U.S. 137 (1803).

3. Review of existing GB laws

At the federal level, there has not been a single piece of law made for GB compliance as a whole. Instead, rules concerning GB compliance are dispersed in the US environmental law.[485] Legislation and executive orders are the main sources of the federal GB law, a big part of which focuses on energy efficiency. Legislation mostly sets target standards for building energy efficiency at the federal level; only in a few cases, it brings up specification standards. Instead of mandating GB, federal legislation tends to use public procurement, funds, and information to integrate different stakeholders. Based on the US legal system, executive orders seem to be an easier way to encourage green. Legislation sometimes gets stuck in politics.

In response to the federal GB legislation, executive orders signed by the US presidents are the federal government leadership in GB. Those executive orders may require all the government buildings to comply with GB standards on a mandatory basis; by contrast, private projects are encouraged to be green voluntarily.

As GB means more than energy efficiency, GB compliance could also be subject to other federal laws applicable to each of the GB elements, e.g., the RCRA for construction and demolition waste disposal, the CERCLA for land use, the CAA for air quality and the CWA for groundwater use.

As opposed to the federal GB laws in a dispersed manner, states and localities are active in making legislation addressing GB as a whole.[486] GB legislation at the state and local level uses more performance standards that are often more stringent than those at the federal level. Instruments used at the state and local are more diverse and vary across jurisdictions with different settings.

This section maps out the legal framework for GB in the US. Section 3.1 deals with the federal laws applicable to GB compliance, including legislation and executive orders that are most relevant to GB compliance, as well as other federal legal provisions concerning the five elements of GB. Section 3.2 investigates GB laws at the state and local level. Since laws at the state and local level are tremendous, the section begins with some general observations on GB lawmaking at the state and local level,

[485] Circo, C. J., 'Using Mandates and Incentives to Promote Sustainable Construction and Green Building Projects in the Private Sector: A Call for More State Land Use Policy Initiatives', 112 (2008) *Penn State Law Review*, at 23.
[486] *Ibid.*

and then illustrate with the GB laws in California, Washington, New York State and Illinois.

3.1 Federal laws

3.1.1 Legislation

3.1.1.1 Energy Policy Act of 1992: setting standards

In 1992, Congress passed the Energy Policy Act of 1992 to improve building energy efficiency.[487] The Energy Policy Act 1992, on the one hand, established the federal building energy efficiency standards that include statements of the requirements, criteria, and evaluation methods to be used.[488] The Act did not lay out specification standards to determine the methods and technologies used to meet the standards. On the other hand, it required states to make energy standards for commercial buildings and reviewed their residential building codes regarding energy efficiency.[489]

The Act also led to the modification of the ASHRAE energy standards 90.1 made by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). The ASHRAE standards are updated every three years and have been incorporated into the LEED system to assess building performance on energy efficiency. Also, the Act gave rise to a new version of the Model Energy Code (MEC). Funded by the USDOE, the MEC was initially developed by a group of building organizations, which sets energy efficiency standard for both new and existing commercial and residential buildings. Some states have adopted the MEC in the light of the local settings. [490]

3.1.1.2 Energy Policy Act of 2005: tax credits

The Energy Policy Act of 2005 (EPA 2005) primarily provided tax reductions and loans for energy production.[491] With regard to building energy efficiency, the EPA 2005 provided owners of commercial or residential buildings with benefits to improve HVAC systems.[492] The improvements made would be measured based on the ASHRAE 90.1-2001 energy standards.[493] Apart from energy saving, the EPA 2005 also encouraged property owners to produce clean energy by on-site solar/wind

[487] 106 STAT. 2776, Public Law 102-486 (1992), 102d Congress (codified at 42 USC 13201).
[488] *Id.*, § 101.
[489] *Ibid.*
[490] A list of states adopted the MEC available at http://www.energycodes.gov/implement/state_codes/index.stm, last visited February 2017.
[491] Pub. L. No. 109-58, 119 Stat. 594 (2005) (codified as amended at 42 U.S.C. ch. 134 § 13201*et seq.).*
[492] *Id.*, §1331.
[493] *Ibid.*

electric generation, in which case public electric utilities were required to offer net metering at the request of customers.[494] In addition to the financial incentives, the EPA 2005 also set standards for energy efficiency in federal buildings.[495]

Though aiming for energy efficiency, the EPA 2005 seems to be less green, as it also provided subsidies for the oil and gas industries. Also, the EPA 2005 partly exempted oil and gas producers from requirements laid down in certain federal laws.[496] One of the reasons behind could be that the EPA 2005 took shape during the incumbency of President George W. Bush, who appointed officials that were barely advocates for the environment and renewable energy.

3.1.1.3 Energy Independence and Security Act of 2007: greening public buildings

The Energy Independence and Security Act of 2007 (EISA) was signed into law by President Bush.[497] Title IV of the Act lays out the requirements on energy efficiency in different types of buildings, with governmental buildings in focus. The EISA established the Office of Commercial High-Performance Green Buildings (OHPGB) in the US General Service Administration (USGSA), which was responsible for implementing the targets laid down in the EISA.[498] Those targets include: a) as of 2010, to reduce the fossil fuel use of all the newly-built or retrofitting buildings by 50%, compared to that in the year 2003; b) to lay out a zero-net energy initiative to ensure all commercial buildings have a zero use of net energy by 2050; c) to have the secretary of energy to opt for a GB certification for federal buildings;[499] d) to equip the federal agencies with Energy Star products for lighting by the end of 2013. The act also required the USDOE to set a standard on energy efficiency. The state governments would be

[494] *Id*., §1251. The idea was that customers who buy electricity from the grid could meanwhile generate their own electricity on-site by the solar panels that would send any excess electricity back to the grid. In doing so, the customers will get credits calculated on the amount of electricity they have returned. The tax credit availed in the EPAct 2005 expired in 2007, but it has been extended in the Energy Economic Stabilization Act (EESA) of 2008. See Pub.L. 110–343 (2008), 122 Stat. 3765

[495] EPAct 2005, *supra* note 491, § 109.

[496] For instance, the Act exempts companies drilling for natural gas from disclosing the chemicals involved in fracking operations that would normally be required by section 1421 of the Clean Water Act. Later the loophole is commonly dubbed as the Halliburton Loophole. See the EPAct 2005, *supra* note 491, § 322; Wiseman, H., 'Untested Waters: The Rise of Hydraulic Fracturing in Oil and Gas Production and the Need to Revisit Regulation,' 20 (2009) *Fordham Environmental Law Review*, pp. 115-195.

[497] Public Law No. 110-140 (2007), 121 Stat. 1492 (codified at 42 U.S.C.ch. 152 § 17001 et seq.)

[498] *Id*., sec. 436

[499] *Id*., sec. 433.

allowed to make their own standards if the USDOE failed to finalize the standards within two years.[500]

Title V of the EISA mainly put in place market-based instruments to encourage compliance with the standards/targets. For instance, it requires the federal government to use long-term energy savings performance contracts to meet the energy efficiency requirements and calculate energy savings.[501] In the meantime, Title V of the EISA launched the Energy and Environment Block Grant program as cashback for energy technology innovations, including but not limited to energy audits, building retrofits and Smart Growth planning and zoning.[502] The EISA also encourages the federal government to buy energy-efficient products, e.g., public procurements for alternative fuels with lower carbon emissions.[503]

3.1.1.4 American Recovery and Reinvestment Act of 2009: all about funding

President Barack Obama signed the American Recovery and Reinvestment Act of 2009 (ARRA) as a stimulus bill to recover the country's economy and bring back jobs. Of its objectives, the ARRA aims to promote renewable technologies, GBs and sustainable infrastructure.[504] The ARRA gives a considerable amount of money to some federal government agencies that may play a key role in pursuing energy efficiency, e.g., the Department of Energy (DOE) and the GSA (General Services Administration).[505] Other governmental agencies such as the Department of Defense and the Agriculture Department are also on the funding list.[506] The ARRA also provides money for the states to invest in energy efficiency and renewable energy programs, of which $250 million would be allocated to increase the energy efficiency of low-income housing.[507]

For GB compliance, the ARRA finances building energy efficiency in multiple ways. First, the ARRA establishes a fund with $5.5 billion for the maintenance of the federal public buildings, of which $ 4.5 will be given

[500] *Id*., Tit. III.
[501] *Id*., Tit. V, sec. 513.
[502] *Id*., Tit. V.
[503] *Ibid.*
[504] Public Law No. 111-5(2009), 123 Stat. 115 (codified as amended at 42 U.S.C.ch. 149 § 15801 et seq.)
[505] Authorized by the Act, the USDOE will receive $16.8 billion for energy efficiency programs that were initiated by the EISA 2007; the General Services Administration would get $5.55 billion to convert federal buildings into GBs; and the Department of Education would be provided with $9 billion to turn schools into LEED-certified buildings. See the ARRA (2009), *supra* note 504, tit.v.
[506] *Id.*, tit. III.
[507] *Ibid.*

to the GSA for its high-performance GBs.[508] Second, the ARRA supports the Energy Efficiency and Conservation Block Grant program with $3.1 billion for the State Energy Program, through which states setting energy efficiency targets can get financial aid conditionally. [509] Besides, the ARRA makes $5 billion available for the Weatherization Assistance Program, which was initiated by the Energy Conservation and Production Act of 1975. The point of the program is to render energy-efficient homes affordable for low-income homeowners.[510]

ARRA is an attempt to achieve sustainable growth. It goes beyond this study to tell whether or not it would live up to its sustainable goal over time, but initially, the ARRA does resonate with some GB initiatives created by other federal laws. For instance, it provides funds to the Energy Efficiency and Conservation Block Grant program initiated by the EISA 2007. Also, the ARRA provides more transparency, in the sense that it allows taxpayers to track where the money goes through a government website.[511]

The ARRA seemed to follow the Keynesian idea that public spending by the government can offset the decline in private spending when the economy is in bad shape. However, some economists criticized that the ARRA was not enough to fill the spending gap.[512] Moreover, too much government spending on the market may lead to a crowd-out effect on private investments, which was referred to in the Congressional Budget Office' report on the ARRA.[513]

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[508] *Ibid.*

[509] For instance, the state or local governments have to show that they have the power to publish building energy codes with standards no less stringent than those in the International Energy Conservation Code or equivalents. ARRA, sec. 410.

[510] Public Law No. 94-163, 89 Stat. 871(codified at 42 U.S.C.§6872)

[511] More information about the website is available at: http://www.recovery.gov/Pages/home.aspx, last visited February 2017.

[512] See 'Nobel Laureate Paul Krugman: Too Little Stimulus in Stimulus Plan,' available at http://knowledge.wharton.upenn.edu/article/nobel-laureate-paul-krugman-too-little-stimulus-in-stimulus-plan/, last visited February 2017.

[513] The report expects the legislation to reduce output slightly by increasing the nation's debt and crowding out private investment. For more information see the US Congressional Budget Office, 'Estimated Impact of the American Recovery and Reinvestment Act on Employment and Economic Output in 2014', USCBO report, February 2015, at 7. Full text available at https://www.cbo.gov/sites/default/files/114th-congress-2015-2016/reports/49958-ARRA.pdf,

3.1.1.5 Energy Efficiency Improvement Act of 2015: information and collaboration

On April 30, President Barack Obama signed into law the Energy Efficiency Improvement Act of 2015 (EEIA).[514] Title I of the EEIA deals with the energy efficiency of federal leased buildings, and a model for private green leasing. Under the EEIA, the Administrator of General Service, in consultancy with the Secretary of Energy, is obliged to develop model commercial leasing clauses addressing cost-effective measures on energy and water efficiency.[515] Those clauses will be used for leasing contracts in which the federal government is a party, and they are encouraged to be used in private leases as well.[516]

Title I also requires the USEPA, with the help of the USDOE, to carry out a voluntary program named 'Tenant Star' to enhance energy efficiency in separate spaces.[517] The Tenant Star program will follow the way in which the Energy Star works, whereby public agencies will recognize commercial buildings of high energy efficiency. Also, the USDOE is required to research the best practices to achieve high-performance buildings, measurement on energy efficiency, and impacts resulting from the use of GB techniques.[518] For the research, the USDOE will publish a notice in the Federal Register to collect public comments on those methods and practices.

According to Title III of the EEIA, the Secretary of Energy, in company with other relevant agencies, shall create or maintain a database to disclose building information to the public. For instance, the USDOE should make available the data provided by laws or programs at all levels, including information about building benchmarking and GB certifications, as well as information voluntarily disclosed by the owners of the buildings.[519]

The EEIA appears to work on collaboration and information. It has been noted before that the dispersion of stakeholders remains one of the biggest challenges facing GB compliance. The EEIA somewhat addresses this issue by coordinating different stakeholders and requiring information disclosure. The EEIA requires the government to use a green leasing model for building owners and tenants so that they can share benefits and

[514] Public Law No: 114-11 (2015).
[515] *Id*., sec. 102, (2) (A)
[516] *Ibid.*
[517] EEIA, *supra* note 514, sec 104. The term 'separate spaces' therein means areas within a commercial building that are leased or otherwise occupied by a tenant or other occupant for some time according to the terms of a written agreement. See the EEIA, sec.103, (a)
[518] *Id*., sec. 103.
[519] *Id*., sec 301 (c) (1).

costs and invest in GB technologies.[520] Elsewhere, coordination is also encouraged among different governmental agencies, primarily the USEPA, the USDOE, and the USGSA, to either conduct a study on GB compliance or to make the data "available to the public in aggregated form."[521]

3.1.2 Executive orders (EOs): federal leadership in GB

3.1.2.1 EO13123

Signed by President Clinton in 1999, EO13123[522] attempted to help improve energy management of the federal government as "the nation's largest energy consumer".[523] EO13123 required the federal government to purchase the Energy Star products or their equivalents.[524] In that case, the GSA and the Defense Logistics Agency (DLA), together with the DOE and the EPA, were obliged to draw a catalogue of the targeting products. Another way was to incorporate energy efficiency standards in line with Energy Star or its equivalents into project specifications for construction or renovation.[525] Besides, in green leasing, government agencies were required to include a preference for buildings with Energy Star labels in their selection criteria.

Apart from public procurement, EO13123 required the DOE and the Office of Management and Budget (OMB) to review and report available financing agreements with the private sector, so as to lower the higher first cost of GB performance.[526] Suasive instruments were also brought up in EO13123, which encouraged government agencies to guide energy efficiency measurement on the one hand, and to develop outreach training programs for energy users on the other hand. For those who performed better in energy management, the Deputy Director for Management of OMB would grant them the Annual Presidential Award for energy efficiency. [527]

EO13123 shows the federal leadership in building energy efficiency. EO 13123 tended to mandate the federal government buildings in the first place, using standards with a certain degree of specification. By contrast,

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[520] *Id.*, sec. 102, (2) (A)
[521] *Id.*, sec. 104 (a)
[522] Exec. Order No. 13123 (1999), 'Greening the Government Through Efficient Energy,' revoked by EO 13693.
[523] EO 13123 Sec 101
[524] If the ENERGY STAR labels are not yet available for some products, agencies shall choose products that are in the upper 25 percent of energy efficiency as designated by FEMP. See E.O. 13123 sec 403.
[525] *Id.*, sec 403 (3)
[526] *Id.*, sec 403 (4)
[527] *Id.*, sec 306 (2); sec 404 (d) (3)

instruments other than the CAC ones were used to promote energy efficiency in the private sector. For instance, to use a financing agreement as a solution to the first cost problem, or to put in place informational programs to nudge GB compliance. Equally important, EO13123 helped to integrate in different ways governmental agencies, e.g., the DOE, the EPA, the GSA, and the OMB, to work jointly through an interagency committee.

3.1.2.2 EO13423

President Bush signed EO13423 in 2007,[528] in order to "strengthen the environmental, energy, and transportation management of federal agencies." EO13423 dealt with the energy use of the federal government, setting targets for GHGs reduction by the end of 2015.[529] EO 13523 also required a certain percentage of renewable energy consumed by the federal government agencies.[530] Moreover, EO13423 went beyond the energy performance of GB, taking into account water efficiency[531] and waste reduction in federal agencies.[532] To achieve those targets, EO13423, on the one hand, required that new construction and major renovation of agency buildings should comply with the Guiding Principles for Federal Leadership in High Performance and with the Sustainable Buildings Memorandum of Understanding (2006).[533] On the other hand, E.O. 13423 required government agencies to put in place the environmental management system (EMS) at all organizational levels to address environmental concerns around energy use and transportation.[534] EO 13423 also made use of environmental compliance review, leadership awards and training programs for implementation.[535]

EO13423 and EO13123 required mandatory compliance by the federal agencies meanwhile using persuasive instruments to encourage private GB compliance. EO 13423 may differ from EO 13123 on the following fronts. First, EO 13423 addressed waste disposal and water efficiency regarding building activities. This might show that lawmakers became better aware of the full meaning of building green than they used to be. Second, it set up target standards on building performance, other than specification standards that were laid down in EO13123. Third, it combined the targets

[528] Exec. Order No. 13423 (2007), 'Strengthening Federal Environmental, Energy, and Transportation Management,' revoked by EO 13693 on March 19, 2015, Sec. 16 (a).
[529] *Id.*, Sec 2 (a)
[530] *Id.*, Sec 2 (b).
[531] *Id.*, Sec 2 (c).
[532] *Id.*, Sec 2 (e).
[533] *Id.*, Sec 2 (f).
[534] *Id.*, Sec 3 (b).
[535] *Id.*, Sec 3 (c).

with the Guiding Principles in the Memorandum of Understanding, which was supposed to be a voluntary compliance agreement among governmental agencies. Lastly, EO13423 had more on accountabilities and monitoring for heads of the different governmental agencies.[536]

3.1.2.3 EO13514

President Barack Obama signed EO13514 in 2009.[537] Of its objectives, EO13514 assisted the US federal agencies to "design, construct, maintain, and operate high-performance sustainable buildings in sustainable locations,"[538] which made EO13514 relevant to GB. To realize its goal, EO13514 laid out several reduction targets on energy intensity, water intensity and construction/demolition waste for the federal agencies.

More specifically, EO13514 required the federal agencies to a) improve water efficiency by 26% by 2020; b) make 95% of all applicable contracts meet sustainability requirement; c) achieve 50% recycling and waste diversion by 2015; d) implement the 2030 net-zero-energy building requirement; e) implement the stormwater requirements laid down in the EISA 2007.[539]

To meet the targets, EO13514 required the federal agencies to provide vendors and contractors with incentives to reduce GHGs, in which case the government might wield its purchasing power to support pro-environment products and technologies.[540] In the meantime, EO13415 encouraged vendors and contractors to register with a voluntary registry or organization for reporting GHGs emissions, making available their GHG inventory and description of measures on mitigation.[541] Each agency was supposed to develop and implement an Agency Strategic Sustainability Performance Plan, which should state the agency's commitment into environmental compliance, the measures to comply and the provision of information about the agency's compliance and commitments.[542] In addition to the federal efforts, EO13514 also advanced regional and local integrated planning on community transportation, site selections of buildings and environmental management at all levels.[543]

[536] *Id*., Sec 4.
[537] Exec. Order No. 13514 (2009), 'Federal Leadership in Environmental, Energy, and Economic Performance,' revoked by EO 13693 on March 19, 2015, Sec. 16 (b).
[538] *Id.*, Sec 1.
[539] *Id*., Sec 2.
[540] *Id.*, Sec 2 (h)
[541] *Id*., Sec 13.
[542] *Id*., Sec 8
[543] *Id*., Sec 2 (f).

As with EO13123 and EO13423, EO 13514 also emphasized the federal leadership in building sustainability, putting in place market-based instruments (e.g., public procurement for environmentally responsible products), as well as persuasive instruments (e.g., voluntary disclosure of GHG emissions).

Compared to the previous two executive orders, EO13514 seemed to follow a broader meaning of building green, taking into account site selection and recovery of historic buildings.[544] Also, EO13514 facilitated not only the integration among federal agencies, but also that among agencies at the state, local, and down to community level. Besides, EO 13514 introduced land use planning for transportation infrastructure, which resonated with the increasing importance of site selection in GB compliance. Apart from the planning, environmental impact assessment as another CAC instrument was also included in EO13514.

3.1.2.4 EO13693

EO13693, signed by President Obama in 2015,[545] aimed for environmental improvement "through a combination of more efficient Federal operations." With energy use in focus, EO13693 establishes a target standard for energy intensity, to reduce agency building energy intensity measured in British thermal units (BTUs) per gross square foot by 2.5% annually through to the end of the year 2015.[546] Also, EO13693 requires renewable energy use in public buildings with a minimum percentage.[547] Building energy performance will be assessed through remote auditing. The data collected will be delivered into the EPA's Energy Star Portfolio or to the consensus-based industry Green Button data access system.[548] To increase renewable energy use, E.O. 13693 encourages the federal government to put in place on-site energy generation, e.g., combined heat and power (CHP) processes.[549]

Apart from energy use, E.O. 13693 also addresses other GB elements. For instance, it requires the federal governments to reduce potable water consumption intensity and install green infrastructure to manage waste-

[544] *Id.*, Sec 2 (e) (iii).
[545] Exec. Order No. 13693 (2015), 'Planning for Federal Sustainability in the Next Decade.'
[546] *Id.*, Sec 3 (i).
[547] *Id.*, Sec 3 (b).
[548] *Id.*, Sec 3 (i) (A).
[549] Combined heat and power (CHP), also known as cogeneration, is a process using both fossil- and renewable-based energy to produce electricity or mechanical power and thermal energy (heating or cooling) from a single source of energy. Unlike centralized power generation, CHP is located at or near the point of consumption. In this way, power or heat lost in the grid will be recycled. To know more about the CHP, see the USDOE, 'Combined heat and power basics,' available at https://energy.gov/eere/amo/combined-heat-and-power-basics

water in federally-owned properties.[550] Concerning land use, EO13693 requires the sustainable design and space usage in the planning for new constructions or renovations of public buildings, e.g., better access to public transit. [551] Waste disposal is also mentioned in EO13693, for which the agencies are required to divert non-hazardous construction and demolition wastes by 50% at least[552] and to reduce hazardous wastes.[553]

EO13693 combines different instruments to enhance GB performance at the federal level. On the one hand, EO13693 requires public procurements with a preference for green products. As baseline standards, the EPA's programs will be used to tell whether or not a building product is green, e.g., the WaterSense for water-efficient products, or Safer Choice label for chemically intensive products. [554] On the other hand, EO 13693 puts forward performance contracting as a tool to meet energy efficiency targets in federal buildings. Apart from public procurement and contracting, EO13693 also enlists suasive instruments, e.g., employee education and training, or data collecting for environmental performance disclosure.[555] Planning is also mentioned in EO 13693 to make buildings better connected to the public transportation network, so as to reduce GHGs emissions.

3.1.3 Other federal laws concerning GB compliance

GB mainly can have many elements like energy, land, IAQ, water, and waste. Not all of the GB elements are adequately addressed in the laws mentioned above, as they mostly focus on energy efficiency. There are other federal laws and regulations that may not be precisely made for GB but applicable to environmental compliance in building activities.

First of all, all the federal building activities should be in line with the National Environmental Policy Act (NEPA) of 1969. [556] The NEPA requires an Environmental Assessment (EA) or an Environmental Impact Statement (EIS) for a federal project to start. The project will be delayed or interrupted if the owner fails to get the EA or EIS. If the EA has shown that the project would probably cause little or no environmental impacts, the EIS is no longer needed. [557]

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[550] *Id.*, Sec 3 (f).
[551] *Id*., Sec 3 (h) (vii).
[552] *Id*., Sec 3 (j) (iii).
[553] *Id*., Sec 3 (j) (iv)
[554] *Id*., Sec 3 (i), (ii), (iii) and (iv).
[555] *Id*., Sec 3 (a) (i).
[556] Public Law No. 91-190 (1969), 83 Stat. 852 (codified at 42 U.S.C. § 4321*et seq.)*
[557] *Id*., sec 2.

Construction/demolition (C/D) wastes treatment may differ for hazardous and non-hazardous wastes. Hazardous C/D wastes are categorized in the Resource Conservation and Recovery Act (RCRA).[558] The RCRA sets forth the requirements for the management, storage, disposal, and transport of the hazardous wastes listed. Apart from the RCRA, there are other laws and regulations addressing particular types of a hazardous substance. For instance, lead-based paints are taken as municipal wastes that can be disposed of according to the state and local regulations. If renovation or construction of a project will release lead-based paint, the work shall be done under regulations in the EPA's Lead-based Paint Poisoning Prevention in Certain Residential,[559] or an authorized state program. In another case, C/D activities generating PCB wastes would be regulated by the Toxic Substances Control Act (TSCA).[560]

For non-hazardous C/D wastes, such as wood, roof material, insulation, plaster, or sheetrock, they would end up with a municipal solid waste treatment that shall accord with the EPA's landfill standards.[561] Stakeholders in charge of the disposal of hazardous wastes are obliged to report spilling and maintain a material safety data sheet, according to the Emergency Planning and Community Right-to-Know Act (EPCRA).[562]

In close relation to the C/D wastes disposal, building stakeholders may be liable for land contamination, according to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and its amendments.[563] Authorized by the CERCLA, the USEPA and the state environmental regulators launched the *Superfund* for contaminated land ('brownfields'). However, the Superfund has become underfunded, relying largely on tax revenues.[564] Therefore, the EPA began to have potentially responsible parties (PRPs) to bear the costs of cleaning up. The CERCLA includes the owners, operators, managers, and transporters of hazardous substances or facilities as PRPs, who will probably be

[558] Public Law 94-580 (1976), 90 Stat. 2795 (codified at 42 U.S.C. §6901 et seq.). Hazardous wastes under the RCRA mainly include organic solvents, paints (e.g., lead-based paint), used oil, paint thinners, PCBs, and other substances that are toxic, ignitable or corrosive. See RCRA, *supra* note 558, subtitle C, sec 3001.
[559] 40 CFR Part 745.
[560] Public Law 94-469 (1976), 90 Stat. 2003 (codified at 15 U.S.C.ch. 53, subch. I §§ 2601–2629), sec.6.
[561] See 40 CFR Part 257.
[562] Public Law 99-499 (1986), 100 Stat. 1728 (codified at 42 U.S.C. §§ 11001-11050), Section 313, 42 U.S.C. § 11023
[563] Public Law 96-510, 94 Stat. 2767 (codified at 42 U.S.C. § 9601 et seq.
[564] See the USEPA' Office of Inspector General (OIG), 'Congressional Request on Funding Needs for Non-Federal Superfund Sites', OIG Report 2004-P-00001, January 7, 2004, at 7. Available at:https://www.epa.gov/sites/production/files/2015-12/documents/20040107-2004-p-00001.pdf, last visited February 2017.

responsible for cleaning up the brownfield sites on the EPA National Priorities List.[565]

With regard to land use, GB compliance has also been a way to the redevelopment of polluted land ('brownfields').[566] Very likely building stakeholders, including lenders of building projects, would be held liable for land contamination when they excavate soil or engage in the actual management of hazardous substances disposal. Currently, there is not any federal statutory law applicable to the 'brown-to-green' redevelopment. The USEPA has initiated programs or pilot projects in cooperation with local governments.[567]

Apart from the ex-post remedies for brownfields, building activities should also sit comfortably with land use planning, on the account that not all harm caused by building activities can be reversible. Specifically, building activities should not do harm to endangered species, as required by the Endangered Species Act of 1973 (ESA).[568] If building activities would affect endangered species habitats anyway, building stakeholders should come up with strategies to mitigate impacts or consult with the National Marine Fisheries Service or its counterparts at the state or local level.[569] Building activities are also subject to section 106 of the National Historic Preservation Act (NHPA), which requires federal building stakeholders to protect historic sites.[570]

The Clean Air Act (CAA) sets forth requirements on emissions from mobile and stationary sources, which may apply to building activities as well.[571] Those requirements, including standards for dust emissions and those for heavy-duty trucks used at the construction site, would be implemented through the State Implementation Plans (SIPs),[572] and through the EPA's regulations in response to the CAA.[573] Authorized by the CAA, the USEPA released the *Standards of Performance for*

[565] As of 9 August 2016, there are 1,328 sites listed on the National Priority List; an additional 391 have been delisted, and 55 new sites have been proposed. See USEPA, 'NPL Site Totals by Status and Milestone', available at https://www.epa.gov/superfund/npl-site-totals-status-and-milestone, last visited November 2018.
[566] The LEED standards for new construction includes one point for re-use of brownfield and other values for using existing infrastructure.
[567] See USEPA, 'Green Buildings on Brownfields Initiatives: Pilot Projects Facts Sheet,' available at https://www.epa.gov/land-revitalization/green-buildings, last visited February 2017.
[568] Public Law 93-205 (1973), 87 Stat. 884 (codified at 16 U.S.C. § 1531 et seq.), sec 4 (f).
[569] *ESA of 1973*, sec 4 (f).
[570] Public Law 89-665 (1966), 80 Stat. 915 (codified at 16 U.S.C. ch. 1A. Subch. II § 470 et seq.)
[571] Public Law 88-206 (1963), 77 Stat. 392 (codified at 42 U.S.C.ch. 85, subch. I § 7401 et seq.)
[572] The State Implementation Plan (SIP) is the federally-enforceable plan for each of the states. The SIP identifies the states should meet Air Quality Standards (NAAQS) established in Section 109 of the Clean Air Act (CAA) and 40 CFR §§ 50.4 - 50.12.
[573]40 C.F.R. Subchapter C, Parts 50-97.

Greenhouse Gas Emissions for new, modified and reconstructed electric utility generating units (hereinafter 'the EGU standard').[574] The EGU standard can be relevant to GB compliance, in the sense that it partly deals with energy use and GHG emissions from stationary sources. All the new, modified and reconstructed power plants (or units) are all subject to the EGU standard and must meet GHG emissions standards based on the EPA's evaluation of the best system for emission reduction (BSER).

The CAA and other federal legislation does not have much to say about indoor air quality (IAQ), neither the OSHA nor the USEPA has regulations specifically made for IAQ.[575] Currently, IAQ can somewhat be addressed by regulations on a specific hazardous indoor pollutant. For instance, as one of the hazardous IAQ pollutants, asbestos should be reduced to the amount that meets the National Emission Standard for Hazardous Air Pollutants.[576] Radon, a long-term exposure to which can cause lung cancer, is regulated by Title III of the Toxic Substances Control Act (TSCA).[577] The TSCA requires financial and technical support to help states with radon monitoring and control,[578] as required in the TSCA, the USEPA set final standards for the control of radon in new residential buildings.[579]

Laws and regulations for water use mainly deal with storm-water run-off and dredging/filling material into waters within the US. According to the Clean Water Act of 1972, if the construction of a project would affect more than one acre of land, the developer needs to get a permit on the discharge of storm-water run-off from the construction site.[580] The permit will be issued by the USEPA National Pollutant Discharge Elimination System

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[574] *Id.*, Part 60, 70, 71 and 98.

[575] The EPA and the OSHA provide guidance and information for IAQ management, yet they do not regulate IAQ through laws and regulations. See OSHA, 'Indoor Air Quality in Commercial and Institutional Buildings', OSHA 3430-04 2011, full text available at https://www.osha.gov/Publications/3430indoor-air-quality-sm.pdf, last visited February 2017; USEPA, 'Indoor Air Quality,' available at https://www.epa.gov/indoor-air-quality-iaq, last visited February 2017.

As an aside, a bill of the 'Radon Gas and Indoor Air Quality Research Act of 1990' was introduced in the 101st Congress, but it failed to be passed in the end. Despite being stillborn, the expected Bill aimed to establish in the Environmental Protection Agency a program of research on indoor air quality, and tried to provide a non-traditional approach was attempted via public information and technical assistance program. See US Congress, 'All Bill Information (Except Text) for H.R.5155 - Indoor Air Quality Act of 1990 ', available at https://www.congress.gov/bill/101st-congress/house-bill/5155/all-info, last visited February 2017.

[576] Asbestos in materials is also a typical hazardous substance if it could be crushed into dust with hand pressure. In that case, the use of asbestos will also be subject to the CERCLA.

[577] Public Law 94-469 (1976), 90 Stat. 2003 (codified at 15 U.S.C.ch. 53, subch. I §§ 2601–2629).

[578] *Id.*, TSCA, Tit. III.

[579] Model Standards and Techniques for Control of Radon in New Residential Buildings**,** EPA 402-R-94-009, March 1994. Full text available at https://www.epa.gov/sites/production/files/2014-11/documents/model_standards.pdf, last visited February 2017.

[580] Public Law 92-500 (1972), 86 Stat. 816 (codified at 33 U.S.C. §§ 1251–1387)

permitting authority.[581] In exercise of the issuance, the EPA will require the appliers to a) submit a notice of intent, which proves that the applier will not harm the listed endangered species; b) develop and carry out a Storm Water Pollution Prevention Plan that outlines the physical conditions of a project site, the potential pollutants, as well as methods to prevent erosion, control sediment and manage storm-water on site.[582] The CWA also requires a permit on discharging dredged material or filling material into waters in the country, which will be granted by the U.S. Army Corps of Engineers.[583]

3.2 State and local laws

3.2.1 Overview

In response to the federal leadership in GB compliance, the state and local governments also put in place a wider range of instruments for GB promotion.[584] Those programs are partly laid down in the GB legislation or executive orders at the state or local level. States with GB legislation mainly include:[585] Arkansas,[586] Colorado,[587] Connecticut,[588] Florida,[589]

[581] *Id.*, Tit. IV sec. 402.
[582] *Ibid.*
[583] *Id.*, sec. 404.
[584] As of 2007, at least 14 percent of all cities with a population greater than 50,000 have GB programs. Those programs range from options that are cost-free to those that involve direct local government investment, which include but are not limited to tax Incentives, bonus density, expedited Permitting, grants (including fee subsidization), loans, insurance, technical Assistance, permit, zone Fee Reductions, labeling (e.g., Energy Star) and Leasing Assistance. For more information about the local initiatives see The American Institute of Architects (AIA), '*A Study of Green Building Programs in Our Nation's Communities,'* AIA Report on Local Leaders in Sustainability 2007, at 4, full text available at http://green.e-arc.com/images/Green-Building-Study.pdf, last visited February 2017; and USGBC, 'Better Buildings, Better Policy: A Compilation of Green Building Policy Adoptions in the United States (2011-2014), full text available at http://www.usgbc.org/sites/default/files/STATE_WINS_REPORT_2014-3.pdf, last visited February 2017.
[585] The list of states with legislation is derived from Del Percio, S., and Koerner, P. D., 'State and Local Green Building Laws and Initiatives', in Howe, J. C., and Gerrard M. B., (eds.), *The Law of Green Buildings: Regulatory and Legal Issues in Design, Construction, Operations, and Financing* (American Bar Association, 2011), at 71-99.
[586] Ark. Code § 22-3-1801 et seq.
[587] Colo. Rev. Stat. § 24-30-1301 et seq.
[588] Conn. Pub. Acts No. 07-242 (2007).
[589] Fla. Stat. § 255.252.

Hawaii,[590] Illinois,[591] Maryland,[592] Minnesota,[593] New Jersey,[594] Ohio,[595] Oklahoma,[596] South Carolina,[597] and South Dakota,[598] Washington.[599]

States with executive orders to promote GB include[600] California,[601] Colorado,[602] Florida,[603] Illinois,[604] Maine,[605] Maryland,[606] Massachusetts,[607] Michigan,[608] New Jersey,[609] New Mexico,[610] New York,[611] Rhode Island,[612] and Virginia.[613]

Those state and local laws have extended GB compliance to both commercial and residential buildings. With regard to standard setting, localities tend to have more stringent standards than their federal counterparts and incorporate industry-based certifications. In a few cases, the governments may want to make their certification system by consulting the industry. In order to meet the standards, instruments used in law to widen GB compliance may vary with jurisdictions. Some states tend to mandate GB compliance, but such mandatory requirements may differ across public and private projects; while others may resort to public procurement or tax reductions as incentives.

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[590] Haw. Rev. Stat. § 5-196.
[591] 105 Ill. Comp. Stat. 230/5-40
[592] Md. Code Ann., State Fin. & Proc. §§ 3-602 (d), 3-602.1.
[593] Minn. Stat. § 216B-241 (1)(F)
[594] N.J. Rev. Stat. §§ 52:32-5.3, 52:32-5.4
[595] Ohio School Facilities Comm'n, Res. 07-124 (2007)
[596] Okla. Stat. tit. 61, § 213 et seq.
[597] S.C. Code Ann. § 48-52-800 et seq.
[598] S.D. Code Ann. § 5-14-32 et seq.
[599] Wash. Rev. Code 39.35D (2005).
[600] Del Percio and Koerner (2011), *supra* note 585, at 71-99.
[601] Exec. Order No. D-16-00 (Cal. 2000).
[602] Exec. Order No. 005-05 (Colo. 2005), Greening of State Government, as modified by Exec. Order No. D 0011 07, Greening of State Government: Detailed Implementation (Colo., 2007).
[603] Exec. Order No. 07-126 (Fla., 2007), Establishing Climate Change Leadership by Example: Immediate Actions to Reduce Greenhouse Gas Emissions from Florida State Government.
[604] Exec. Order No. 11 (Ill. 2009), Executive Order to Reduce Energy Consumption in State Facilities.
[605] Exec. Order No. 08 FY 04/05 (Me. 2003), An Order Regarding the Use of 'LEED' Building Standards for State Buildings.
[606] Exec. Order No. 01.01.2001.02 (Md. 2001), Sustaining Maryland's Future with Clean Power, Green Buildings and Energy Efficiency.
[607] Exec. Order No. 484 (Mass. 2007), Leading by Example – Clean Energy and Efficient Buildings.
[608] Exec. Order No. 2005-4 (Mich. 2005), Energy Efficiency in State Facilities and Operations.
[609] Exec. Order No. 24 (N.J. 2002).
[610] Exec. Order No. 2006-001 (N.M.2006), State Of New Mexico Energy Efficient Green Building Standards for State Buildings
[611] Exec. Order No. 111 (N.Y. 2001), Green and Clean State Buildings and Vehicles.
[612] Exec. Order No. 05-13 (R.I. 2005), Energy AND Environmental Performance Standards for New Public Buildings.
[613] Exec. Order No. 82 (Va. 2009), Greening of State Government.

Despite the increasing commitment to GB, some state and local GB regulations may face legal concerns. First of all, some of the GB regulations incorporate private GB standards into regulations, which may to some degree clash with the non-delegation doctrine.[614] Particularly when a GB regulation does not refer to a fixed version of an industry-based certification, the rules could be changed by the creator over time and the industry party is de facto making the law without due legislative process. Second, given that some states tend to have more stringent standards than their federal counterparts, it remains to be seen to what extent the federal GB laws may pre-empt the state or local GB standards. If pre-emption is available, the more stringent local standards may not have a chance to be applied.[615] Last, incorporating an industry-based certification may reduce competition. When an industry-made certification is incorporated in the GB regulation, some of building products suppliers will find themselves excluded from the market if their certifications are not on the list.[616] A remedy on the excluded parties may be less easily available as the US Supreme Court has established a state-action immunity doctrine. Under this doctrine, industry entities that make or enforce the GB regulations can justify their anti-competitive activities by proving that what they are doing is authorized by the state.[617]

3.2.2 The state and local GB laws illustrated

GB laws and the ways they address GB compliance differ across jurisdictions. It may go beyond this study to look at all of the state and local GB laws as there are very large number of them. Therefore, this section looks into GB laws in four states, viz., California, Washington, New York State and Illinois. The four states take the lead in GB development with a considerable number of certified GBs.[618] More

[614] Teyber, E., 'Incorporating Third-Party Green Building Rating Systems into Municipal Building and Zoning Codes', 31 (2014) *Pace Environmental Law Review*, pp.832-843.

[615] AHRI et al. v. The city of Albuquerque, No. CIV-08-633 (D.N.M 2008), quoting Shari Shapiro, 'Green Federalism--The Rising Conflict Between Local and Federal Regulation of High-Performance Buildings,' an article on LexisNexis Real Estate Law Blog, published on 14 November 2008, available at https://www.lexisnexis.com/legalnewsroom/real-estate/b/real-estate-law-blog/archive/2008/11/14/green-federalism-the-rising-conflict-between-local-and-federal-regulation-of-high-performance-buildings.aspx?Redirected=true, last visited February 2017.

[616] Del Percio, S., 'Revisiting Allied Tube and Noerr: The Antitrust Implications of Green Building Legislation and Case Law Considerations for Policymakers', 34 (2009) *William & Mary Environmental Law and Policy Review*, at 239-342.

[617] Prum, D. A., Aalberts, R. J., and Del Percio, S., 'In Third Parties We Trust? The Growing Antitrust Impact of Third-Party Green Building Certification Systems for State and Local Governments', 27(2012) *Journal of Environmental Law and Litigation*, at 222

[618] See McCadden, L., 'USGBC Releases the 2015 Top 10 States for LEED Green Building Per Capita in the U.S.', posted on the USGBC website on 26 Jan 2016, available at http://www.usgbc.org/articles/usgbc-releases-2015-top-10-states-leed-green-building-capita-us, last

importantly, GB laws are diverse in those states in terms of instruments used and/or standards setting. All four states tend to mandate GB compliance, but they set standards in different ways. California and the New York State have GB standards that do not refer to any industry-based certification programs and provide the states with a chance to tailor the standards to local needs. As opposed to California, Washington and Illinois all on different levels incorporate industry-based GB certifications. Apart from mandates, funding, permitting, public procurement, information reporting are the most favored instruments used by the states and municipalities within.

3.2.2.1 California

In 2000, California's then-governor Gray Davis signed Executive Order No. D-16-00, to incorporate GB compliance into the planning, operations, policymaking, and regulatory functions of state entities.[619] In order to achieve the goal, the state entities must broadly consult with private sector individuals and report their efforts in implementing a sustainable building strategy.

Apart from the executive order, California is also the first state to have GB standards for both public and private sectors, and it stands out in GB standard setting.[620] The California Green Building Standards Code (hereinafter the 'CALGB Code') was approved in 2008 and coded in 2010 as the 11th part of the California Code of Regulations.[621] The CALGB Code is made for both residential and non-residential buildings. In line with the life-cycle performance of GB, the CALGB Code aims to minimize the negative effects on building sites;[622] to reduce energy use by 15%[623] and water use by 50%;[624] to recycle/recover 50 % of non-hazardous C&D wastes at the minimum;[625] and to ensure a safe indoor environment through pollutant control,[626] and requirements on the HVAC

visited February 2017.

[619] Exec. Order No. D-16-00 (Cal.2000).

[620] It remains to be seen how much energy the building energy code can actually help to save. Some empirical evidence hints that the building energy codes in California are working to some extent, but energy savings resulting from the codes significantly fall behind the original goal. Apart from non-compliance with standards, the gap between the actual savings and those projected may come for different reasons. It could be that the policy goal per se is not reasonable. It could also be that the goal is achievable, but the results of empirical studies are inaccurate due to the limitations of measurement. See Levinson, A., 'How Much Energy Do Building Energy Codes Save? Evidence from California Houses', 106 (2016) *The American Economic Review*, at 2867-2894.

[621] Cal. Code Regs. (2008), tit. 24, Part 11

[622] *Id.*, sec 4.106.1.

[623] *Id*., sec 503.

[624] *Id.*, sec 603

[625] *Id.*, sec 708.

[626] *Id.,* sec. 4.504.

system.[627] In order to achieve the goals, the CALGB Code includes mandatory and voluntary measures applicable to every single building or its attached structures throughout its lifecycle.[628]

It is worth heeding that the CALGB Code does not incorporate any existing certifications in GB mandates; only in a few cases, it refers to the Energy Star or some specific standards in the LEED system. [629] For a better measurement of GB performance, the Building Sustainable Task Force, a state-sponsored organization, came up with a set of standards tailored to California on account of the local setting.[630]

At the local level, municipalities also incorporate GB compliance into their municipal codes. The City of Los Angeles has set up a GB program composed of a Standard of Sustainable Excellence,[631] which refers to the LEED system as a requirement. The program requires the LEED certification for a building permit to be issued. The Los Angeles GB program does not incorporate a specific version of the LEED system, in which case the USGBC may change the standards. In that sense, the Los Angeles government is actually delegating the regulatory power to the industry.

The San Francisco Green Building Code requires all the new and existing buildings to meet GB standards over the lifecycle.[632] If the standards clash with those at the state and local level, the stricter standards should prevail.[633] In other words, the San Francisco GB Code might apply more stringent standards than the state. The San Francisco Code enlists the LEED and the Green Point in building permits. The LEED system incorporated refers to a specific version in the San Francisco GB Code.[634] Equivalents of the certifications can be used when approved by the Director.[635]

It took 20 years for the green standard to prevail for new construction. Green is relatively common in new residential buildings in California.[636]

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[627] *Id.*, sec. 4.506.
[628] *Id.*, 202.
[629] See in general Cal. Code Regs., tit. 24, Part 11 (2008), cps 4-8.
[630] As a result of the formation of the Cabinet-level Green Action Team, the task force is not active anymore. For more information about the standards see http://www.calrecycle.ca.gov/GreenBuilding/Specs/Section01350/, last visited April 2018.
[631] Los Angeles Mun. Code 16.10, 16.11 (modified by Ordinance No. 179820, 2008)
[632] San Francisco Bldg. Code 1301C-1310 C
[633] San Francisco Bldg. Code 101.6.3.
[634] San Francisco Bldg. Code 101.10.
[635] *Ibid.*
[636] Simons, R.A., Choi, E., and Simons, D. M., 'The Effect of State and City Green Policies on the Market Penetration of Green Commercial Buildings', 1 (2009) *The Journal of Sustainable Real Estate*, at 149.

The motivation for the green in California partly grew out of the need to reduce waste. The state then began to use LEED standards to have an immediate positive impact on landfill capacity. California is not only motivated to go green to decrease waste but also to reduce energy consumption. Over the last 30 years, California has led the nation with energy policy. It has been successful: state energy use is flat despite a significant rise in population.[637]

3.2.2.2 Washington

Washington's state GB law was enacted in 2005,[638] requiring that all major facility projects of government agencies, public schools and any other projects funded by the State capital [639] or projects financed through contracts with the State,[640] should at least be certified to a LEED Silver standard. An exemption is available if the agencies and the design team[641] can prove that the project can certainly not meet the LEED Silver standard.[642] In that case, the agency responsible for the project should hand in an Exemption Declaration form to the Department of General Administration, so as to get permission for compliance with lower standards. To monitor the compliance, the department and other agencies need to submit individual reports to the legislative committees on the capital budget and means to review the program's performance.[643]

Concerning standard setting, the Washington GB law refers only to the LEED certification as a measurement tool.[644] Moreover, the Washington GB law puts forward a good faith standard of care as a limitation on liability, whereby members of the design or construction teams may not be held liable for non-compliance as long as they act bona fide in GB activities.[645]

Apart from the legislation, the Washington Governor issued Executive Order No. 05-01, which required that all building construction projects and major renovations over 25,000 gross square feet, should be verified

[637] *Id.*, at 149.
[638] Wash. Rev. Code 39.35D (2005).
[639] Wash. Rev. Code 39.35D.040.
[640] Wash. Rev. Code 39.35D.030.
[641] The Washington GB law per se has nothing further to say about what qualifies as the 'design team,' which has been elsewhere defined as the architect of the project in the Quality Assurance Process Guidelines made by the Department of General Administration.
[642] Wash. Rev. Code 39.35D.020 (5) (b).
[643] Wash. Rev. Code 39.35D.050.
[644] Wash. Rev. Code 39.35D.080.
[645] Wash. Rev. Code 39.35D.070. However, the statute does not give too many details on what can be taken as 'good faith,' leaving the discretion to the court to decide in a case-by-case manner. We would later discuss how the standard of care takes shape through common law.

by the LEED Silver standard, or by an equivalent standard approved by the Department of General Administration (GA).[646] Particularly when it comes to building materials, the executive order favors local products manufactured from forests regulated under the Washington Forest Practices Act. The GA will develop and implement a review process to ensure that the GB performance standards are consistent with the LEED. Also, the GA will provide reimbursable training and support to all affected project managers.

At the municipal level, GB compliance is achieved through land use permits. The Seattle Land Use Code has provided the LEED-certified projects with an expedited permit on land use for new buildings and on the demolishing of residential buildings.[647] So far a chapter on GB standards is taking shape in Seattle, aiming to bring together the dispersed green building requirements into one chapter of the Seattle Land Use Code. [648] The chapter on GB in its current form refers to more than one GB certification. Other certifications than the required ones are also acceptable if the certifications are based on standards equivalent or superior to the required ones.[649] Before the issuance of the permit, the applicant must write a statement to identify the industry-based certification to be used and how the certification is in line with the required standards. The owner or financially responsible party will underwrite the statement. [650]

3.2.2.3 New York State

In 2009, the New York's State Green Building Construction Act (hereinafter the NY GB Act) was created as a new Article 4-C in the Public Buildings Law, and it came into force in 2010.[651] The NY GB Act requires GB performance on constructions or substantial renovations of buildings owned by every state department, state agency and state public authority.[652] Unlike the Washington GB Law which relies mainly on industry-based standards, the NY GB Act enlists the Office of General

[646] Executive Order No. 05-01(Wash. 2005), Establishing Sustainability and Efficiency Goals for State Operations

[647] See Seattle Department of Constructions and Inspections, 'Priority Green Expedited,' available at http://www.seattle.gov/dpd/permits/greenbuildingincentives/prioritygreenexpedited/default.htm, last visited March 2017.

[648] See Seattle Department of Constructions and Inspections, 'Green Building Permit Incentives', available at http://www.seattle.gov/dpd/permits/greenbuildingincentives/, last visited March 2017

[649] See the draft on Green Building Standards (SMC tit. 23, 23.58D; 23.84A.014 "G"), a full text of the Draft chapter available at http://www.seattle.gov/dpd/cs/groups/pan/@pan/documents/web_informational/p2553226.pdf, last visited March 2017.

[650] *Ibid.*

[651] N.Y. Pub. Bldgs. L. (2010), Article 4-C.

[652] N.Y. Pub. Bldgs. L. (2010), Article 4-C, § 81.

Service, in company with other government entities, to come up with a set of GB standards. The Office of General Services is encouraged by the Act to collect suggestions or comments from the GB industry parties, such as the USGBC.[653] Those government-made standards are not retrospective, meaning that they do not apply to a building project that has been "substantially commenced" by the effective date of the regulations. To keep track on compliance with the standards, agencies at stake should report annually to the Office of General Services the information about energy consumption, water, and waste reduction, IAQ and maintenance processes.[654]

As with the NY GB Act, Executive order No. 111 also aims at the state agencies. [655] According to EO No.111, all the state agencies and departments are required to reduce the energy use of buildings owned, leased or maintained by them by 35% relative to the 1990 levels.[656] All the new buildings, to the maximum extent practicable, should be built in the light of the guidelines on GB, including those in the Tax Law 19 that provides green builders with tax credits, as well as the requirements in the LEED system.[657] Besides, all the state entities are required to procure Energy Star products when they need to replace existing equipment.[658]

At the local level, the New York City's Local Law 86 (hereinafter LL86 of 2005) came into effect on January 1, 2007, for both public and private entities.[659] The LL86 of 2005 incorporates primarily the LEED in the requirements for GB compliance, which may vary across projects of different sizes. In general, any non-residential municipal project with $2 million costs or more for construction, or any project that receives 50% or more public funding, must achieve at least the LEED Silver.[660] Any project with a LEED certification and with construction costs of or more than $12 million must also reduce energy cost by a minimum of 20%-30%. Projects with $500,000 or more of domestic plumbing work must reduce potable water use by30% or more.[661] For monitoring, the LL86 of 2005 requires the preparation of a report each year to provide information in accordance with specific requirements in the LL86 of 2005.

[653] N.Y. Pub. Bldgs. L. (2010), Article 4-C, § 83.
[654] *Ibid.*
[655] Exec. Order No. 111 (N.Y. 2001).
[656] Exec. Order No. 111 (N.Y. 2001), i.
[657] Exec. Order No. 111 (N.Y. 2001), II (B).
[658] Exec. Order No. 111 (N.Y. 2001), III.
[659] New York City Local Law 86.
[660] New York City Local Law 86, b (1)
[661] New York City Local Law 86, b (2).

3.2.2.4 Illinois

The Green Buildings Act (hereinafter the GBs Act) and the Energy Efficiency Building Act are the two main state statutory laws that govern GB compliance in Illinois. The GBs Act applies mandates to all new state-funded building constructions and renovations. Concerning standard setting, the GBs Act incorporates the LEED system, Green Globe and other equivalent certifications.[662] In the exercise of its power, the Capital Development Board can exempt building stakeholders from those standards if compliance could lead to excessive costs, technical difficulties or damage to historic buildings.[663] It can be seen that the GBs Act mainly enlists the industry-based certifications without referring to a fixed version. However, those private standards should be analyzed and evaluated by the Capital Development Board.[664]

Unlike the GB Act that addresses GB as a whole, the Energy Efficiency Building Act (hereinafter the EE Act) deals with only one aspect of GB.[665] The EE Act extends GB compliance to both commercial and residential buildings, regardless of the ownership. The EE Act also draws on standards in the International Energy Conservation Code created by the International Code Council as specific requirements on energy performance.[666] The Board can adapt those standards to local settings without distorting the goal of the legislation.[667] Furthermore, the EE Act allows local governments to make their standards for building energy efficiency, which may vary with different building types. In the case of commercial buildings, they are not allowed to set standards that are less stringent than those at the state level. By contrast, standards for residential buildings can be either more or less stringent than those required by the GBs Act at the state level.[668]

4. Instruments for GB promotion

The US GB law has put in place different instruments to promote GB compliance. Along the theoretical line, those instruments will be

[662] Projects of 10, 000 square feet or less must meet the highest LEED standard or its equivalents, whereas projects of or more than 10, 000 square feet only need to meet less stringent standards for LEED Silver or its equivalents. 20 ILCS 3130/1, sec. 15 (b)
[663] 20 ILCS 3130/1, sec. 15(e)
[664] 20 ILCS 3130/1, sec. 15 (g)
[665] Public Act 096-0778 (2009) (codified at ILCS 3125/). The Energy Efficiency Building Act was signed into law on August 28, 2009, amending the Energy Efficient Commercial Building Act by including residential buildings and amending the name of the act to the Energy Efficient Building Act. The new requirements for residential buildings became effective on January 29, 2010.
[666] 20 ILCS 3125/10.
[667] 20 ILCS 3125/5.
[668] 20 ILCS 3125/45.

classified into command-and-control (CAC), market-based and persuasive instruments. This section further investigates what instruments are available, how (well) they work for GB promotion. Section 4.1 looks into the CAC instruments at work, prominently building permits and land use planning following GB standards. Section 4.2 maps out the market-based instruments that avail financial incentives (or disincentives), mainly including tax reductions, public procurements, green loans and liability for brownfields laid down in the CERCLA and its amendments. Section 4.3 deals with persuasive instruments, including voluntary environmental agreements, and environmental information disclosure via labeling, reporting, and energy auditing.

Apart from the instruments working in isolation, the US GB law has come up with two instrument mixes, which will be addressed in Section 4.4. One of the mixes is the Supplemental Environmental Project (SEP) as part of the settlement in liability litigation. Another mix is self-reporting, by which the regulated turn themselves into the regulator, in exchange for penalty abatement. The two instrument mixes both allow the regulator to make use of private information about non-compliance.

4.1 GB Standard setting

As with environmental standard setting in general, GB standard setting needs to take into account three aspects: the level of standards (i.e., uniform or differentiated), the types of standards (i.e., target, performance or specification) and how regulations use private standards.[669] GB standard setting in the US also corresponds to the three aspects. First, the federal agencies set the minimum requirements on GB compliance, leaving states and localities the power to make more stringent standards based on different settings. Second, most of the federal standards are target standards; while performance standards are more common at the state and local level. Third, GB regulations at the different levels mostly refer to some industry-based GB certifications, meanwhile retaining the power to change and enforce the standards.

4.1.1 Differentiated standards with a bottom line

The US federal law sets the minimum requirements for GB, meanwhile allowing the state and local governments to make their standards. In other words, the US GB law tends to combine both uniform and differentiated standards. For instance, the Energy Policy Act of 1992 established the federal building energy efficiency standards that include the statements of

[669] See Chapter III, Section 6.1.

requirements, criteria, and evaluation methods to be used.[670] In the meantime, the Energy Policy Act 1992 required states to make energy codes on commercial and residential buildings.[671] At the local level, municipalities tend to set more stringent standards than their state counterparts.[672]

Uniform standards are said to be better at dealing with trans-boundary externalities and reducing the race to the bottom.[673] The US federal GB standards seem to deal more with the transboundary externalities concern, and less with the race to the bottom. Most of the federal GB standards are for energy efficiency, which aims at GHGs reduction as a typical trans-boundary environmental issue. Moreover, the federal standards in their current form are mostly target standards to reduce emissions or resource use.[674] As noted in the theory, target standards are mainly for total control over the environmental quality, as opposed to performance standards that work at the individual level.[675] In that sense, the federal standards for energy use may not directly impact upon the firms' decisions on location, and hence may not actually stop states from lowering environmental performance standards for firms.

The states may not always race to the bottom; in some circumstances, localities may even race to the top to gain the competitive edge of local energy-efficient products.[676] GB deals with a wide range of environmental concerns, for which the states may relax their environmental regulation in some circumstances.[677] But the reason to relax may differ. Sometimes lax standards can be a result of the legislators being business-friendly.[678] At

[670] 106 STAT. 2776, Public Law 102-486 (1992), 102d Congress (codified at 42 USC 13201)., § 101.
[671] *Ibid.*
[672] For instance, the San Francisco Green Building Code requires all the newly-built and existing buildings to meet GB standards over the lifecycle, and wherever the standards in this code clash with those elsewhere laid down in state or local codes, the stricter standards should prevail. See San Francisco Bldg. Code 101.6.3.
[673] Chapter III, Section 6.1.2.
[674] For instance, the EISA (2007) set a target to reduce the fossil fuel use of all the newly-built or retro-fitted buildings by 50% as of 2010. See EISA (2007), *supra* note 497, sec. 433. Elsewhere, the executive orders seem to have more to say about target standards. E.O. 13514 required the federal agencies to improve water efficiency by 26% by 2020, and required 50% recycling and waste diversion by 2015. E.O. 13693 set a target on energy intensity reduction in agency buildings by 2.5% through the end of the year 2015, and required the federal agencies to divert non-hazardous C/D wastes by 50% at the minimum. See E.O. 13514, *supra* note 537, sec 2; E.O.13693, *supra* note 545, Sec 3 (i) and Sec 3 (j) (iii).
[675] See Chapter III, Section 6.1.1.
[676] Klass, A. B., 'State Standards for Nationwide Products Revised: Federalism, Green building Codes, and Appliance Efficiency Standards,' 34 (2010) *Harvard Environmental Law Review*, at 335.
[677] Saleska and Engel (1998), *supra* note 287, at 86.
[678] Saleska and Engel further point out that, the stringency of environmental regulation turns out to be of little to no importance to industries in site choosing. On that account, it might be more rational for the states not to relax environmental regulation. However, the state government may still provide the

other times, the state governments may view that the payoff of relaxation is greater than that of more stringent standards.[679] A general solution to the race-to-the-bottom problem could be to set a minimum bar in the federal environmental laws.[680] The federal GB standards, because they are nationwide in scope, can to some degree provide a threshold for GB compliance.

Apart from the federal standards, the US GB law also has GB standards at the state and local level, on the account that some of the GB elements like land use can be better addressed by localities. For instance, the Seattle Land Use Code has provided projects certified by LEED or its equivalents with an expedited permit for land use of new buildings, and the destruction of residential buildings. 681 So far a chapter on GB standards is taking shape in Seattle, aiming to bring together the dispersed green building requirements into one chapter of the Seattle Land Use Code. However, the local governments may tailor industry-made standards to the local needs, since rating systems like the LEED system usually do not differentiate across jurisdictions.

A growing idea of dual federalism in the U.S. indicates that on the one hand the federal and the local efforts should complement each other in environmental regulation.[682] On the other hand, local efforts matter a lot in the face of the federal government's inaction. The US GB law has followed this idea. For instance, the Energy Independence and Security Act of 2007 (EISA)[683] required the USDOE to set standards on energy efficiency, and where the USDOE fails to finalize the standards within two years, states would be allowed to make their own standards.[684]

It remains to be seen to what extent GB laws at the state or local level can survive the pre-emption doctrine.[685] The pre-emption doctrine has been

industry with lax environmental regulation even though the relaxation cannot really attract business. But by doing so, the politicians can claim that they have tried to attract new business at best. If firms place themselves elsewhere than the state, the public cannot blame the politicians for that. *Id*., at 78-79.

[679] *Id*., at 75.

[680] For instance, the Clean Water Act (CWA) does not allow the states to adopt or enforce water standards less stringent than those laid down under the Act. See 42 U.S.C. sec 1370 (1994).

[681] Adler, J. H., 'Free & Green: A New Approach to Environmental Protection', (34) 2001 *Harvard Journal of Law & Public Policy*, at 690-691.

[682] Engel, K. H., 'Harnessing the Benefits of Dynamic Federalism in Environmental Law', 56 (2006) *Emory Law Journal*, at 161-162.

[683] Public Law No. 110-140 (2007), 121 Stat. 1492 (codified at 42 U.S.C.ch. 152 § 17001 et seq.)

[684] *Id*., Tit. III.

[685] The pre-emption of the federal law came from a 1963 decision of the US Supreme Court, in which the Court invalidated a California law that imposed minimum fat content standards for avocados sold in the state. The case is often cited as an example of pre-emption issues. See *Florida Lime & Avocado Growers, Inc. v. Paul*, 373 U.S. 132 (1963).

used against some local standards for the HVAC equipment in buildings. A group of plaintiffs, including three trade associations representing manufacturers, distributors, installers of the HVAC products water heaters, and twelve local distributors who sell and install HVAC products, filed a suit against the District of New Mexico. The plaintiffs claimed that the federal laws, primarily the Energy Policy and Conservation Act and the National Appliance Energy Conservation Act, pre-empted the proposed energy conservation codes for HVAC equipment in the city of Albuquerque. [686] In October of 2008, Judge Vazquez had granted the plaintiffs' application for a preliminary injunction against the enforcement of Albuquerque's Energy Conservation Code, given the fact that certain portions of the Code are pre-empted by federal law.[687] As the federal government is taking the lead in GB promotion, the state and local governments need to be more cautious about GB standard setting, particularly when they tend to have more stringent standards than their federal counterparts. A more stringent state or local standard will be watered down if it cannot survive the pre-emption doctrine.

4.1.2 Using industry-based standards, but retaining the authority to change and enforce

There are two ways in which GB regulation in the US works with private standards. One is to let the government develop its own rating system, as is the case with GB standards in New York State.[688] In another way, some local governments may incorporate an industry-based GB rating system into a building or zoning code, and meanwhile retain the authority to issue permits and to inspect. The incorporation of an industry-based certification appears to be more common, and has been in existence in the states like California,[689] and Washington for some time.[690]

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[686] See AHRI et al. v. The city of Albuquerque, No. CIV-08-633 (D.N.M 2008), quoting Shapiro, S., 'Green Federalism--The Rising Conflict Between Local and Federal Regulation of High-Performance Buildings,' article on LexisNexis Real Estate Law Blog, published on 14 November 2008, available at https://www.lexisnexis.com/legalnewsroom/real-estate/b/real-estate-law-blog/archive/2008/11/14/green-federalism-the-rising-conflict-between-local-and-federal-regulation-of-high-performance-buildings.aspx?Redirected=true, last visited February 2017.

[687] *Ibid.*

[688] NY GB Act enlists the Office of General Service, in company with other government entities, to come up with a set of GB standards. The Office of General Services in New York is encouraged by the Act to invite suggestions or comments from the GB industry parties, such as the USGBC. N.Y. Pub. Bldgs. L. (2010), Article 4-C, § 83.

[689] The CALGB Code does not incorporate any existing certifications in GB mandates, and only in a few cases it refers to the Energy Star or draws on some specific requirements in the LEED system without conferring on the LEED program. See in general Cal. Code Regs., tit. 24, Part 11 (2008), cps 4-8

[690] See Wash. Rev. Code 39.35 D.080.

The government-made GB standards may not face the non-delegation or monopoly concern since the standards are made and enforced by regulators. The incorporation way does not necessarily go against the non-delegation principle unless it overly gives private entities the power to permit and inspect.[691] Sometimes the government may incorporate industry-based rating systems without referring to a certain version of the system. In that case, the standards may be changed by private parties without due process, which may not accord with the intelligible principle of the non-delegation doctrine.[692] Some of the state and local GB laws have come up with some solutions to obey the non-delegation principle. For instance, if the government plans to use the LEED system, it can articulate the LEED standard in the building or zoning codes as an appendix, rather than referring to the LEED system as a whole. Alternatively, the government can provide regulatory control over the change of industry standards. For instance, the GBs Act in Illinois requires that the industry rating system incorporated shall be analyzed and evaluated by the Capital Development Board.[693]

Government-led monopolies may be another concern around the mix of regulation and private standards. When GB compliance becomes mandatory, the industry-based GB certification and the products it referred to may become dominant in the market. In that case, the GB regulations may *de facto* reduce the competition and create an entry barrier for better building standards/products.[694] For instance, in an old version of the LEED system, the USGBC required that the wood used in a LEED project should be verified by the Forest Stewardship Council (FSC), which resulted in a battle between the FSC and the Sustainable Forestry Initiative (SFI) program.[695] The LEED's exclusive use of the FSC rating system has been accused of violating anti-trust laws when adopted by the municipal governments.[696] Yet a remedy for the excluded parties may not always be

[691] Teyber (2014), *supra* note 614, at 843-844.
[692] *Ibid*.
[693] 20 ILCS 3130/1, sec. 15 (g)
[694] See Chapter III, Section5.3.
[695] See Del Percio (2009), *supra* 616, at 239-342.
[696] The USGBC itself has tried to fix the problem. As of 2016, the USGBC seems to open the door to wood certification programs other than the FSC. The USGBC introduced the Alternative Compliance Path (ACP) pilot to close a loophole in the current raw materials credit that required only a certain percentage of wood be FSC-certified. The ACP pilot would require that 100 percent of the wood in a project is verified by a legal source, as defined by ASTM D7612-10. See USGBC, 'USGBC Announces New LEED Pilot ACP Designed to Help Eliminate Irresponsibly Sourced Materials—Like Illegal Wood—From the Building Material Supply Chain,' Published on 5 Apr 2016, available at http://www.usgbc.org/articles/usgbc-announces-new-leed-pilot-acp-designed-help-eliminate-irresponsibly-sourced-materials—, last visited March 2017.

However, this may not fully solve the anti-trust problem. It is likely that the old version of the LEED system is still working when referred to by some GB mandates. For instance, LEED v 2009

workable as the US Supreme Court has established a state-action immunity doctrine, which allows the state and local governments to be immune from an anti-trust action against their anticompetitive standards under the FTC or the DOJ. This doctrine can also apply to provide immunity to non-state actors if a two-pronged requirement is met: a) there must be a clearly articulated policy to displace competition; b) there must be active supervision by the state of the policy or activity.[697] According to the doctrine, industry entities making the GB regulations can justify their anti-competitive activities by proving that the state authorized the activities.[698]

4.1.3 Targets with performance standards

In the federal GB laws, GB standards mostly come as target standards for building energy efficiency or for the GHG emissions of building activities. For instance, the EISA 2007 set a goal to reduce the fossil fuel use of all the newly-built or retro-fitting buildings by 50% as of 2010, compared to the baseline year 2003.[699] The EPA 1992 established the federal building energy efficiency standards without determining the methods used to meet the standards.[700] Also in the GB laws at the state and local level, target standards have been around for some of the GB elements. For instance, the CALGB Code has as its aims to reduce energy use by 15%, [701] water use by 50%; [702] to recycle/recover 50 % of non-hazardous construction/demolition (C/D) wastes of both residential and nonresidential buildings.[703]

By contrast, specification standards are barely seen in the GB law, especially those at the federal level. One of the reasons could be that specification standards provide few incentives for firms to control pollution or develop cheaper technologies of abatement.[704] Besides, GB is highly context-based, which implies that a specific GB technique may not always be workable across jurisdictions

(or LEED V3) requires parties to ensure that the FSC-certified wood products are installed and quantify the total percentage of FSC- certified wood products installed. See USGBC, 'LEED 2009 for New Construction and Major Renovations', at 55, full text available at http://www.usgbc.org/Docs/Archive/General/Docs5546.pdf, last visited March 2017.

[697] See *Parker v. Brown* 317 U.S. 341 (1943); *California Retail Liquor Dealers Assn. v. Midcal Aluminum, Inc.*, 445U.S. 97 (1980).

[698] Prum, Aalberts and Del Percio (2012), *supra* note 617, at 222

[699] Public Law No. 110-140 (2007), 121 Stat. 1492 (codified at 42 U.S.C.ch. 152 § 17001 et seq.)

[700] 106 STAT. 2776, Public Law 102-486 (1992), 102d Congress (codified at 42 USC 13201), § 101.

[701] *Id.,* tit. 24, Part 11, sec 503.

[702] *Id.,* tit. 24, Part 11, sec 603.

[703] *Id.,* tit. 24, Part 11, sec 708.

[704] Ogus (1994), *supra* note 180, at 168.

Target standards primarily work as total environmental quality control, and hence have little to say about how individual firms should perform. In that sense, target standards may be prone to private interest, as noted in theory. [705] Therefore, target standards need to be translated into performance standards that can directly affect individual behavior.[706]

It can be seen that performance standards are more common in GB regulations at the state or local level, in conjunction with building permits. [707] Some of those performance standards are mandatory in principle, with exemptions in cases where the compliance is not economically or technically feasible. This corresponds to the theoretical point that the best available techniques not entailing excessive costs ('BATNEEC'), rather than the best practicable environmental option ('BPEO'), are more likely to be used in performance standards applicable to firms.[708] For instance, in Illinois, if the applicant for a building permit can prove that GB compliance is an "unreasonable financial burden," s/he may get a waiver granted by an appropriate agency.[709] The state GB law in Washington also makes an exemption available if the agencies and the design team can reason that by no means can the project meet the LEED Silver standard.[710]

4.2 Command-and-control instruments

4.2.1 Building permit

A possible way to regulate GB compliance is to make it a requirement in building permits, which has been the case in cities like Chicago[711] and Seattle.[712] Permitting is *ex ante* in nature, due to which it may not help to achieve GB compliance over a building's lifecycle. On that account, the City of Pleasanton, California, has come up with a life-cycle permit. According to the city's GB ordinance, it needs to go through four stages for a building permit to be issued: a) the applicant submits application materials and completes "pre-permitting review" in company with a review process for building design; b) a GB official will review the construction prior to issuance of an occupancy permit; c) the GB official

[705] *Id.*, at 212.
[706] *Id.*, at 210.
[707] See, e.g. Wash. Rev. Code 39.35D.040; Log Angeles Mun. Code 16.10 & 16.11.
[708] Ogus (1994), *supra* note 180, at 207.
[709] See 20 ILCS 3130/1(e) (1).,
[710] Wash. Rev. Code 39.35D.020 (5) (b).
[711] For more information see City of Chicago, 'Green permit', available at https://www.cityofchicago.org/city/en/depts/bldgs/provdrs/green_permit.html, last visited March 2017.
[712] See Seattle Department of Constructions and Inspections, 'Priority Green Expedited', available at http://www.seattle.gov/dpd/permits/greenbuildingincentives/prioritygreenexpedited/default.htm,

then re-inspects the premises after one year; d) the GB official inspects again after five years, to ensure that the building remains in compliance.[713] In this case, the regulatory process does not end after the issuance.

In order to implement a lifecycle permit, the government needs to consider when the permitting system should end, and at what point a permittee can rely on the issuance of a permit in making investments, improvements, leasing the premises. Some of the GB laws at the state or local level require developers to get the industry-based certification, which may sometimes call for final documents that are not available until the construction is done. For instance, the LEED v. 3.0 requires building stakeholders to report energy and water-usage data for five years after a building is issued a permit of occupancy.[714] If the reporting requirement is not satisfied, certification can be revoked. The de-certification may lead building professionals to be liable for a failure to achieve the certification, and it is likely that the statutes of limitations would often expire five years after the building is issued a certificate of occupancy.[715]

4.2.2 Land use planning and zoning

Increasingly, land use planning and zoning are used to promote GBs in pursuit of public health and environmental protection.[716] At the federal level, EO13514, followed by EO13693, has put forward land planning for a more efficient transportation network, in conjunction with an environmental impact assessment.[717] In recent years, the USEPA has taken GB compliance as a way to redevelop brownfields,[718] for GBs can "revive

[713] See Pleasanton, Cal., Mun. Code 17.50.070 (2006), (D) (1) – (3).

[714] See USGBC, 'LEED 2009 for New Construction and Major Renovations', at 43-44, full text available at http://www.usgbc.org/Docs/Archive/General/Docs5546.pdf, last visited March 2017.

[715] The statutes of limitations for common-law claims are mostly laid down in the state statutes and may vary from state to state. See Jeanne Schubert Barnum and Levi Jones, 'Green Building: Limitations Clock Starts at First Sign of Trouble,' an article on the American Association Bar, September 10, 2012, available at http://apps.americanbar.org/litigation/committees/construction/email/summer2012/summer2012-0912-green-building-limitations-clock.html, last visited March 2017.

[716] For instance, the Standard State Zoning Enabling Act requires that state and local land use regulations should be "designed to lessen congestion in the streets; to secure safety from fire, panic, and other dangers; to promote health and the general welfare; to provide adequate light and air; to prevent the overcrowding of land; to facilitate the adequate provision of transportation, water, sewerage, schools, parks, and other public requirements. See The Standard State Zoning Enabling Act (SZEA) of 1926, section 3. Full text available at http://landuselaw.wustl.edu/StndZoningEnablingAct1926.pdf, last visited March 2017.

[717] See E.O. 13693 (2015), *supra* note 545; E.O. 13514, *supra* note 537, Sec 2 (e) (iii).

[718]GBs as the Brownfields Pilot Projects included the Springfield in Massachusetts; the National Aquarium in Baltimore's Center for Aquatic Life and Conservation in Baltimore, Maryland; ReGenesis District Redevelopment in Toledo, Ohio; Word Headquarters for Heifer International in Little Rock, Arkansas; the Trailnet, Inc. Trailhead Building in St. Louis, Missouri; a Community Culture and Commercial Center in Kauai, Hawaii; and the Volcanic Legacy Discovery Center in Mount Shasta, California. See USEPA, 'Green Buildings on Brownfields Initiative: Pilot Projects Fact

these sites and promote growth and development."[719] GB compliance appears to be more frequently required by the local planning and zoning codes. For instance, in Cambridge, Massachusetts**,** any new or existing building project of 25,000 square feet or more is required to meet GB requirements laid down in the city's Zoning Ordinance.[720] The Zoning Code for the Town of Normal, Illinois, also mandates that all new construction should be certified by the LEED in its latest version.**[721]** Some other cities like Seattle are on the way to incorporating GB compliance into the land use code.[722]

Nevertheless, as noted in the theoretical framework, GB compliance may not always accord with existing land use planning and zoning. The government's plan for affordable housing may not stand comfortably with GB requirements in the zoning codes.[723] At first sight, affordable green housing is a contraction in terms, given the higher first cost of GB. Building stakeholders may still think of GBs as high-end or costly projects. Perhaps on that account, some state or local governments combine green zoning with ex-ante subsidies to help municipalities reach their affordable housing targets.[724] Apart from the governments, the USGBC has also been aware of the first cost concern. In 2009, the USGBC came up with the LEED Neighborhood Development rating system, in which 7 points are awarded for dwelling units priced for households below the average income.[725]

The second concern may arise about the preservation of historical and cultural sites. It could be the case that installations of equipment for energy efficiency, e.g., solar panels, or renovations of an HVAC system,

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Sheet,' November 2002, available at https://nepis.epa.gov/Exe/ZyNET.exe/P1000XR8.TXT?ZyActionD=ZyDocument&Client=EPA&Index=2000+Thru+2005&Docs=&Query=&Time=&EndTime=&SearchMethod=1&TocRestrict=n&Toc=&TocEntry=&QField=&QFieldYear=&QFieldMonth=&QFieldDay=&IntQFieldOp=0&ExtQFieldOp=0&XmlQuery=&File=D%3A%5Czyfiles%5CIndex%20Data%5C00thru05%5CTxt%5C00000015%5CP1000XR8.txt&User=ANONYMOUS&Password=anonymous&SortMethod=h%7C-&MaximumDocuments=1&FuzzyDegree=0&ImageQuality=r75g8/r75g8/x150y150g16/i425&Display=hpfr&DefSeekPage=x&SearchBack=ZyActionL&Back=ZyActionS&BackDesc=Results%20page&MaximumPages=1&ZyEntry=1&SeekPage=x&ZyPURL, last visited March 2017.

[719] Edwards, A. L., 'When Brown Meets Green: Integrating Sustainable Development Principles into Brownfield Redevelopment', 18 (2009) *Widener Law Journal*, at 861.

[720] CAMBRIDGE, MASS., ZONING ORDINANCE § 22.000 *(2011)*,

[721] NORMAL ILL., CODE § 15.17-14 (1969), Amended 5/18/09 by Ord. No. 5258.

[722] See Seattle Department of Constructions and Inspections, 'Green Building Permit Incentives', available at http://www.seattle.gov/dpd/permits/greenbuildingincentives/, last visited March 2017.

[723] See Chapter III, Section 6.2.2.

[724] Wolf (2011), *supra* note 295, at 961-962.

[725] See USGBC et al., 'LEED 2009 for Neighborhood Development Rating System', May 2011, full text available at http://www.growsmartri.org/training/LEED%20for%20Neighborhood%20Development%20Rating%20System%20v2009%20(Updat.pdf, last visited March 2017.

may foul the landscape of historical value. The GB law in Illinois tackles this issue by giving exemptions when GB compliance "would compromise the historic nature of the structure."[726]

Lastly, land use regulation often travels with taking claims, which may also plague GB compliance that would probably restrict the use of land. However, in the US legal system, GB compliance regarding land use may face less taking claims than other land regulations do.[727] In the US case law, regulatory restrictions on land use may be deemed as takings if and only if they reduce the economic value or the utility of properties without just compensation.[728] GB requirements, unlike other zoning laws, would not significantly reduce the utility of land; instead, it even encourages property owners to make the best use of land, as is the case with brownfields redevelopment. Moreover, it can be hard for property owners to prove that GB compliance leads to a much lower economic value of the property.[729] Conversely, GB compliance may avail building stakeholders with economic incentives, e.g., higher premiums for the landlord, or a lower operation cost for end-users.[730]

4.3 Market-based instruments

4.3.1 Tax reductions and impact fees

The US GB law mostly provides tax reductions for GBs, rather than taxing non-green properties. At the federal level, tax reductions are given to enhance energy-related GB performance. For instance, the EPAct2005 provided the owners of commercial or residential buildings with financial incentives to improve HVAC systems or related insulation.[731] At the state and local level, governments relieve taxes for the LEED-certified buildings.[732] Those tax credits are available for commercial and residential

[726] 20 ILCS 3130/1, (e) (4).
[727] Hirokawa (2012), *supra* note 45, at 552.
[728] The US Constitution in its 5th Amendment provides that private property "shall not be taken for public use, without just compensation." The identification of taking was summed up in Agins v. The city of Tiburon, in which regulatory restrictions on properties will be taken as takings "if the ordinance does not substantially advance legitimate state interests." Later in Lingle v. Chevron U.S.A. Inc., the Court ruled out the Agins test as a way to tell whether or not a regulatory activity constitutes a taking. To file a taking suit, the plaintiff must assert either a physical taking, i.e., a total deprivation/occupation regulation, or a land-use exaction that deprives a property owner of all economically beneficial uses of their properties. See *Agins v. The city of Tiburon,* 447 U.S. 255 (1980); *Loretto v. Teleprompter Manhattan CATV Corp.*, 458 U.S. 419 (1982); and *Lucas v. South Carolina Coastal Council*, 505U.S.1003 (1992).
[729] Hirokawa (2012), *supra* note 45, at 554-555.
[730] See Chapter II, Section 2.1 and Section 2.3.
[731] Pub. L. No. 109-58, 119 Stat. 594 (2005) (codified as amended at 42 U.S.C. ch. 134 § 13201 *et seq.)*, §1331
[732] Arizona offers tax relief to LEED-certified data centers. Maryland has extended the Sustainable Communities Tax Credit Program to high-performance buildings that meet or exceed the LEED gold

buildings. In a few cases, they are also used as rewards for the recovery of a historical site.[733]

Tax reductions may be implemented more quickly in terms of due process. However, tax reductions may give rise to a continuing loss of revenues. Perhaps on that account, the New York State only delegates the power to reduce the tax to a certain number of the local governments. For instance, tax reductions can be given to green roofs in cities of one million or more by $ 4.5 per square foot.[734] In another case, a property tax exemption is available in a city with a population of not less than 130, 000 and not more than 160, 000 for LEED-certified buildings.[735] Moreover, the tax reduction is not available forever in the New York State; instead, they will be phased out gradually after seven to ten years.[736]

Apart from tax reductions, tax increment financing (TIF) was in place for green infrastructure development or the brownfield redevelopment.[737] With the TIF, municipalities will divert future property tax revenue that increases from a defined area to a public improvement project in the community. By the year 2004, 50 states in the US have authorized the use of TIF,[738] some of which incorporate GB standards to evaluate projects requesting TIF.[739] However, in recent years the TIF has been found misused for urban sprawl and of less actual impact on green projects promotion.[740] The designation of the TIF has two requirements: a) an area

standards and provide for a tax credit for the rehabilitation of small commercial properties under specified circumstances. Louisiana also provides tax credits for solar energy systems. Washington requires the commission to establish standards for the energy efficiency of available housing, and provide tax exemptions for residential buildings satisfying the standards. For more information about the state and local tax reductions for GB in the US see USGBC, 'Better Buildings, Better Policy: A Compilation of Green Building Policy Adoptions in the United States (2011-2014)', the USGBC resources, 19 August 2014, full text available at http://www.usgbc.org/sites/default/files/STATE_WINS_REPORT_2014-3.pdf, last visited March 2017.

[733] For instance, New Hampshire allows towns and cities to launch tax relief programs for the preservation and re-use of historical buildings. See New Hampshire, SB 0080, Chapter 0078 (Effective 04/01/2013).

[734] See 1 RCNY §105-01, Chapter 100.

[735] *Id.*, Chapter 441.

[736] *Id.*, Chapter 14.

[737] Merk, O., et al., 'Financing Green Urban Infrastructure', OECD Regional Development Working Papers 2012/10, OECD Publishing, at 36. Full text available at https://www.oecd.org/gov/regional-policy/WP_Financing_Green_Urban_Infrastructure.pdf,

[738] Council of Development Finance Agencies (CDFA), 'TIF State-by-state Report,' CDFA 2008 research report, December 2008, at 1. Full text available at https://www.cdfa.net/cdfa/cdfaweb.nsf/0/8ee94afeece08bc988257936006747c5/$FILE/CDFA-2008-TIF-State-By-State-Report.pdf, last visited March 2017.

[739] The city of Columbia, 'Tax Increment Financing: Frequently Asked Questions', at 3, available at https://www.como.gov/wp-content/uploads/TIF_FAQ.pdf, last visited March 2017.

[740] LeRoy, G., 'Greenfields, and Sprawl: How an Incentive Created to Alleviate Slums Has Come to Subsidize Upscale Mall and New Urbanist Developments,' (60) 2008 *Planning and Environmental*

should be blighted; b) the development would not take place but for the incentive. The two requirements of the TIF, however, have nothing to say about the specific conditions on which the TIF can apply. As a result, the two requirements may be somewhat relaxed by states,[741] and "become merely a gesture of formality to justify that the TIFs are not simply giveaways to developments that would have occurred anyway."[742]

In practice, the TIF for green projects can be abused for turning farmland into commercial districts that bring more revenues to the localities.[743] Moreover, the TIF gives the governments a chance to condemn homes for a private development project, which may lead to taking actions within a TIF district.[744] Those concerns have been addressed by some of the state and local laws. For instance, California passed legislation to put off nearly 400 redevelopment agencies that implemented the TIF in the jurisdiction. The legislation also provides some measures to stabilize school funding by reducing the diversion of property taxes from the public sector.[745]

4.3.2 Public procurement

The ARRA provides funds for the governments at all levels to buy GB products. [746] Also, a set of executive orders required the federal government to support GB products. For instance, EO 13693 requires renewable energy use in the federal government buildings, [747] and mandates federal entities to buy green products. Likewise, governments at the state or local level also put in place GB compliance through executive orders or programs authorized by the federal law. The New York Governor signed Executive Order No. 111, requiring that all the new buildings owned or occupied by the state agencies, should be built in line

Law, at 3.

[741] Youngman, J., 'TIF at a Turning Point: Defining Debt Down,' Lincoln Institute of Land Policy Working Paper No. WP11JY1, June 2011, pp. 11-12. Full text available at https://www.lincolninst.edu/sites/default/files/pubfiles/1914-1232-tif-final.pdf, last visited March 2017.

[742] Merk, O., et al. (2012), *supra* note 737, at 38.

[743] LeRoy, G. (2008), *supra* note 740, at 10.

[744] In Kelo v. The city of New London, for instance, the City of New London, Connecticut, tried to condemn a privately owned property to make it a part of a "comprehensive redevelopment plan." At that point, the states and municipalities had slowly extended their use of the eminent domain for economic development. In the Kelo case, Connecticut had a statute allowing the eminent domain for "economic development" even in the absence of blight. In a 5–4 decision, the US Supreme Court ruled that the private redevelopment plan can contribute economic growth and hence bring general benefits to the community. Therefore, the private redevelopment plan could qualify as permissible public use" under the Takings Clause of the Fifth Amendment. See *Kelo v. City of New London*, 545 U.S. 469 *(2005)*.

[745] Lefcoe, G., Gand Swenson, C. W., 'Redevelopment in California: The Demise of TIF-Funded Redevelopment in California and Its Aftermath', 67 (2014) *National Tax Journal*, pp. 719-744.

[746] Public Law No. 94-163, 89 Stat. 871(codified at 42 U.S.C.§6872).

[747] EO 13693, Sec 3 (b).

with the guidelines on GB compliance to the maximum extent practicable.[748]

Affordable housing programs have been another way for the government to finance residential GBs. The ARRA makes $5 billion available for the Weatherization Assistance Program to make energy-efficient homes affordable for low-income homeowners.[749] Authorized by the federal law, some state governments have made GB performance part of their affordable housing plans. For instance, California makes a legislative declaration that it is the goal of the state to install solar energy systems for low-income residential housing. Correspondingly, the Single-Family Affordable Solar Homes Program was implemented.[750] The Washington government has put the LEED into its affordable housing scheme, in which case "the Department of Community, Trade, and Economic development shall identify, implement, and apply a sustainable building program to affordable housing projects that receive housing trust fund in a state capital budget."[751]

In theory, public procurement may jump-start GB compliance and make private stakeholders aware of, and invest in, GB compliance.[752] There has been some empirical evidence showing a positive relationship between the adoption of government GB procurement policies and the number of LEED-certified private buildings.[753] Another study compared cities of similar size and environmental preferences and found that the LEED standard prevails twice as fast among private developers in cities with GB public procurement policies, compared to those without such policies.[754] It is noteworthy that government spending should not overly crowd out private parties in the GB market.

The reason why green public procurement makes practical sense may sometimes be different from what was expected in theory. A study has suggested that public procurement does encourage building professionals to invest in GB skills; but it may not make a significant difference in making consumers, developers, and suppliers more aware of the LEED

[748] Exec. Order No. 111 (N.Y. 2001), II (B).
[749] Public Law No. 94-163, 89 Stat. 871(codified at 42 U.S.C.§6872)
[750] See Grid Alternatives, 'Single-Family Affordable Solar Homes (SASH) Program: Semi-Annual Program Status Report,' January 2017, full text available at http://gridalternatives.org/sites/default/files/Semi%20Annual%20SASH%20Program%20Status%20Report_January%202017.pdf, last visited March 2017.
[751] RCW 39.35D.080.
[752] See Chapter III, Section 6.3.4.
[753] See Simcoe and Toffel (2012), *supra* note 350, pp. 411-434.
[754] *Ibid.*

certification.[755] At other times, public procurement may be effective for various reasons including demonstration effects, moral persuasion, scale economies, learning effects, anticipated regulatory changes, and GB policies that provide preferential treatment in building permits.[756]

4.3.3 Green loans and PACE financing

The federal law authorized the state and local governments to work with lenders (e.g., banks) to provide green builders with loans at a lower interest rate. For instance, in support of energy efficiency improvements in buildings, the California Housing Finance Agency is authorized to make grants to buyers of residential structures, in conjunction with the Federal Housing Administration (FHA) Energy Efficient Mortgage Program.[757] The USHUD promoted the Property Assessed Clean Energy (PACE) program to finance energy efficiency, renewable energy, and water conservation upgrades to buildings.[758] A PACE loan will fully cover a project's costs and be repaid for up to 20 years through property assessments, in addition to the regular property taxes. The PACE loan will be attached to the property upon sale and can be shared with tenants.[759]

The PACE has two advantages that may make it accepted by governments and property owners. Firstly, a PACE loan is a debt tied to properties, and not to a property owner. Any balance of a PACE loan remains intact when ownership of the property changes hands.[760] In that case, property owners may be less likely to get stuck in the cost of installing energy-efficient equipment. The PACE tax assessment is not like any traditional property tax assessment; hence some states may single it out through legislation to empower municipalities to create a PACE program.[761]

Secondly, a PACE loan showcases better financing terms by virtue of the priority given to tax liens when default occurs.[762] In principle, property tax assessments are superior to mortgage loans or other liens on a property,

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[755] *Ibid.*
[756] *Ibid.*
[757] See California Housing Finance Agency, 'Cal-EEM + Grant Program,' available at http://www.calhfa.ca.gov/homebuyer/programs/eem.htm, last visited March 2017.
[758] PACENation, 'What is PACE,' available at http://pacenation.us/what-is-pace/, last visited March 2017.
[759] *Ibid.*
[760] USHUD, 'FHA Single Family Housing Policy Handbook,' The HUD transmittal, December 2016, at 551-584. Full text available at: https://portal.hud.gov/hudportal/documents/huddoc?id=40001HSGH.pdf, last visited March 2017.
[761] *See, e.g.,* MINN. STAT. § 216C. 436 (2) (11) (2010). For more information about the state PACE laws see PACENation at http://pacenation.us/pace-programs/, last visited March 2017.
[762] Cox, P., 'Keeping Pace?: The Case against Property Assessed Clean Energy Financing Programs', (83) 2011 *University of Colorado Law Review*, at 92.

regardless of the date on which the first or secondary liens are registered.[763] In that case, local governments and investors in PACE loans can get the balance before any recovery requested by a mortgage lender.[764] This would probably make investors feel more secure and hence worry less about the property owners' ability to repay. Perhaps for that reason, the PACE financing may face lower transaction costs and reach more homeowners.[765]

The two benefits of the PACE financing, however, do not seem to make PACE loans well- accepted. On the one side, it might be illusory to say homeowners would be free from long-term PACE financing obligations, as homeowners (sellers) are not the only parties that leverage the bargaining.[766] Rational buyers will take into account any lien on a property, including a PACE lien. Throughout the bargaining, the sellers are likely to be asked by the buyers, or by the lenders who have secured interests in the properties, to fulfill the financing obligations on a PACE loan.[767] Alternatively, the buyers may take over the PACE financing obligations in return for a lower selling price of the property. In neither case will the PACE financing lead to lower transaction costs to property owners than a traditional private mortgage loan does.

On the other side, the priority given to a PACE lien appears to clash with the underwriting restrictions set up by the regulator.[768] In July 2010, the Federal Housing Finance Agency (FHFA) as a secondary mortgage market regulator put some restrictions on the PACE loans. The FHFA statement requires that mortgages that originated in a jurisdiction with a PACE program would be subject to significant restrictions. As a result, the state and local governments, together with environmental interest groups who supported the PACE financing, filed lawsuits to seek

[763] In foreclosure, liens on a property are put in order, in which case prior liens are paid before liens registered later. The prior liens are usually first mortgage liens, and the later liens are the secondary mortgage liens. Tax assessments are not subject to the priority rule of liens. In principle, unpaid property tax assessments are superior to other liens, regardless of the date the prior liens were registered or when the tax assessments became delinquent. See the Internal Revenue Code of 1986, 26 U.S.C. § 6323(b).

[764] Cox (2011), *supra* note 762, at 95.

[765] White House, 'Policy Framework for PACE Financing Programs', 18 October 2009, at 4-6. Full text available at https://obamawhitehouse.archives.gov/sites/default/files/PACE_Principles.pdf, Last visited March 2017.

[766] Cox (2011), *supra* note 762, at 96.

[767] Coughlin, J., 'PV as an Eligible Measure in Residential PACE Programs: Benefits and Challenges', National Renewable Energy Laboratory (NREL) Facts Sheet Series on Financing Renewable Energy Projects, June 2010, at 3. Full text available at http://www.nrel.gov/docs/fy10osti/47845.pdf, last visited March 2017.

[768] See FHFA, 'FHFA Statement on Certain Energy Retrofit Loan Programs', 7 June 2010, available at https://www.fhfa.gov/Media/PublicAffairs/Pages/FHFA-Statement-on-Certain-Energy-Retrofit-Loan-Programs.aspx, last visited March 2017.

injunctions or declarations against the underwriting restrictions.[769] Governments and environmental groups tend to assert that PACE financing is not a loan, in analogy to any other tax assessment used by local governments to pursue public interest.[770] The PACE financing by its nature is not different from a loan, despite the fact that it may work for the public interest.[771] Apart from litigations, the PACE advocates also lobbied for the passage of a bill introduced in Congress, hoping to resolve the conflict between PACE programs and the underwriting restrictions.[772] The bill did not get passed in the end.

Since neither of the efforts worked through, many state and local governments have diverted the PACE financing from residential energy improvements to energy investments by commercial entities.[773] Some homeowners also pull out of the PACE programs due to a higher interest rate and transaction cost.[774]

Despite the concerns about the PACE, some PACE districts did report that the pilot PACE programs resulted in homeowners' willingness to pay for energy efficiency improvements.[775] This might have nothing to do with the PACE financing in its original form, but with the local governments'

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[769] The governments and environmental groups as plaintiffs asserted that there was no rational relationship between the action taken by the regulators and their statutory authority regarding safety and soundness of the lending institutions. In that sense, the regulators' actions violated the Administrative Procedure Act (APA). *See* County of Sonoma v. Fed. Hous. Fin. Agency, No. CV 10 3270 (N.D. Cal. July 26, 2010); Natural Res. Def. Council v. Fed. Hous. Fin. Auth., No. 10 Civ. 7647 (S.D.N.Y. Oct. 6, 2010); People *ex rel.* Brown v. Fed. Hous. Fin. Agency, No. C10-03084 BZ (N.D. Cal. July 14, 2010).

[770] See Sierra Club v. Fed. Hous. Fin. Agency, No. CV 10 3317 (N.D. Cal. July 29, 2010); People *ex rel.* Brown v. Fed. Hous. Fin. Agency, No. C10-03084 BZ (N.D. Cal. July 14, 2010).

[771] Cox further explains why PACE financing should be taken as a loan. Unlike a for-public tax assessment, homeowners go for PACE voluntarily, and the money flowing from PACE loans will be given to homeowners for energy efficiency improvements. On the side of lenders, PACE financing leads to another lien on the property to evaluate the value of the home as security in case of default by the homeowner on the mortgage loan. See Cox (2011), *supra* note 762, at 104.

[772] The bill was for the first time introduced in 2010 but did not get passed by the 111th Congress. See the PACE Assessment Protection Act of 2010, H.R. 5766, 111th Cong. (2d Sess. 2010). Later in 2014, the bill was brought up again in a previous session of the Congress but ended up a failure. See the 'PACE Assessment Protection Act of 2014', H.R. 4285 — 113th Congress.

[773] Clinton Climate Initiative et al., 'Policy Brief: Property Assessed Clean Energy (PACE) Financing: Update on Commercial Programs', 23 March 2011, at 2-4. Full text available at https://emp.lbl.gov/sites/all/files/POLICY%20BRIEF%20pace%20financing.pdf, last visited March 2017.

[774] Braaksma, A. et al., 'Report on a Property Assessed Clean Energy (PACE) Program for the City of Minneapolis, 2010, at 36-38. Full text available at http://law-prdweb.law.umn.edu/uploads/p0/Xo/p0Xo6vryak4O-5QNQl7XwA/PACE-REPORT-FINAL-pdf.pdf, last visited March 2017.

[775] See the City of Berkeley, California, 'Property Assessed Clean Energy ("PACE") Seismic Financing,' April 7, 2015, available at https://www.cityofberkeley.info/Clerk/City_Council/2015/04_Apr/Documents/2015-04-07_Item_13_Property_Assessed_Clean.aspx., last visited March 2017.

efforts to combine the PACE financing with other sanctions and incentive programs.[776]

4.3.4 Liability for indoor air pollution and brownfield reclamation

Product liability and liability for land contamination may lend some support to GB compliance in the US. In a few cases, a building or a structure as a whole has been taken as a product, to apply product liability rules for defects in design and construction.[777] For the time being only mobile homes and tract housing can be taken as products.[778] For GB compliance, it is more likely to hold companies liable for harm caused by building products containing hazardous substances (e.g., radon and asbestos).[779]

Liability for brownfield reclamation often relates to construction/demolition (C/D) waste treatment, which is regulated by the CERCLA, the RCRA, and the TSCA. Very likely building stakeholders would be held liable for land contamination when they excavate soil or engage in the actual management of hazardous substances disposal, according to the CERCLA.[780] As liability is more of a way to deal with harmful externalities,[781] it might not be well-suited to promote GB regarding energy efficiency.

As noted in theory, liability may at times under-compensate or under-deter, particularly when it comes to environmental harm.[782] The US GB law to some extent deals with those problems. The US law makes product

[776] Cox (2011), *supra* note 762, at 120-121.
[777] *See* Blagg v. Fred Hunt Co., 612 S.W.2d 321, 324 (Ark. 1981) (quoting Guiffrida, G. C., 'The Proposed Indoor Air Quality Acts of 1993: The Comprehensive Solution to a Far-reaching Problem,' (11) 1993 Pace Environmental Law Review, at 345-347.
[778] *Id.*, at 345-347.
[779] See Heady, G. J., 'Stuck Inside These Four Walls: Recognition of Sick Building Syndrome Has Laid the Foundation to Raise Toxic Tort Litigation to New Heights,' 26 (1995) *Texas Tech Law Review*, at 1049-1051.
[780] Under CERCLA, EPA can require liable parties to conduct cleanups. Alternatives, the EPA can conduct cleanup and subsequently seek cleanup costs from liable parties. The CERCLA defines a liable party as (a) the current *owner and operator* of a contaminated property; (b) any *owner or operator* at the time of disposal of any hazardous substances; (c) any person who arranged for the disposal or treatment of hazardous substances, or arranged for the transportation of hazardous substances for disposal or treatment; (d) any person who accepts hazardous substances for transport to the property and selects the disposal site. The CERCLA further clarifies that a person is an "owner or operator" of a facility (or property) if that person (1) owns or operates the facility, or (2) owned, operated, or otherwise controlled activities at that facility immediately before title to the facility, or control of the facility, was conveyed to a state or local government due to bankruptcy, foreclosure, tax delinquency, abandonment or similar means. See the CERCLA, Public Law 96-510, 94 Stat. 2767 (codified at 42 U.S.C. § 9601 etseq, section 107 and Section 101(20) (A).
[781] Kaplow, L., and Shavell, S., 'Property Rules versus Liability Rules: An Economic Analysis,' 109 (1996) *Harvard Law Review*, at 715.
[782] See Chapter III, Section 5.2.

liability a strict liability and provides punitive damages for the injured, in addition to the actual losses. For instance, in the Austin case, the plaintiffs sought punitive damages, along with damages for medical expenses, attorney's fees, and other costs, to compensate for the harm caused by exposure to hazardous substances in buildings.[783] However, the causation can sometimes be hard to prove, due to which a victim may be less willing to sue, given the high legal cost and a low possibility to win. Forum shopping seems to make it more likely for the victim to win. Some empirical evidence has shown that the plaintiffs in asbestos litigations tend to file a suit in jurisdictions with the most favorable legal rules, judges or juries.[784] Yet forum shopping may lead the number of trials to be too large for the court to handle in time. Hence the US court has made use of bifurcated trials, bouquet trials or consolidated trial to reduce caseload.[785] Together with the forum shopping, the three types of trials help to increase the damages directly and lead to a higher settlement rate.[786]

However, even if the harm is detected and proved, liability may under-compensates due to the judgment proof problem. This could be the case as the US law allows individuals, as well as companies, go bankrupt.[787]

[783] In Texas, a group of 86 plaintiffs at an elementary school, including 44 children and 42 adults, had been exposed to poor IAQ with hazardous substances. The plaintiffs showed different sick building syndromes (SBS), e.g., headaches, nausea, dizziness, throat and eye irritation and allergic reactions. In 1990, the plaintiffs filed a suit against 29 defendants, including materials manufacturers, material suppliers, mechanical engineers, architects, and contractors, who were liable for the harm for violating the Texas Deceptive Trade Practices-Consumer Protection Act (DTPA). Besides, the plaintiffs also sought relief under liability rules against the different types of defendants. By a strict liability rule, the plaintiffs claimed that the manufacturers produced products with hazardous chemicals and failed to test and take precautions against the danger inherent in the products. By a negligence rule, the plaintiffs alleged that at the planning and construction stages, the architects and contractors should be liable as they breached express and implied warranties that the school would be a safe and toxic-free place, and attempted to mislead the plaintiffs about the hazardous exposure. See Rogers v. Keller Martin Organization, quoting Gene j. Heady (1995), *supra* note 779, at 1049-1051.

[784] In her work, White examines how forum shopping and procedural innovations affect the outcomes of asbestos trials using a new data set of all asbestos trials from 1987 to 2003 in the US. See White, M. J., 'Asbestos Litigation: Procedural Innovations and Forum Shopping,' 35 (2006) *The Journal of Legal Studies*, at 365-366.

[785] In the case of consolidated trial, suits filed by different plaintiffs are heard by the same jury. The jury then makes separate decisions for each plaintiff. Bifurcation is a way to divide trials into usually two phases. After the first phase, the judge will delay the case and allow parties to negotiate. If the parties cannot settle, the judge will resume the trial. In most of the cases, liability will be determined in the first phase, followed by damages decided in the second phase; while this would go the other way around when it comes to asbestos trials. Bouquet trials are like consolidated trials but with a smaller group of plaintiffs representing a large group of claims. The decision of the bouquet trial would later be used as a model to settle all of the cases in the large group. *Id.*, at 366-367.

[786] There has been a study showing that having a bifurcated trial or a bouquet trial can increase plaintiffs' expected returns. Consolidated suits seem to have mixed impacts. Small consolidations with less than five claims make it more likely for plaintiffs to win and receive punitive damages; whereas large consolidations with more than five claims turn out to lower the expected returns. *Id.*, at 396.

[787] 11 U.S.C., §§ 101 to 112.

Perhaps for that reason, the law has tried to hold more parties other than the actual injurers liable for the harm. The CERCLA of 1980,[788] along with the Superfund Amendments and Reauthorization Act of 1986 (SARA),[789] and the Small Business Liability Relief and Brownfields Revitalization Act (2002),[790] imposes a strict liability on owners and operators, who will be jointly liable for the costs of cleanups. Lenders involved in loans would be liable for remedies if they have the ability to influence the borrower's hazardous waste disposal.[791] The US case law ever broadened the lender liability, putting lenders that took the title at a foreclosure sale in the same position as any other buyers.[792]

In theory, the liability rules may have different deterrent effects, which have also been reflected in lender liability in the US case law. The lender liability in its original form is likely to scare away lenders.[793] Correspondingly, the law has made available a security interest exemption for lenders, whereby a lender would not be liable if the lender only maintains a mortgage or lien on a property, but be liable for overwhelmingly getting involved in the actual management of the property.[794]

Generally, lender liability may get the damages better paid and put bad firms out of business.[795] Yet the different lender liability rules may affect injurers' activity level differently. It has been shown that a full lender liability does not necessarily score better than a no-lender-liability rule in terms of reducing accidents, since too broad a lender liability may lead to more accidents.[796] One of the reasons could be that the principal (the lender) alone will be discouraged from taking more care if the strict

[788] Pub. L. No. 96-510, 94 Stat. 2767 (1980) (codified at 42 U.S.C. §§ 9601–9675 (2006)).
[789] Pub. L. No. 99-499, 100 Stat. 1613 (1986) (codified at 42 U.S.C. §§ 9601–9675 (2006)).
[790] Pub. L. No. 107-118, 115 Stat. 2356 (2002) (codified at 42 U.S.C. §§ 9601–9675 (2006)).
[791] United States v. Fleet Factors Corp., 901 F.2d 1550, 1559 (11th Cir. 1990).
[792] Guidice v. BFG Electroplating & Mfg. Co., 732 F. Supp. 556, 563 (W.D. Pa. 1989).
[793] Prum (2013), at 433-434.
[794] The CERCLA provided a security interest exemption that excludes lenders from the owner/operator liability, provided that the lenders' activities are meant to protect their security interest in that facility and do not participate in the management of the facility on a daily basis. "Participation in management" does *not* include activities such as property inspections, requiring a response action to be taken to address contamination, providing financial advice, or renegotiating or restructuring the terms of the security interest. Of note, foreclosing on a property does not result in liability for a bank, provided the bank takes reasonable steps to convey the property "at the earliest practicable, commercially reasonable time, on commercially reasonable terms." See 42 U.S.C. § 9601(20) (F)(i), (iii) and (iv); 42 U.S.C. § 9601(20)(F)(i)-(ii); and 42 U.S.C. § 9601(20)(E)(ii).
[795] Pitchford, R., 'How Liable Should a Lender Be? The Case of Judgment-Proof Firms and Environmental Risk", 85 (1995) *American Economic Review*, at 1182-1183.
[796] *Ibid.*

liability comes without a contributory negligence defense.[797] Also, vicarious liability is said to induce a higher care level and a lower activity level of the agent (the actual injurer) if and only if the principal has better information about the risk and the agent's behavior than courts do.[798] However, if the principal faces an information problem and is not able to control the agent's behavior, he may not require the agent to take more care or engage less in the activity. It is also likely that the agent will be less incentivized to take care if he knows that the damages will be borne by others, given a joint and several lender liability.[799] Besides, an increase in liability will raise the cost of credit and drive some marginal firms out of business.[800] That said, lawmaking has to tradeoff between compensating for harm and having more accidents.[801]

4.4 Suasive instruments

4.4.1 VEA among public agencies

Voluntary environmental agreements (VEAs) have been around for decades in environmental governance. A Task Force of the USEPA recommended the administrator to house a voluntary compliance office in the USEPA. Where necessary, the EPA could use sanctions if the participants do not comply.[802] VEA agreements are likely to lead interests groups, industries and even individual citizens to environmental compliance, especially when governmental agencies are also involved.[803] Hence the US government has put in place VEAs through the federal regulation code.[804]

For GB, the Sustainable Buildings Memorandum of Understanding (SBMOU) was signed by the federal government agencies to commit to

[797] See Chapter III, Section 5.2
[798] Shavell (2004), at 232-235.
[799] *Ibid.*
[800] Pitchford (1995), *supra* note 795, at 1182-1183.
[801] *Id.*, at 1183.
[802] USEPA, 'Our Urban Environment and Our Most Endangered People: A Report to the Administrator of the EPA by the Task Force on Environmental Problems of the Inner City, September 1971, at 137.
[803] *Id.*, at 138.
[804] See 28 CFR § 35.173. [It provides that: (a) When the designated agency issues a non-compliance Letter of Findings, the designated agency should (1) Notify the Assistant Attorney General by forwarding a copy of the Letter of Findings to the Assistant Attorney General; and (2) Initiate negotiations with the public entity to secure compliance by voluntary means. (b) Where the designated agency is able to secure voluntary compliance, the voluntary compliance agreement should(1) Be in writing and signed by the parties; (2) Address each cited violation; (3) Specify the corrective or remedial action to be taken, within a stated period of time, to come into compliance; (4) Provide assurance that discrimination will not recur; and (5) Provide for enforcement by the Attorney General.]

GB performance.[805] In accordance with EO13423 and the USDOE guidelines, parties of the SBMOU work jointly to "establish and follow a common set of sustainable Guiding Principles (attached) for integrated design, energy performance, water conservation, indoor environmental quality, and materials aimed at helping Federal agencies and organizations."[806] For instance, the parties should optimize energy efficiency, compare actual performance data from the first year of operation with the energy design target, and enter data and lessons learned from sustainable buildings into the High-Performance Buildings Database. The SBMOU also gives special attention to waste treatment, requiring the parties to make use of the design to recycle or salvage at least 50 percent construction, demolition and land clearing waste, where markets or on-site recycling opportunities are available.[807] As a VEA, the SBMOU is made for internal management between the signatory parties, and it would not lead to any legally enforceable obligation and rights imposed on the parties.[808] It could be modified by the parties and would not be put off unless otherwise agreed.[809]

The SBMOU only applies to the federal government agencies, which appears to be less common in VEAs. A VEA in theory usually get involved in both private and public agencies, whereby the industry commits, governmental agencies support and sometimes environmental groups watch.[810] In pursuit of 20% energy savings in buildings, the USDOE seems to go for a partnership between the US government and the building industry through the Better Building Alliance. In the Alliance, owners, operators, and managers of buildings will work with the USDOE on a voluntary basis, taking advantage of the network and experts provided by the USDOE to develop GB technologies and make better buildings.[811] So

[805] E.O. 13423 Sec 2 (f).

[806] See 'Federal Leadership in High Performance and Sustainable Building Memorandum of Understanding,' 2006, at 1. Full text available at https://www.energystar.gov/ia/business/Guiding_Principles.pdf, last visited March 2017.

[807] *Id*., at 3-5.

[808] *Id*., at 2.

[809] *Ibid.*

[810] See Chapter III, Section 6.4.2. In recent years, an industry-based VEA has come into being between the International Code Council (ICC), ASHRAE, the American Institute of Architects (AIA), the Illuminating Engineering Society of North America (IES) and the U.S. Green Building Council (USGBC), in an attempt to jointly develop the LEED GB voluntary program. An agreement among the parties outlines the development, maintenance and implementation of new versions of the ANSI/ASHRAE/IES/USGBC Standard 189.1, which is likely to be a part of a regulatory tool. See USGBC, 'Leading Building Industry Groups Agree to Streamline Green Building Tool Coordination and Development,' the USGBC release, published on 21 Aug 2016, Available at http://www.usgbc.org/articles/leading-building-industry-groups-agree-streamline-green-building-tool-coordination-and-deve, last visited June 2018.

[811] See USDOE, 'Better Building Alliance: Winter 2016 Progress Update', Feb 2016, at 1, available

far the Alliance has more than 200 companies and organizations, and most of them have upon joining made commitments to the activities that support energy savings in commercial buildings.[812] Apart from technical solutions, the Alliance also deals with the financial aspect of GB compliance, in a way that the Leasing & Split Incentive team will continue to align financial and energy incentives for landlords/tenants through the Green Lease Leaders.[813]

The benefits of VEAs work both ways. On the one hand, VEAs allow the government to carry out "the pilot testing of new approaches and the absence of legislative authority to establish mandatory programs."[814] On the other hand, the industry parties may have face investigations or stringent regulations-to-come by joining a VEA.

In practice, some of the VEAs in the US may also work for GB compliance as a way to environmental governance. As one of the most successful voluntary compliance programs, the USEPA's 33/50 program was meant to reduce hazardous waste disposal, including those released to land, and had led thirty-four states to meet or exceed the Program's goal of a 50% reduction in releases and transfers of the targeted chemicals.[815] By and large, the 33/50 program is working as a VEA. Some empirical evidence shows that the 33/50 program participants experienced lower rates of governmental inspection, fewer enforcement actions, and lower levels of pollution.

Moreover, a VEA can be an effective tool to reduce pollution and save government costs when reasonably combined with regulatory and enforcement rewards for program participation.[816] It remains to be seen through empirical evidence whether or not VEAs on GB compliance will work out, as they are still limited in use in recent years.

Despite the advantages, VEAs can at some point be less effective when commitments are under-delivered. It is also likely that VEAs are misused

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at https://betterbuildingssolutioncenter.energy.gov/sites/default/files/attachments/Winter_2016_Progress_Report_0.pdf, last visited March 2017.

[812] *Ibid.*

[813] *Id.*, at 13

[814] See USEPA, 'The U. S. Experience with Economic Incentives for Protecting the Environment,' Part 10 'Voluntary programs,' 2001 EPA Report, January 2001, available at https://yosemite.epa.gov/ee/epa/eerm.nsf/vwAN/EE-0216B-11.pdf/$file/EE-0216B-11.pdf, last visited March 2017.

[815] USEPA, 'The 33/50 Program: The Final Record', EPA Archive Document No. EPA-745-R-99-004, March 1999, at 2. Full text available at https://archive.epa.gov/oppt/3350/web/pdf/3350-fnl.pdf, last visited March 2017.

[816] Innes and Sam (2008), *supra* note 382, at 271-293.

by the industries as shields from environmental regulation, due to which public interest groups will cast doubt on a VEA. For example, when the USEPA tried to give a regulatory relief for Performance Track participants in 2005, some environmental groups complained that the Agency was improperly trading away needed regulations and enforcement authority to induce facilities to join.[817]

4.4.2 Environmental information disclosure (EID)

The US law has made use of EID to encourage or oversee GB regarding energy use and waste disposal. In theory, EID can be relatively cheaper and easier to 'nudge' compliance, compared to the CAC instruments. In implementing EID, the law should clarify what kind of information should be disclosed by whom and how.

Information disclosure by various stakeholders can have different impacts. Sometimes the law may require the government to be the information provider. For instance, the EPA has built up an Energy Star Portfolio and a consensus-based industry Green Button data access system, which will gather and assess building performance on energy use.[818] The EPA also created a Toxic Release Inventory (TRI) to make parties better aware of hazardous wastes. Some studies find that the release of the information by the USEPA can result in positive outcomes such as better environmental behavior by firms,[819] or more spending on environmental and natural resource programs.[820] However, it may also lead to an inefficient allocation of benefits and costs for clean firms and polluters.[821]

At other times, the law requires private stakeholders to be the information disclosers. For instance, EO13415 encouraged vendors and contractors to register with a voluntary registry or organization for reporting GHGs emissions, making available their GHG inventory and description of measures on mitigation.[822] According to the CERCLA, a failure to report the release of hazardous substances may result in fines or imprisonment.[823] Also at the state level, the New York's State Green Building Construction

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[817] See a letter from John Walke, National Resources Defense Council, to the USEPA Docket ID OA-2005-0003 (Nov. 3, 2005), available at http://www.environmentalintegrity.org/pdf/publications/Press_Release_WalkeComments.pdf, last visited March 2017.
[818] EO 13693, Sec 3 (i) (A).
[819] Konar and Cohen (1997), supra note 363, pp.109-124.
[820] Patten, D. M., ' The Impact of the EPA's TRI Disclosure Program on State Environmental and Natural Resource Expenditures', 17 (1998) *Journal of Accounting and Public Policy*, pp. 367-382.
[821] Delmas, M., and Montes-Sancho, M.J., and Shimshack, J. P., 'Information Disclosure Policies: Evidence from the Electricity Industry', 48 (2010) *Economic Inquiry*, at 483-498.
[822] EO 13514, Sec 13.
[823] 42 U.S.C., Sec. 9603 (b).

Act requires parties at stake to report annually to the Office of General Services the information about energy consumption, water, and waste reduction, IAQ and maintenance processes.[824]

Generally, EID can be done in two ways, viz product labeling and reporting. [825] Labeling programs such as the LEED system and the ENERGY STAR are widely used for GB compliance in the US, and there is evidence showing significant premiums benefiting from the Energy Star and the LEED certifications.[826] Those labeling programs, when working in isolation, are self-regulatory in character. Those certifications are likely to be manipulated for private interest, in which case the environmental benefits flowing from them would be less than ideal.[827]

Reporting so far has not played a significant role in GB compliance, but it might be more workable since it provides some governmental supervision, as opposed to labeling as pure self-regulation. There are two basic ways of reporting, namely benchmarking and auditing. In the case of GB compliance, the former requires owners or occupiers to report some basic information about energy use to a government-made database. Energy auditing requires an assessment done by a building professional, e.g., an engineer licensed by the ASHRAE, reporting detailed information about building characteristics, HVAC systems, and occupancy status.

The two ways of reporting may differ in their costs,[828] and impacts on stakeholders' energy use behavior.[829] A study has shown that government-led energy audits can lead industries to commit to energy efficiency projects.[830] However, it might not be true to say auditing scores better than benchmarking in any case. On the one hand, energy auditing will have more to say about specific technologies or property ownership. The

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[824] *Ibid.*

[825] Stevens, R., 'Experience with Market-based Environmental Policy Instruments, in Handbook of Environmental Economics Volume 1 (North Holland, 2006), at 355-435.

[826] Eichholtz., P., Kok, N., and Quigley, J. M., 'Doing Well by Doing Good? Green Office Buildings,' 100 (2010) *American Economic Review*, pp. 2492-2509; Fuerst, F., and McAllister, P., 'Green Noise or Green Value? Measuring the Effects of Environmental Certification on Office Values', 39 (2011) *Real Estate Economics*, at 45-69.

[827] More about the self-regulation failure See Chapter III, Section 5.3.

[828] For instance, benchmarking in New York City is estimated to cost $500-$ 1500 per building; while auditing will be at around $1.50 per square meter, which could be greater an amount in total per building. Hsu, D., 'How Much Information Disclosure of Building Energy Performance is Necessary?', 64 (2014) *Energy Policy*, at 266.

[829] Aaron Ingle et al., 'Behavioral Perspectives on Home Energy Audits: The Role of Auditors, Labels, Reports, and Audit Tools on Homeowner Decision-Making,' Lawrence Berkeley National Laboratory Report, May 2012, at 12-16. Full text available at https://homes.lbl.gov/sites/all/files/ingle-lbnl-5715e.pdf, last visited March 2017.

[830] Anderson, S.T., and Newell, R.G., 'Information Programs for Technology Adoption: the Case of Energy –Efficiency Audits,' 26 (2004) *Resource and Energy Economics*, pp. 27-50.

information, however, can sometimes be proprietary information that is confidential and protected by law.[831] On the other hand, energy auditing may be more costly but less useful. In theory, environmental regulation uses more performance-based standards than specification standards.[832] At first sight benchmarking is more performance-based, and data for auditing says more about the specification. In that sense, benchmarking could do more to predict energy use and help to shape performance standards.

In practice, it is empirically shown that building-level variation is the most important factor in explaining building energy use, based on an analysis of a comprehensive dataset of New York City multi-family buildings.[833] In other words, benchmarking is less costly but can provide as good information as engineer auditing does. This indicates that information disclosure laws can gain more by requiring benchmarking data than engineering audits to predict the energy performance of buildings.[834]

Information can also work to change individual GB behavior.[835] All else being equal, buildings of the same type can have different levels of energy use intensity.[836] This implies that sometimes the way we use energy systems in buildings matters more than do the energy systems themselves. Information is said to work as non-price interventions when given in comparison and at the proper frequency.

In practice, information as a behavioral intervention has some implications in the US. A case in point can be the Opower program, in which energy use reports are mailed to customers over time. In partnership with some utility and electricity suppliers, the Opower company has been providing peer comparison reports for more than 10 million households in 22 states,[837] to show customers how much energy was used historically and to what extent they perform better (or worse) than their neighbors do in energy conservation.

The Opower program was tested in empirical studies to see whether or not it can work in different areas. A field experiment at 80, 000 households in Minnesota has shown that the monthly peer feedback could reduce energy

[831] See Chapter III, Section 6.4.1, at 62.
[832] Ogus (1994), *supra* note 180, at 166.
[833] Hsu (2014), *supra* note 828, at 265.
[834] However, by no means should the benefits of engineer auditing be denied. For instance, energy auditing can provide end-users with specific measures on energy conservation, so that the end-users will take action on energy efficiency. *Id.*, at 263.
[835] *Id*., at 270-271.
[836] *Id.*, at 271.
[837] Ayres, I., Raseman, S., and Shih, A., 'Evidence from Two Large Field Experiments that Peer Comparison Feedback Can Reduce Residential Energy Usage,' 29 (2012) *The Journal of Law, Economics, & Organization*, at 1016.

consumption by 2.3 to 24 percent relative to the baseline.[838] Likewise, evidence from another two field experiments shows that, among 170, 000 household customers of two utilities, the Sacramento Municipal Utility District (SMUD) and Puget Sound Energy (PSE), households getting peer comparison reports tend to reduce energy use by 1.2% (PSE) to 2.1% (SMUD).[839] Besides, households with more pre-treatment energy use score better than do those with less base-line pre-treatment energy use.[840] The two studies have shown that information as nudges can affect customer behavior, yet a 'boomerang effect' is likely to happen when customers' behavior is put in comparison,[841] in which case customers with lower reported energy use may be less motivated to reduce or may even increase their energy use ahead.

Even if the information is able to affect customer behavior, a further question can be asked how long the effects of behavioral interventions can last. Through data from 234,000 households receiving personalized energy use reports under the Opower program, a study finds that consumers are likely to reduce energy use shortly after being informed about their energy performance, yet the effects would die out if no further information follows.[842] The situation can be improved if consumers get used to the reports coming monthly over the long term, in which case the consumers may change their capital stock of habits or physical technologies.[843] However, it might take more than two years for those behavioral changes to happen and last.[844] The Opower program suggests that, when it comes to changing behavior patterns, an informational program could produce better results when the treatment is available at frequent intervals over a long period.

4.5 Instrument mixes

4.5.1 Supplemental Environmental Projects: liability meets regulation

The Supplemental Environmental Projects (SEPs) are environmentally beneficial projects not required by the law but are undertaken by defendants as part of the settlement of an enforcement action.[845] In 2004,

[838] Allcott, H., 'Social Norms and Energy Conservation,' 95 (2011) *Journal of Public Economics*, pp. 1082-1095.
[839] Ayres, Raseman and Shih (2012), *supra* note 837, at 992-1022.
[840] *Id.*, at 1015-1016; Allcott (2011), *supra* note 838, at 1093.
[841] Allcott (2011), *supra* note 838, at 1093.
[842] Allcott, H., and Rogers, T., 'The Short-Run and Long-Run Effects of Behavioral Interventions: Experimental Evidence from Energy Conservation', 104 (2014*) The American Economic Review*, at 3004.
[843] *Id.*, at 3005.
[844] *Id.*, at 3034.
[845] USEPA, 'US Environmental Protection Agency Supplemental Environmental Projects Policy

the USEPA started to encourage parties to deliver GB projects or other GB strategies on contaminated properties in exchange for penalty mitigations.[846] The SEP program is a settlement policy and not meant to be used as law by the EPA, defendants, courts, or administrative law judges in a trial. It thus largely relies on the EPA's discretion to determine whether or not a project will be accepted as a SEP, and how much of the penalty abatement can be given.[847]

The SEP policy has as its goals environmental justice,[848] pollution reduction and technology innovation.[849] Perhaps for its pro-environment goals, the SEP program has been referred to by the federal and state laws as a way to environmental enforcement. The CAA is the only environmental statute in which Congress has explicitly mentioned the use of SEPs.[850] The USEPA has tried to incorporate SEPs into settlements for violations of various federal statutes, including the TSCA, the Emergency Planning and Community Right-to-know Act (EPCRA), the RCRA, the CWA, and the CAA.[851]Some states also follow this way of enforcement. For instance, in 2015, the California legislature passed the AB 1071, requiring the Cal EPA to issue a new SEP policy, creating public process to make SEPs available for 'disadvantaged communities' that bear the consequences of pollution.[852]

According to the EPA's policy, a proposed project should, first, qualify as a SEP. The EPA coins a SEP as an "environmentally beneficial project which a defendant agrees to undertake in settlement of an enforcement action, but which the defendant, or any other third party, is not otherwise

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2015 Update', 10 March 2015, at 1. Full text available at https://www.epa.gov/sites/production/files/2015-04/documents/sepupdatedpolicy15.pdf, last visited March 2017.

[846] Edwards (2009), *supra* note 719, at 878-880.

[847] USEPA (2015), SEP Policy, *supra* note 845, at 2.

[848] The idea is that defendants are encouraged to conduct SEPs in communities where there are environmental justice concerns. SEPs can help the government to identify and address disproportionately high and adverse human health or environmental impacts of its programs, policies, and activities on minority and low-income populations in the United States and its territories. See USEPA (2015), SEP Policy, *supra* note 845, at 4.

[849] As declared in the SEP policy, "SEPs provide defendants with an opportunity to develop and demonstrate new technologies that may prove more protective of human health and the environment than existing processes and procedures. SEPs also provide the EPA with a unique opportunity to observe and evaluate new technologies." See USEPA (2015), SEP Policy, *supra* note 845, at 5.

[850] 42 USC. § 7604(g) (2) (2000).

[851] See TSCA **§§** 2-412, **15** USC. **§§** 2601-2692 (1988 & Supp. V 1993); EPCRA **§§** 301-330, 42 U.S.C. **§§** 11,001-11,050 (1988 & Supp. V 1993); RCRA **§§** 1002-11,012, 42 U.S.C. **§§** 6901-6992k (1988 & Supp. V 1993); CWA **§§** 101-607, **33** U.S.C. **§§** 1251-1387 (1988 & Supp. V 1993); and CAA **§§** 102-618, 42 U.S.C. **§§** 7401-7671q (1988 & Supp. V 1993) [quoting Laurie Droughton, L, 'Supplemental Environmental Projects: A Bargain for the environment', 12 (1995) *Pace Environmental Law Review*, at 793.

[852] AB 1071, 2015-16 Leg., Reg. Sess. (Cal. 2015).

legally required to perform."[853] By its definition, a SEP is meant for the environment, and defendants can barely profit from it. The SEP as a part of legally enforceable settlement should not be a project that has been around before the violation is found (e.g., usually through a notice of violation, administrative order or a complaint), so that the EPA has a chance to review the project. The project or activity to which a defendant commits, should not be a legal obligation imposed by any federal, state or local law or regulation, or that required by an injunction or an existing settlement in another legal action. [854]

Second, a potential SEP should meet the criteria laid down in the EPA's policy. The criteria are set in the light of the SEP policy goals, including significance, quantifiable benefits to public health or the environment, environmental justice, community Input, innovation, multi-media impacts, and pollution prevention.[855]Apart from the policy goals as general criteria, all projects must have a sufficient nexus, which is the relationship between the violation and the proposed projects. A common way to identify the nexus is to see whether or not the project at stake will advance at least one of the objectives of the environmental statutes that are the basis of the enforcement action.[856] Yet these two criteria still appear to be vague. The EPA thus lists out the designated categories of SEPs. [857] Of particular note, two types of projects can by no means be accepted as SEPs, including projects fully or partly supported by any federal loan, or any other federal financial assistance or non-financial assistance.[858] Also unacceptable are projects expected to become profitable to the defendant within the first five years of implementation (or within the first three years for SEPs implemented by defendants that are small businesses or small communities).[859]

Then the EPA will, as the third step, determine the amount of penalty mitigation when a proposed SEP is accepted. Usually, the penalty will recoup the economic benefits flowing from non-compliance, plus a

[853] USEPA (2015), SEP Policy, *supra* note 845, at 6.
[854] *Id.*, at 6-7.
[855] *Id*., at 20-21.
[856] *Id*., at 8.
[857] Among other categories, the designated categories of GB projects include a) Pollution prevention which also includes any project which protects natural resources through conservation or increased efficiency in the use of energy, water, or other materials; b) Environmental Restoration and protection. Concerning the built environments, SEPs may involve the environmental remediation of facilities and buildings, provided such activities are not otherwise legally required. This includes the removal/mitigation of contaminated materials, such as soils, asbestos and lead-based paint, which are a continuing source of hazardous releases to individuals. See USEPA (2015), SEP Policy, *supra* note 845, at 12-15.
[858] USEPA (2015), SEP Policy, *supra* note 845, at 9.
[859] *Id*., at 17.

punitive amount calculated on the gravity of the violation. The amount of penalty abatement for a SEP should be equivalent to a percentage of the estimated cost of the SEP, and should not exceed eighty percent (80%) of that estimated cost.[860] The EPA does not set the general ceiling of abatement to 100%,[861] as it believes that the defendant will elsewhere get benefits from a SEP, e.g., gaining goodwill or creating a positive public image. [862] A point worth heeding is that the cost of a SEP is not limited to the statutory penalty cap,[863] since SEPs are not penalties, and they are designed to complement but not replace monetary penalties.[864]All else being equal, the final settlement penalty will be lower for a violator who agrees to perform a SEP, compared to the violator who does not.[865]Even if the amount after an abatement can be less than the full penalty, the defendant needs to show the ability to pay the full settlement penalty;[866] otherwise the SEP can only be used in a few cases. [867]

When all the terms are finally written down in the settlement document, a SEP is ready for implementation, at which point the EPA should stand back and let the defendants work. The EPA would not retain authority to manage or administer the SEP. In other world, the EPA will not direct, recommend, or propose the defendant to hire a particular third party to conduct the SEP.[868] The EPA can only decide to approve or disapprove the proposals made by the defendant,[869] and to provide information to the public, in particular to the communities that bear the consequences of the SEP. [870] By contrast, the defendant should fully engage in and be

[860] *Id*., at 23.
[861] Yet the 80% ceiling is applied with exceptions. For defendants that are small businesses, government agencies or entities, or non-profit organizations, the penalty mitigation amount may be set as high as one hundred percent (100%) of the estimated SEP cost. Alternatively, if the defendant can demonstrate the project is of outstanding quality; and for any defendant, if the SEP implements pollution prevention technologies or practices which reduce or eliminate the generation of a pollutant at its source, the penalty mitigation credit may be set as high as one hundred percent (100%) of the estimated SEP cost. USEPA (2015), *supra* note 845, at 24-25.
[862] Kristl, K. T., 'Making a Good Idea Even Better: Rethinking the Limits on Supplemental Environmental Projects', 31 (2006) *Vermont Law Review*, at 263.
[863] USEPA (2015), SEP Policy, *supra* note 845, at 23.
[864] Droughton, L., 'Supplemental Environmental Projects: A Bargain for the Environment', 12 (1995) *Pace Environmental Law Review*, at 804.
[865] USEPA (2015), SEP Policy, *supra* note 845, at 21.
[866] The defendant's ability to pay (ATP) can be determined using the EPA's financial models: ABEL or INDIPAY (if the defendant is an individual). *Id.*, at 33.
[867] For instance, the ATP requirement can be lowered if a project shows outstanding quality and meets at least one of the SEP Policy exceptions for one hundred percent (100%) mitigation credit. But still, the defendant must be able to pay the minimum penalty required by the SEP Policy. The required minimum penalty, which must be determined before the settlement penalty is reduced based on ATP considerations. *Id.*, at 33-34.
[868] *Id.*, at 26-27.
[869] *Id.*
[870] *Id.*, at 19.

responsible for the SEP until the end. The defendant is not allowed to simply pay the cost and transfer the responsibilities to another party.

Sharing responsibilities among defendants is possible. Defendants in separate cases may face similar violations in the same general geographic area and at approximately the same time. In that case, the defendants can be jointly and severally liable for the performance of consolidated SEPs.[871] Alternatively, they can choose to undertake one of the separate SEPs as different parts of a large project.[872]

The SEP appears to be a mix of liability and regulation. It can in the first place be derived from citizen suits,[873] whereby the detection of harm may rely on private parties. A primary incentive for a defendant to propose a SEP is the potential mitigation of its civil penalty. When the defendant seeks a SEP, the settlement of a suit is in the EPA's hands, where the EPA by its regulatory power determines and oversees what the defendant should do to compensate the harm through the proposed SEP.

However, the SEP program has some limits in practice. Firstly, the SEP has only been used in a minimal number of cases.[874] Second, the SEP is likely to diminish the deterrence of liability. A study has shown that the SEP tends to deter parties already subject to the SEP and can bring them back to compliance, but it may not give general deterrence as fines do.[875]

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[871] For instance, defendants may jointly hire a contractor to manage and implement a consolidated SEP. Such an approach could be acceptable if the defendants each remain liable under their separate settlement agreements to perform the consolidated project in the same manner as they would under a typical settlement. Defendants are generally held accountable through the inclusion of stipulated penalties, should the SEP not be completed as agreed upon. See USEPA (2015), SEP Policy, *supra* note 845, at 34.

[872] However, the complementary SEPs must meet the following conditions: a) each discrete project must have a nexus to the violations at issue in the particular settlements and meet all conditions of the SEP Policy; b) Each discrete project must itself be worthwhile with environmental or public health benefits; c)The settlement must hold each defendant responsible for implementation and completion of a specific portion of the larger project; d) the segregable pieces must not be dependent on each other. If the settlements are structured carefully, such an approach can result in significant environmental or public health benefits that might otherwise be unavailable. USEPA (2015), SEP Policy, *supra* note 845, at 34.

[873] Until the mid-1980s, the CWA was the only statute that allowed citizens to file suits against polluters on behalf of the US and to seek civil penalties. Citizen suits brought under the CWA partly facilitated the use of SEPs. See Abell, C. S., 'Ignoring the Trees for the Forests: How the Citizen Suit Provision of the Clean Water Act Violates the Constitution's Separation of Powers Principle', (81) 1957 *Virginia Law Review*, at 1957.

[874] A study shows that fewer than 12% of settlements annually in cases involving penalties used SEPs from 1992 to 2006. Kristl (2006), *supra* note 862, at 219.

[875] Through data from the 499 major chemical manufacturing facilities across the US during the years 1995 and 2001, Glicksman and Earnhart compared the effectiveness of different governmental interventions on environmental performance in the chemical industry. The study made a distinction between the general deterrence and specific deterrence. The specific deterrence is meant to identify and return specific violators to compliance, on the assumption that the regulated entity will comply when it costs less to comply than to violate. The general deterrence can work to induce compliance

Glicksman and Earnhart (2007) examined the effectiveness of fines, injunctions and the SEPs in the CWA-related performance. Part of their findings have shown that fines and SEPs are equally effective in reaping specific deterrence, yet fines turn out to be more effective than the SEPs as general deterrents.

It is also likely that the SEP can deter large firms more than it does when dealing with small companies.[876] On the one hand, it could at times allow a defendant to benefit from her/his wrong. The EPA has stressed that the SEPs are not meant to replace penalties and should exclude projects that generate profits in the first five years.[877] Yet some pro-environment projects by their nature would not bring quick money anyway, but over the long term it could probably be a lucrative business. For instance, the average payback period of a GB renovation is 5 to 7 years in the US. Besides, the SEPs can also bring other benefits such as a good public image or a better environmental audit that can improve a company's compliance status and reduce the risk of future enforcement actions. When the penalty turns into benefits, "the SEP dollars simply do not have the same deterrent effect as penalty dollars."[878]

Third, the SEP may be misused by regulators to put out a citizen suit.[879] The SEPs were not based on any statutory ground until section 505 of the CWA was amended to allow the government to find and deter problematic settlements wherever possible. According to the amended section 505, a citizen suit would be excluded if any state agency starts prosecuting the issue within 45 days.[880] This rule has been phased in and become a rule rather than an exception in some jurisdictions, where the government tends to over-file citizen suits at the request of the polluter. This will make some citizen suits destined for environmental protection in the end relieve the polluters.[881] In the case of GB compliance, citizen suits could be a way to combat land contamination or sick building syndrome. As noted in the legal framework, the Clean Air Act (CAA) is made to regulate outdoor air quality, which has little to say about indoor air pollution. In that case,

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in the broader regulated community, based on the increased subsequent penalty likelihood and increased subsequent penalty size. Glicksman, R. L. and Earnhart, D., 'The Comparative Effectiveness of Government Interventions on Environmental Performance in the Chemical Industry,' 26 (2007) *Stanford Environmental Law Review*, at 12-14, 31-47.

[876] *Ibid.*

[877] USEPA (2015), SEP Policy, *supra* note 845, at 32.

[878] Kristl (2006), *supra* note 862, at 263.

[879] Hodas, D. R., 'Enforcement of Environmental Law in a Triangular Federal System: Can Three Not Be A Crowd When Enforcement Authority Shared by the United States, the States, and Their Citizens?', 54 (1995*) Maryland Law Review*., at 1552

[880] See Clean Water Act §505, 33 US C §1365 (2006).

[881] Hodas (1995), *supra* note 879, at 1552.

citizen suits allow plaintiffs to file a suit against personal injuries caused by sick building materials. Though under the citizen suit provision, the plaintiffs per se may not get the damages, still they can abate the harm.[882] Elsewhere, citizen suits have played a role in C/D waste disposal and brownfield reclamation. Public interest groups, as well as commercial plaintiffs, are entitled to seek cleanup of wastes alleged to be causing an imminent and substantial endangerment, according to the citizen suit provision of the Resource Conservation and Recovery Act (RCRA).[883]

Lastly, the SEP policy may not accord with the existing legislation. The SEPs are bound by the Miscellaneous Receipts Act (MRA), which requires that all penalties should go to the Treasury.[884] This has led the EPA to be more cautious in seeking SEPs and to underscore in its latest policy that the SEPs are not penalties.[885] However, that may not suffice to settle the legal doubt, as the SEPs are mostly working along with the EPA's policy, and have little legal basis. Hence some SEP proponents propose to set up an Environmental Trust managed by the EPA. The idea is that the money will not be delivered to the EPA, but to the Environmental Trust, which would later be used by the EPA or a third-contractor to put in practice a SEP.[886] Yet the SEP policy, as its policy goal suggests, means more than just getting the harm paid. It might also take into account environmental justice.[887] If the money goes into the Environmental Trust, instead of going for a particular use, the reinvestment of penalty funds in the communities that bear the harm would not be guaranteed.[888] Besides, a SEP does not merely create a money-for-

[882] Guiffrida (1993), *supra* note 777, at 28-29.
[883] 42 USC. § 6972.
[884] The Miscellaneous Receipts Act requires money received by federal agents to be deposited into the United States Treasury. 31 USC. § 3302 (2000). See USEPA, 'The Importance of the Nexus Requirement in Supplemental Environmental Projects,' EPA's Memorandum from Walker B. Smith, Director, Office of Regulatory Enforcement, to Reg' l Counsel et al., 31 October 2002, at 3.
[885] Rubin, D., 'How Supplemental Environmental Projects Can and Should be Used to Advance Environmental Justice,' 10 (2010) *University of Maryland Law Journal of Race, Religion, Gender, and Class*, at 194-195.
[886] Robertson, B. E., 'Expanding the Use of Supplemental Environmental Projects,' (86) 2009 Washington University Law Review, at 1038-1039.
[887] The SEP policy aims to "ensure that residents who spend significant portions of their time in, or depend on food and water sources located near the areas affected by violations will be protected." See USEPA (2015), SEP Policy, at 20.

Corresponding to the SEP goal, The Cal EPA was required by legislation to establish a SEP policy to create a public process to solicit potential SEPs from 'disadvantaged communities". The Cal EPA may assign 'disadvantaged community' status based on socio--economic factors, but the underlying statute does not mention indicators like race, ethnicity, or national origin. The act also emphasizes SEP's value to disadvantaged communities, but it does not limit SEPs to those communities. See AB 1071, 2015-16 Leg., Reg. Sess. (Cal. 2015), §2 (b) (3), (c); §2 (b) (4).
[888] Debellis, E. A., 'Implementing Supplemental Environmental Project Policies to Promote Restorative Justice,' posted on the Environmental Law Review Syndicate, at 2.

pollution situation; it might also be a way of restorative justice. A SEP will largely rely on the defendant to take care once accepted, in which situation the defendant should not only pay the costs but also correct her/his wrongdoing.[889] This appears to be slightly different from the Superfund under the CERCLA, whereby the EPA is in charge of remedies with the payment from injurers.

4.5.2 Self-reporting: voluntary EID meets mandates

Self-reporting is when those who are regulated report their own environmental non-compliance to the regulator.[890] Environmental information disclosure (EID) is not new in the case of GB compliance, in the way of energy auditing required by the US GB laws.[891] The US GB law seems to make energy auditing of buildings mandatory, yet the law has little to say about what would happen if the regulated fail to report their energy performance. Only when it comes to waste disposal, a failure to report the release of hazardous wastes can result in fines or imprisonment.[892]

As opposed to mandatory EID, self-reporting is done on a voluntary basis, in which case the regulated will report their violations ahead of the investigations by regulators, in exchange for penalty abatement. Though still widely used in GB compliance, self-reporting has been put in place to help environmental regulators detect activities that may cause environmental harm. It is likely that self-reporting can help GB promotion when GB compliance becomes mandatory, and the incentives available do not suffice to make building stakeholders report non-compliance.

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[889] *Ibid*.

[890] Kaplow and Shavell (1994), *supra* note 400, at 583-606.

[891] For instance, the USEPA and the USDOE jointly come up with a way of compiling energy audit data and benchmarking a building's energy performance through the Energy Star Program's Portfolio Manager. The Portfolio Manager is an online tool that allows owners and operators of buildings (and those who may be acquiring them) to (a) track energy use in a single building or a portfolio of buildings; (b) compare a building's energy performance to others nationally; (c) estimate the building's "carbon footprint," i.e., greenhouse gas ("GHG") emissions from on-site fuel combustion and purchased energy; (d) track energy conservation improvement projects; and (e) apply for national Energy Star recognition by EPA.

States also use energy auditing. The states of California and Washington, and New York City, Washington, DC, San Francisco, Seattle, and Austin have all enacted laws requiring energy audits and disclosure of energy audit information. For example, California state law requires owners and operators of non-residential buildings to release the past 12 months of benchmark data and ratings generated by the Energy Star Program's Portfolio Manager to prospective buyers, lessees and lenders before the closing of a transaction involving the entire building. Similar to the state of California, the state of Washington requires owners of non-residential buildings to rate their buildings using Portfolio Manager "or an equivalent tool" adopted by the state and disclose that information before the closing of a transaction.

[892] See CERCLA, 42 USC sec 9603 (b).

Through its self-reporting policy, the USEPA aims to "enhance protection of human health and the environment by encouraging regulated entities to voluntarily discover, disclose, correct and prevent violations of Federal environmental requirements."[893] In order to qualify as a self-reporter, the regulated need to follow the way information should be disclosed according to the self-reporting policy.

More concrete, the self-reporting policy requires that: a) the regulated should report systematically, either through an environmental audit or a compliance management system reflecting the regulated entity's due diligence in preventing;[894] b) the disclosure is voluntary, meaning that the disclosure is not otherwise legally required by any statute, regulation, permit, judicial or administrative order, or consent agreement;[895] c) the regulated should report promptly, usually within 21 days or shorter where otherwise required; [896] d) the regulated should report the violation independent of the government or a third-party plaintiff, usually prior to an investigation by regulators or a suit filed by a third party;[897] e) the regulated should remedy the harm within a required period and certify the remediation in written;[898] f) the violation reported should not be a re-offense within the past five years,[899] regardless of the ownership of the

[893] USEPA, 'Incentives for Self-Policing: Discovery, Disclosure, Correction and Prevention of Violations', May 2000, at 36. Full text available at https://dec.alaska.gov/water/npdes/Binders/application/APDES%20Application%20Guidance%20Documents/Incentives%20for%20Self-policing-%20Discovery,%20Disclosure,%20Correction%20and%20Prevention.pdf, last visited March 2017.

[894] *Id.*, at 40.

[895] But violations discovered pursuant to an environmental audit or compliance management system may be seen as voluntary even if required under an Agency "partnership" program in which the entity participates, such as regulatory flexibility pilot projects like Project XL. The USEPA will consider the application of the Audit Policy to such partnership on a project-by-project basis. See *Id.*, at 41 & 48.

[896] *Id.*, at 42.

[897] For entities that own or operate multiple facilities, the fact that one facility is already the subject of an investigation, inspection, information request or third-party complaint does not preclude the Agency from exercising its discretion to make the Audit Policy available for violations self-discovered at other facilities owned or operated by the same regulated entity. Id., at 42-43.

[898] Usually, the time limit is 60 days. However, "the EPA retains the authority to order an entity to correct a violation within a specific period shorter than 60 days whenever correction in the shorter period is feasible and necessary to protect public health and the environment adequately. If more than 60 days are needed to correct the violation, the regulated entity must so notify EPA in writing before the 60-day period has passed. Where appropriate, the EPA may require a regulated entity to enter into a publicly available written agreement, administrative consent order or judicial consent decree as a condition of obtaining relief under the Audit Policy, particularly where compliance or remedial measures are complex, or a lengthy schedule for attaining and maintaining compliance or remediating harm is required." See *Id.*, at 44.

[899] This means that "the specific violation (or a closely related violation) has not occurred previously within the past three years at the same facility, and has not occurred within the past five years as part of a pattern at multiple facilities owned or operated by the same entity. For the purposes of this

facilities;[900] g) the violation reported would not actually or imminently result in severe actual harm.[901]

If a potential reporter can fully or partly meet the requirements, the EPA then will reciprocate by giving gravity-based penalty mitigation, based on the extent to which the requirements above are met.[902]

The penalty abatement is granted with limits. First, it does not apply to violations under the Federal environmental statutes administered by the EPA.[903] Second, it does not apply to any violation that has received penalty mitigation under other policies.[904] Last but not least, it applies only to a gravity-based penalty and the EPA still retains the power to collect any economic benefits flowing from the violations.[905] In doing so, the EPA tries to protect law-abiding firms, so that they can compete with their non-complying rivals on an equal footing.[906]

Benefits of the self-reporting policy seem to work both ways. On the one side, the regulated are able to pay less for their violations and experience "a significantly lower probability of inspection in the near future."[907] On the other side, regulators can deter violations with cheaper enforcement if the enforcement authority commits beforehand to an ex-post investigation effort.[908]

Despite the benefits, self-reporting can sometimes be less effective in terms of specific deterrence. If a violator can expect fewer investigations

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section, a violation is: (a) any violation of Federal, State or local environmental law identified in a judicial or administrative order, consent agreement or order, complaint, or notice of violation, conviction or plea agreement; or (b) any act or omission for which the regulated entity has previously received penalty mitigation from EPA or a State or local agency." See *Id.*, at 44.

[900] *Id*., at 26 & 35.

[901] *Ibid.*

[902] Basically the EPA has two types of mitigation on gravity-based penalties: a) if the regulated can meet all of the requirements, the EPA fully frees them from any gravity-based penalties ('no gravity-based penalties'); b) if a regulated entity establishes that it satisfies all of them except for the first one, i.e., the systematic discovery, the EPA will reduce by 75% gravity-based penalties ('reduction of Gravity-Based Penalties by 75%'). Id., at 39-40.

[903] For the states that have adopted their audit policies in Federally-authorized, approved or delegated programs, EPA will generally defer to State penalty mitigation for self-disclosures as long as the State policy meets minimum requirements for Federal delegation. *Id.*, at 46 & 31.

[904] *Id.*, at 47.

[905] In some cases, the penalties that EPA assesses consist of two elements, the economic benefit component, and the gravity-based component. The economic benefit component reflects the economic gain derived from a violator's illegal competitive advantage. Gravity-based penalties are that portion of the penalty over and above the economic benefit. *Id*., at 13.

[906] *Id.*, at 13

[907] Stafford, S. L. 'Should You Turn Yourself in? The Consequences of Environmental Self-policing,' 26 (2007) *Journal of Policy Analysis and Management*, at 324-325.

[908] See Kaplow and Shavell (1994), *supra* note 400, at 583-606; Innes, R., 'Violator Avoidance Activities and Self-reporting in Optimal Law Enforcement,' 17 (2001) *The Journal of Law, Economics and Organization*, at 239.

in the near future by self-reporting, s/he would probably misuse it as a shield from regulation. It is likely that the violator will disclose some minor violations ('red herrings') to distract regulators from the violator's other non-complying behavior.[909] In that case, the regulators have to bear the cost of information processing, which could be large relative to the expected harm from these minor violations.[910] The reduction in investigations, on the other hand, leads the regulator to a trade-off between self-reporting rate and deterrence. When the harm of the violation is enormous and irreversible, it is better to rely more on deterrence and procedural investigation, and not the self-reporting scheme.[911]

In practice, the self-reporting does not seem to be widely used. The USEPA reported that about 670 organizations had disclosed actual or potential violations at more than 2700 facilities not long after the policy began to run.[912] By looking into the EPA's side of the story, some scholars find that the violations reported are mostly about a failure to report or to inventory, few of which have anything to say about actual emissions.[913] It is likely that the violators may not have enough incentives to self-report (honestly). This could be partly because the reduction in penalties is insignificant, particularly when the probability of detection or the penalty per se is low. Put differently, a violator is less likely to self-report a harmful act if the reduced penalty is much less than the expected value of not reporting.[914] The EPA's self-reporting reduces only the gravity component of fines, putting behind the economic benefit component,[915] in which case the mitigation of fines may not be a good deal for the violators, particularly when it takes a lot to become an eligible self-reporter.[916]

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[909] Stafford (2007), *supra* note 907, at 324-325.
[910] Innes (2001), *supra* note 908, at 248-249.
[911] Gerlach, H., 'Self-Reporting, Investigation, and Evidentiary Standards', 56 (2013) *The Journal of Law and Economics*, at 1075, 1083-1084.
[912] See USEPA (2000), *Incentives for Self-Policing*, *supra* note 893, at 19.
[913] In their work, Pfaff and Sanchirico further pointed out that, a newsletter published by the EPA highlights 600 specific violations at 314 facilities. Of the total, 511 violations concerned GTE's failure to notify authorities of batteries containing sulfuric acid at 229 telecommunications sites (the other 89 violations were failures to have spill prevention control and countermeasure plans in place diesel fuel). One may reasonably speculate that most of the 229 telecommunication sites were switching stations in GTE's extensive telephone network and that EPA counted each of the unreported batteries within each station as a separate violation. Moreover, on the heels of the GTE case, EPA reached an agreement with ten other telecommunications companies under the policy for 1300 violations at more than 400 facilities, with reporting failures again the dominant violations." Pfaff, A., and Sanchirico, C. W., 'Big Field, Small Potatoes: An Empirical Assessment of EPA's Self-Audit Policy', 23 (2004) *Journal of Policy Analysis and Management*, at 417.
[914] Kaplow and Shavell (1994), *supra* note 400, at 605-606.
[915] USEPA (2000), 'Incentives for Self-Policing', *supra* note 893, at 13.
[916] Pfaff and Sanchirico (2004), *supra* note 913, at 427.

Another concern arises about how the EPA deals with the information reported. The EPA in its latest policy expressly distinguishes self-reporting from audit privilege or immunity, as they "run counter to encouraging the kind of openness that builds trust between regulators, the regulated community and the public."[917] It is likely that the information disclosed would later be used against the self-reporters, and lead to civil or criminal liability.[918] Moreover, the EPA makes the information disclosed and other relevant documents related available to the public,[919] which may not protect proprietary information. However, the two problems can to some extent be solved by changing the rules of self-reporting. For instance, to raise the bar on penalty mitigation, or to make information privileged and not be used to initiate criminal prosecutions for the self-disclosed violations.[920]

5. Observations on the use of instruments

5.1 GB was based on self-regulation in the beginning; informational instruments induce GB compliance at the individual level

It is viewed that the US GB law in early times relied mainly on informal rules, e.g., building customs and the industry-based standards.[921] When building professionals became better aware of the environmental impacts of buildings, they began to stock GB knowledge and used it on a project-by-project basis. Though with subsidies from the government, the increasing GB knowledge did not seem to make GB compliance known to a broader range of building stakeholders, neither did the loosely-knit incentive programs have significant impacts in the building industry.[922] The establishment of the USGBC provided a more collective approach for GB. The USGBC as a self-regulator not only created one of the most important GB certifications ('LEED') but also devoted to GB technology development and professional training. As the USGBC became more influential, the LEED system and GB compliance were better recognized in the industry.

Since 2008, the adoption of energy benchmarking laws has rapidly advanced across US cities, counties and states. Laws and policies require the governments to report GB information into a database. The information showcased the benefits of GBs, whereby "a growing number

[917] USEPA (2000), 'Incentives for Self-Policing', *supra* note 893, at 29.
[918] Innes (2001), *supra* note 908, at 253-254.
[919] USEPA (2000), 'Incentives for Self-Policing', *supra* note 893, at 35.
[920] Innes (2001), *supra* note 908, at 253-254.
[921] Hirokawa (2012), *supra* note 45, at 526.
[922] McGraw-Hill Construction (2013), *supra* note 6, at 41.

of financial institutions and private investors woke up to the GBs."[923] Also, the US GB law required the government to set out guidelines on GB contracting, so as to make stakeholders better aware of and address the split incentive problem.[924]

Meanwhile in the commercial world, 23 cities, and the state of California have now enacted laws requiring large commercial buildings to measure and benchmark their energy consumption annually, as well as to publish the resulting scores. The 2017 CBRE report has shown that 9 out of the top 10 markets ranked in the 2017 Green Building Adoption Index (GBAI) have implemented benchmarking ordinances, and some cities have collected multiple years of benchmarking data.[925] This suggests that these benchmarking and transparency laws may contribute to increased adoption of environmental building certification.[926]

5.2 Financial incentives play a bigger role than liability in inducing GB compliance

The US GB law in early times made GB compliance voluntary for private projects, in company with various market-based instruments.[927] The choice of instruments depends primarily on a government's financial situation, oversight structure, local political and cultural environment and limits to power.[928]

Tax reductions are used at all levels. The federal GB law appears to mention public procurements more; while the state and local governments have found green loans a more effective way to leverage private money into GB projects. The 2018 CBRE/Maastricht University Green Building Adoption Index has indicated that at the asset level, mortgage financing is now aligned to green certification by capital providers offering discounted interest rates for multi-family properties that demonstrate defined

[923] Hirokawa (2012), *supra* note 45, at 544

[924] The split incentive problem may occur at the early stage of a GB project. For instance, GBs may benefit the occupiers rather than the developers. But over the long term, all the private stakeholders can find GB not only the right thing to do, but also a future-proofing investment. See Chapter II, Section 2.1.

[925] CBRE, 'National Green Building Adoption Index 2017', full text available at https://www.cbre.com/about/corporate-responsibility/pillars/environmental-sustainability/green%20building%20adoption%20index, last visited April 2019.

[926] *Ibid.*

[927] Hirokawa (2012), *supra* note 45, at 529.

[928] For instance, it might take many efforts for a government to set up a new tax on construction waste disposal given the delegation of power and due process concern. Hence governments are more likely to give tax reductions on energy efficient properties. For another example, public procurement can help to jump-start GBs, while its use may be less available given the tight budget of a government or the crowd-out effect it may have on the market. In that case, some local governments may shift to green loans that primarily rely on private investments.

environmental standards.[929] At the corporate level, "green bonds" have emerged, which allow companies to tap the capital market for investments in green-certified assets.[930]

The US GB law in its current form hints at a lower use of liability and VEAs for GB promotion. The reason why liability matters less could be that energy efficiency is still the centerpiece of GB compliance. In theory, liability is mainly to deal with harmful externalities; while building energy efficiency can hardly be taken as a harmful externality. Even if energy efficiency may lead to a reduction in GHGs emissions, it is viewed in theory that when it comes to pollution of the atmosphere, the tax may be superior to liability, for there may be less variability among parties in expected harm per unit.[931]

In the near future, liability is expected to play a role as GB compliance goes beyond energy use, incorporating C/D waste disposal and land contamination as major concerns. As far as dealing with environmental harm is concerned, liability may be superior to the tax in theory, due to the significance of variability among parties in expected harm and of opportunities to take precautions.[932]

VEAs are not quite common in GB promotion either. Currently, a written VEA only exists among governmental agencies, while a VEA between the government and the industry is still underway. VEAs are often proposed in the absence of strong legislature. Companies join a public voluntary agreement primarily for the benefits offered by the government. Even if some studies have shown that a tax is inherently a preferable instrument than VEAs,[933] VEAs could still play a role if the cost of technology adoption does not vary greatly across firms, and political backlash to taxation is high.[934]

[929] CBRE (2018), *supra* note 925, at 5.
[930] *Ibid.*
[931] Shavell (2011), *supra* note 171, at 274.
[932] *Ibid.*
[933] The US Climate Change Action Plan helped to mount the public VA as an instrument for solving environmental problems. Against this backdrop, the study builds up a general model in which the public VA is shown to be a less desirable tool than environmental taxation unless the political opposition against tax is high. Notably, the study also shows that welfare may be reduced by the use of public VAs. Of note, the study assumes that the fixed cost of creating a VA is equal to the cost of proposing an environmental tax. Also, the focus will be on the case of incomplete information, assuming that the regulator cannot identify the cost of an individual firm, and must set a single subsidy level that applies to all firms." Lyon and Maxwell, (2003), *supra* note 267, at 1454 & 1471.
[934] *Id.*, at 1480-1471.

5.3 CAC instruments with administrative incentives can be effective; GB regulations tend to work with private standards

It can be seen that GB compliance is mandatory not only for government buildings,[935] but also for residential and commercial buildings. As of June 2009, GB legislation is present in 44 states and 12 federal agencies,[936] many of which require mandatory GB compliance. The building industry, surprisingly, also expects mandates from the government. A survey has shown that "there was a marked change in corporate executives' opinion related to government mandates on sustainability – the expectation of mandates grew from 47 % in 2006 to 72 % in 2009, with an increase of 65%."[937] Some empirical information has also shown that many central cities with higher market penetration rates of green buildings have mandated regulatory policies.[938] It is also noteworthy that the municipal administrative incentive has a significant impact on GB development.[939] One of the explanations could be that delays often lead to more significant risks and higher costs that developers would rather avoid. On that account, faster building approvals and permitting processes for green building projects lower the risks for the private sector developers with the added benefit of promoting greener construction.[940]

GB regulations are often made at the state and local level, in the form of building permits.[941] Where GB compliance goes citywide, land planning will also take into account GB standards. Those GB regulations tend to set standards requiring an industry-based certification; in a few cases, the government would like to make their GB standards with some experience from the industry. In either case, the government will retain the authority to change and enforce the standards, in deference to the principle of non-delegation of power. However, when GB regulations refer to a particular

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[935] Cole, R. J., 'Environmental Performance of Buildings: Setting Goals, Offering Guidance, and Assessing Programs, in Kibert, C. (ed.), *Reshaping the Built Environment: Ecology, Ethics, and Economics*, Chapter 16 (Island Press, 1999), at 276 & 292.

[936] McGraw-Hill Construction, '2009 Greening of Corporate America: The pathway to sustainability – from strategy to action', the Greening of Corporate America SmartMarket Report (SMR), 11 November 2009, p.6. Full text available at http://construction.com/market_research/FreeReport/GreeningCorpAmerica/2009_GreeningCorpAmerica.pdf, last visited November 2016.

[937] The survey looks into the board patterns of sustainability activities among the largest firms in corporate America. Opinions were taken from several firms across different sectors, including manufacturing, pharmaceutical, construction, computer technology, retail, real estate, insurance, energy, and natural resources. Respondents were the CEOs and COOs from the firms, whose number amounts to 2% of the total population of firms in corporate America. McGraw-Hill Construction (2009), *supra* note 936, at 18 & 31.

[938] Simons, Choi, and Simons (2009), *supra* note 636, at 139–166.

[939] Choi (2010), *supra* note 452, at 18.

[940] *Ibid.*

[941] Hirokawa (2012), *supra* note 45, at 545.

industry-based certification, they may not be free from anti-trust litigations. Besides, the more stringent standards at the state and local level may not always survive the pre-emption doctrine, in which case the more stringent state and local standards cannot work against the less stringent standards at the federal level.

5.4 Regulators tend to enlist private parties to spot and remedy non-compliance

The SEPs and the self-reporting policy as instrument mixes have featured in environmental compliance, part of which deals with GB performance. The two instrument mixes both seem to be a mix of regulation and liability, whereby regulators can make use of private parties to detect and pay for environmental harm.

Self-reporting is when private parties voluntarily report their violations before the regulator spots them. In both cases, the violators are seeking abatement on penalty, in return for the information they give to the government. The use of the two mixes may correspond to the conjecture that governments are not able to be fully informed about individual behavior, due to which government failure may occur.[942]

In the case of SEPs, the USEPA encourages parties to deliver GB projects or other GB strategies on contaminated properties in exchange for penalty abatement.[943] The settlements originally stem from suits brought by private parties to the court but end up in the EPA's discretion to determine whether or not a project will be accepted as a SEP, and how much of the penalty abatement can be given.

Apart from using private information, the SEP policy somewhat eases the judgment proof problem by lowering the penalty that ought to be paid in the short run; and gives the injurer a chance to correct the wrong over a longer time. Equally important, the SEP policy looks beyond the compensation per se, taking into account environmental justice, in the sense that the injurers not only need to pay but also manage a SEP till the end. This may make SEPs score better than an instrument mix like the Superfund, where injurers only need to write a check and leave the rest of the remediation work to the government.

6. Preliminary conclusion

By and large, the US GB movement has gone through the process of a novel change: the industry and professionals increased the knowledge; the

[942] See Chapter III, Section 5.1.
[943] Edwards (2009), *supra* note 719, at 878-880.

knowledge then got translated into the belief systems of those decision makers, e.g., legislators and regulators; and accordingly, institutional changes are made to provide incentives and help to shape the public preference towards GB.

In terms of GB law-making, the federal legislation mostly requires building energy efficiency on a voluntary basis, according to which the federal government took the lead in greening their buildings. In response to their federal counterpart, the state and local GB laws came into being, and lead the GB performance to go more extensive in scope and mandatory in compliance.

The US GB law puts in place the CAC, market-based and persuasive instruments during GB movement. It started with persuasive instruments like labeling to showcase the benefits of GBs and provide potential green builders with information. The US law at the same time draws on market-based instruments to provide financial incentives for GBs (or products), including tax reductions, public procurements, and green loans. By contrast, the liability regime and VEAs play a smaller part in boosting voluntary compliance. To date, GB compliance is becoming mandatory in the form of building permits incorporating industry-based certifications. Moreover, the US government also tends to involve private parties to detect and remedy environmental harm, in which case instrument mixes like the SEPs and self-reporting would have a chance to work for GB promotion.

Chapter V China GB promotion

Building energy use in China has increased by 40% as of 1990, and accounts for 28% of the country's total energy consumption.[944] In response to environmental concerns in the building industry, the central government in China laid out the 9th Five Year Plan (FYP) in 1994, followed by the 11th, 12th and 13th FYPs for GB compliance that further pushed forward the GB movement in China. Those policies not only set target standards for GB compliance but also put in place pilot GB projects in the top ten cities by GDP.

In pursuit of the policy targets, the law came into play for GB compliance, with energy performance at heart. The GB law in early times seemed to use subsidies and public procurements to increase the quantity demanded of GB. In the meantime, the law put the government to the fore and required governments of all levels not only to green their buildings but also to come up with technical standards and regulations for residential and commercial GBs. As a result, the number of new GBs kept increasing over the last decade,[945] with most of the GBs certified by the GBEL as a government-made GB certification.

In contrast to the central government taking the lead, the industry and ENGOs in China appeared to be less zealous about GB compliance. It was not until 2008 that the first GB professional association in the country, the China Green Building Council (CGBC), was born. The CGBC in its infancy did not do much in GB certification, compared to its counterparts like the USGBC or the World Green Building Council (WGBC).

Despite the growth, there are challenges ahead, due to which GBs still account only for a minimal part in the existing buildings.[946] The

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[944] Yu, S., Evans, M., and Shi, Q., 'Analysis of the Chinese Market for Building Energy Efficiency,' USDOE report no. PNNL-22761, March 2014, at 8. Full text available at https://pdfs.semanticscholar.org/6429/70e40c2c2afa8eb42826b7785239b3701f68.pdf, last visited August 2017.

[945] The SmartMarket GB reports have shown that environmental regulations are one of the triggers of GB compliance in China. See Dodge Data & Analytics (2016), at 42; Dodge Data & Analytics (2018), at 48.
Likewise, environmental regulations have also turned out to be one of the most important drivers for green construction in China, as shown empirically in a survey. See Qi, G. Y., et al., 'The Drivers for Contractors' Green Innovation: an Industry Perspective', 18 (2010) *Journal of Cleaner Production*, at 1363.

[946] See CBRE, 'the New Era of Green Buildings in China,' CBRE report, June 2015, at 25. Full text available at http://greeninitiatives.cn/img/white_papers/1441531986096China_Major_Report_-_The_New_Era_of_Green_Buildings_in_China_July_2015.pdf, last visited October 2017; MOHURD, 建筑节能与绿色建筑的十三五规划 (The 13th FYP on Building Energy Conservation and Green Building Development, hereinafter 'the GB 13th FYP'), published on February 2017, at 15. Full text available at http://www.mohurd.gov.cn/wjfb/201703/W020170314100832.pdf, last

SmartMarket GB reports have found the higher first cost to be the biggest challenge in the way of GB compliance.[947] Affordability and a lack of public awareness are second to the higher first cost as the most important concerns, followed by a lack of political support and incentives.[948] Those challenges might be a result of the interaction between the rules and players in GB compliance, in which case the law is said to provide the players with correct incentives and direct preferences, as noted in theory.[949] As GB compliance has gone beyond energy efficiency,[950] and beyond government buildings, it is likely that the law needs to enlist different building stakeholders to play out the rules of various instruments.

This chapter proceeds as four sections. Section 1 sketches out how the GB movement evolved in China. Section 2 explains the Chinese legal system in a nutshell, in light of which Section 3 further looks into how the GB law takes shape at the central and local levels. Section 4 deals with the instruments working for GB compliance, based on the theoretical framework. The last section summarizes how the law uses different instruments to promote GB, concluding what type of instruments (mixes) may work better for GB in China.

1. GB movement in China

1.1 GB Facts

1.1.1 1980-2005: the start of building sustainability

GB in China started with the idea of vernacular architecture in the 1980s. Back then the country's economy was still in the aftermath of the 'Great Leap Forward,' and most of the people could not afford homes with quality air-conditioning systems.[951] To build quickly and cheaply, builders shifted to vernacular buildings that best fit into the local physical landscape, making use of accessible local materials. The re-use of house caves *('yaodong'*) around the Loess Plateau and the earthen buildings in the Fujian Province ('*nanjingtulou'*) are good examples in point.[952] Though the idea of vernacular architecture was more of a way to solve the

visited September 2017.

[947] Dodge Data & Analytics (2018), *supra* note 40, at 49.

[948] *Ibid.*

[949] See Chapter III, Section 3.

[950] In China, the environmental reasons to build green include reductions in energy consumption, protection of natural resources, and the improvement of indoor air quality that matters more to China green builders than it does on the global average. Dodge Data & Analytics (2016), *supra* note 6, at 43.

[951] Green Building Research Institute (GBRI), *中新天津生态城绿色建筑探索与实践 (Green Buildings in Practice: the Case of Sino-Singapore Tianjin Eco-city)* (China Architecture & Building Press, 2015), at 2.

[952] *Ibid.*

housing shortage, it somewhat marked the start of sustainable building in China.[953]

Throughout the 1990s, building energy efficiency became the centerpiece of GB. On the Rio Summit in 1992, the whole world became concerned about the environment and thus committed to emission reductions. In response, China came up with the 9th Five Year Plan (FYP) to back up technology R&D for building energy efficiency. The 9th FYP, along with the Regulation of Building Energy Conservation (1994) in its original form, to some extent spurred GB technologies and innovations, e.g., solar energy systems, and laid the ground for the development of some pilot GB projects at the beginning of the 2000s.[954] As the then world largest green neighborhood, the Beijing Olympic Village became a hub of GB technologies. The Olympic Village was built at the point when SARS raged on in China, which led people to care more about the indoor environment of buildings. As a result, the Beijing Olympic Village featured not only better performance on energy conservation but also took into account the indoor environment. Meanwhile in the commercial world, building projects like the Vanke Center in Shenzhen and the Favorview Palace in Guangzhou were built green on a voluntary basis.[955]

1.1.2 2006-2015: laws and policies lent support to GB

GB grew fast in this period as a wide range of GB standards, laws and policies were phased in. Taking stock from the pilot GB projects, the central government drafted the Green Building Evaluation Standards in 2006,[956] based on which a national GB rating system was established (GBEL).[957] In the meantime, policies and laws were made to stimulate GBs. China's 11th FYP set a goal of 20% reduction in energy intensity, part of which would be achieved by improving building energy efficiency.[958] More ambitious goals were couched in the 12th FYP.[959] Correspondingly, the Ministry of Housing Urban-Rural Development (MOHRUD) and the National Development and Reform Commission

[953] *Id.*, at 12.
[954] Kong, X., Lu, S., and Wu, Y. 'A Review of Building Energy Efficiency in China during the 11th Five-Year Plan Period', 41 (2012) *Energy Policy*, at 631.
[955] GBRI (2015), at 15.
[956] MOHURD, 绿色建筑评价标准 (Assessment Standard for Green Buildings, GB/T 50378-2006), published on June 1 2006; amended on April 15, 2014 (GB/T 50378-2014), effective on January 1, 2015.
[957] Kong, Lu, and Wu (2012), *supra* note 954, at 632.
[958] MOHURD, "十二五" 绿色建筑和绿色生态城区发展规划 (The 12th FYP on China Green Building and Eco-city Development, MOHURD document No. 53), published on April 3, 2013, at 2; Kong, Lu and Wu (2012), at 633.
[959] MOHURD (2017), 13th FYP for GB, *supra* note 946, at 6.

(NDRC) laid out the 'Green Building Action Plan' in 2013, which set more specific building energy efficiency targets that should be met by the year 2015.[960]

In light of the policies, the national legislature lent some support to GB promotion through the amendment of the Energy Conservation Law in 2007, a chapter of which particularly deals with building energy efficiency. On the administrative side, the State Council (SC) and the Ministry of Housing, Urban-Rural Development (MOHURD) made regulations or rules for GB, most of which refer to the GBEL as a government-led national GB rating system.[961] It was during this decade that the GB movement in China took off. From 2008 to 2011, the number of GBEL-certified buildings increased from 10 in 2008 to 20 in 2009, to 83 in 2010 and over 100 in 2011, and to 494 as of 2012.[962] During the 11th FYP (2006-2010), energy efficient buildings account for 23.1% of the total number, most of which were pilot projects built in line with the national GB standards.[963] The total square footage reached 1 billion m^2, which is 1.4 times the SC target in the 12th FYP.[964] Four thousand seventeen of those GBs were GBEL certified, with gross square footage amounting to 470 million m^2.

Table 3 GB Development during the 11th FYP

Goals	Planned	Achieved
Compliance rate in New Buildings (%)	>95	95.4
GB pilot projects	30	217 (113 GBEL certified)

[960] The GB Action Plan (2013) sets more ambitious target standards and a goal of developing one billion m^2 of green buildings certified by the GBEL. On the other side, the Plan also required renovations that amount to 120 million m^2 of public buildings, as well as 400 million m2 of residential buildings by 2015, with a focus on buildings in the Hot-Summer-Cold-Winter area. See SC, 绿色建筑行动方案 (Green Building Action Plan, SC Document No.1), on January 1, 2013.
[961] See *infra* Section 4.1.3.
[962] Khanna et al. (2014), *supra* note 51, at 9.
[963] One hundred and twelve projects with a floor area of 13 million square meters were certified by the national B rating system; 217 GB pilot projects of 40,000,000m^2 in the area were carried out nationwide, primarily in cities like Shanghai, Suzhou, Shenzhen, Hangzhou, Beijing, and Tianjin. See MOHURD, 2011 年全国住房城乡建设领域节能减排专项监督检查建筑节能检查情况通报 (Report on the Supervision and Special Investigations for building energy efficiency in 2011, MOHURD document No.212*),* published on April 9, 2012.
[964] MOHURD (2017), 13th FYP for GB, *supra* note 946.

BEE renovations in northern China (gfs million $m^{2)}$	150	182
BEE management in public buildings	To adopt energy use monitor systems in the government buildings and other large public buildings	Statistics on the energy use of 33,000 buildings; energy auditing in 4,850 buildings; real-time monitor for energy use in 1,500 buildings; dynamic supervision systems for energy use in 9 areas, including Beijing, Tianjin, Shenzhen, Jiangsu, Chongqing, Inner Mongolia, Shanghai, Zhejiang, and Guizhou; 72 sustainable campus projects completed
Renewable Energy Use in Pilot Projects	200	371 pilot projects using renewable energy; 210 pilot projects using photovoltaic solar systems; 47 demo cities and 98 demo counties that excel in renewable energy use

(Source: MOHURD, 2012)

Table 4 GB development during the 12th FYP

Goals	2010 Baseline	Planned		Achieved	
		2015	Average increase per year (accumulated)	2015	Average increase (accumulated)
Compliance rate in new Buildings (%)	95.4	100	[4.6]	100?	[4.6]
Renovations in the (severe) cold zones (100 million $m^{2)}$	1.8	8.8	[7]	11.7	[9.9]
Renovations in the hot-summer-cold-winter Zones(100 million $m^{2)}$	-	0.5	[0.5]	0.7	[0.7]
Renovations in public buildings (100 million $m^{2)}$	-	0.6	[0.6]	1.1	[1.1]

(Source: MOHURD 2017)

1.1.3 As of 2016: growth continues, and challenges have shown

The GB movement in China is still young and expecting a higher level of GB compliance in the existing buildings. In 2012, only 2% of the new

buildings in cities were green. Correspondingly, SC laid out a national plan on smart city development, in order to obtain an increase to 50% by the year 2020.[965] To push forward the GB movement, in 2017, the NCRD made the Plan for Standard Setting for Energy Conservation (PSSEC), part of which aims to improve the existing standards for building energy efficiency.[966] Shortly after the release of the PSSEC, the MOHURD released the 13th FYP for Building Energy Conservation and Green Building Development, with more specific measures to promote GB.[967]

Table 5 GB targets in the 13th FYP

Goals	2015	2020	Average Annual Growth Rate (AAGR)
% BEE increase in new buildings	--	--	20
% GBs of new buildings	20	50	30
GB renovations in residential buildings (million m2)	--	--	5
GB renovations in public buildings			1

(Source: MOHURD 2017)

With the policy support, GB in China is expected to grow in multiple sectors, mainly include new commercial buildings, new high-rise residential buildings and new institutional buildings.[968] The level of GB renovation activities remained low in 2016, but it may go up as more commercial interiors are coming.[969]

Among other triggers, market demands and healthier buildings have been the top triggers for GB increasing over time.[970] Compared to the high market demands, client demand for GB is much lower.[971] In other words, the aggregate demand for GB might be increasing, but the quantity

[965] SC, 国家新型城镇化规划 (2014－2020 年) (National Plan for Smart City Development 2014-2020), published on March 16, 2014, Chapter 5. Full text available at http://www.gov.cn/zhengce/2014-03/16/content_2640075.htm, last visited September 2017.
[966] NCRD, 节能标准体系建设方案 (Plan for Standard Setting for Energy Conservation, NCRD document No. 83), January 11, 2017. Full text in Chinese available at:http://www.ndrc.gov.cn/gzdt/201701/W020170119398477901696.pdf, last visited July 2017.
[967] MOHURD (2017), 13th FYP on GB, *supra* note 946.
[968] Dodge Data & Analytics (2018), *supra* note 40, at 48.
[969] *Ibid.*
[970] Dodge Data & Analytics (2016), *supra* note 6, at 42; Dodge Data & Analytics (2018), *supra* note 40, at 49.
[971] Dodge Data & Analytics (2018), *supra* note 40, at 49.

demanded by individual consumers may remain low. It may imply, on the one hand, that the GB market in China is growing. On the other hand, there are not so many private buyers going for GB, which can partly result from the higher first cost of GB and the increasing government spending on GB. Environmental regulations were reported in 2016 to be the most important driver for GB growth.[972] However, in the latest report in 2018, the right thing to do reason and branding/PR outweigh environmental regulation as one of the major triggers for GB.

There are challenges facing GB in China. According to the SmartMarket reports, the higher first cost is the top challenge in the way of GB promotion.[973] The payback period turns out to be 6-9 years on average, which becomes longer than expected before.[974] The SmartMarket report does not further explain the reason why the higher first cost plagues GB compliance in China most. Another report shows that, though building green is getting cheaper over time, still a GBEL-certified GB can cost 30%-50% more than does a non-certified GB, and the cost may vary with building types and with certification levels (Table 6).[975]

Besides, concerns about affordability are still the second challenge facing GB in China. The lack of public awareness used to rank high as the top challenges facing GB compliance in China, [976] but it becomes less important in the latest Report 2018.[977] Instead, a lack of political support and incentives now are selected by the respondents as one of the major challenges. According to Report 2016, corruption has plagued GB promotion in China more,[978] which appears not to be a major concern in the SmartMarket Report 2018.[979]

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[972] Dodge Data & Analytics (2016), *supra* note 6, at 43.
[973] Dodge Data & Analytics (2018), *supra* note 40, at 49.
[974] Dodge Data & Analytics (2016), *supra* note 6, at 43. Also, some studies have shown that additional costs remain the biggest challenge facing green construction in China, followed by the high costs of information and measurement as another challenge. See Li, J., and Colombier, M., 'Managing Carbon Emissions in China through Building Energy Efficiency,' 90 (2009) *Journal of Environmental Management*, at 2441; Shi, Q. *et al*., 'Identifying the Critical Factors for Green Construction – An Empirical Study in China,' 40 (2013) *Habitat International*, pp. 1-8; Zhang, X., Platten, A., and Shen, L., 'Green Property Development Practice in China: Costs and Barriers,' 46 (2011) *Building and Environment*, pp. 2153-2160.
[975] See EUSME, 'The Green Building Sector in China,' EUSME center report, published on October 8, 2013, at 13. Full text available at:http://fca.be/sites/fca.be/files/images/EU%20SME%20Centre%20Sector%20Report_Green%20building.pdf, last visited October 2017
[976] Dodge Data & Analytics (2016), *supra* note 6, at 43.
[977] *Id.*, at 49.
[978] *Ibid.*
[979] *Id.*, at 49-50.

Table 6 First costs of GBEL-certified GBs

	1-star CNY/m^2	2-star CNY/m^2	3-star CNY/m^2
Public	45	176	320
Residential	63	131	219

(Tsinghua University 2012; derived from the EUSME 2013)

1.2 New GBs grow fast in rich areas, while more green renovations need to run

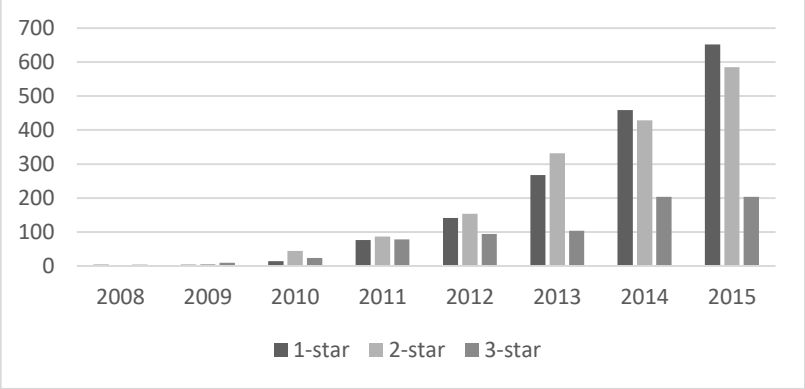
New GBs are not evenly distributed across the country. More than 80% of the GBs are located in rich areas, prominently the top ten provinces by GDP and the four municipalities.[980] This is in part because of the policy goal set in the 12th FYP, which put most of the top ten jurisdictions as loci of pilot GB projects.[981] The policy goal aside, the higher level of GB activities could also be a result of the higher incomes in the top ten cities. A report done by the CBRE has found a positive correlation between the stock of GBs and the economic development of a region.[982]As economies are in good shape in most of the top ten cities, energy consumption could be higher, and hence building energy efficiency is becoming important. In their work, Auffhammer and Wolfram test the relationship between poverty rates and residential energy consumption. It has been found that in provinces with a higher fraction of the population with incomes above CNY3, 000 per year, the number of appliances per household is higher.[983] The result further indicates that income distribution plays a significant part in driving the household acquisition of energy-using durable goods in rural Chinese areas.[984]

GB may sometimes deviate from its pro-environment goal, focusing only on building new GB communities regardless of the actual client demands. It is likely that the client demand for GB is not high enough to make the

[980] China Green Building Council (CGBC), 中国绿色建筑未来发展趋势以及各省市的政策扶持力度
(China green building trends and policies), China GBC report published on January 5, 2016, available at http://www.chinagb.net/zt/WeChat/20160105/114354.shtml, last visited September 2017.
[981] MOHURD (2013), 12th FYP on GB, *supra* note 958, at 20.
[982] The CBRE report indicates that the correlation coefficient between GB quantity and local GDP is 0.78. See CBRE (2015), *supra* note 946, at 5.
[983] Auffhammer, M., and Wolfram, C. D., 'Powering up China: Income Distributions and Residential Electricity Consumption,' 104 (2014) *The American Economic Review*, at 575–580.
[984] *Ibid.*

investment pay off.[985] As a result, those new demo GB communities become ghost towns with few residents and ostensibly consume more energy than they can save.[986] The under-occupation of GB communities may not help to make the most of the land in urban areas.[987] Therefore, down the road, GB compliance can be achieved more via renovations. To date, there are 40 billion m^2 buildings in China, merely 1% of which are certified green, which may signal a bigger potential in GB compliance.[988] Perhaps for that reason, the national standard for GB renovations came into being recently to wake up the potential of GB renovations.[989]

Figure 2 China GB development 2015



(Source: Wang et al. 2016)

1.3 The government takes the lead in GB, whereas the industry can do more

The GB movement in China appears to be more top-down, with the central government taking the lead. In early times, the central government tried to make all the public buildings green,[990] using energy performance contracting to oversee GB compliance.[991] A study has shown that the public sector has a more significant role in the GB market in China, which

[985] Li, X., and Li, B., '绿色生态城区发展现状 (The Status quo of Eco-City Development in China)', in China Society for Urban Studies (CSUS) (ed.), *中国绿色建筑 2016 (China Green Building 2016)* (Beijing: China Architecture and Building Press, 2016), at 69-71.
[986] *Ibid.* More about demo GB projects see *infra* Section 4.4.1.
[987] *Ibid.*
[988] See CGBC (2016), China Green Building Trends and Policies, supra note 980.
[989]MOHURD, 既有建筑绿色改造评价标准 (Standard for Green Renovations, GB/T51141-2015), effective on August 1, 2016.
[990] *Id.*, *at* 5.
[991] Kong, Lu, and Yong (2012), *supra* note 954, at 625.

may suggest that green public procurement can be the key to GB promotion in China.[992] The central government also promotes GBs through financial incentives and GB standard setting.[993] The *National* Assessment Standard for Green Buildings (2015) and the GBEL made of the standards,[994] seem to be the doorsteps to GB compliance to begin with. Unlike the LEED system as a private rating system, the GBEL is a government-led certification program established and administered by the MOHURD and its local counterparts.[995]

In contrast to the government's exuberance in GB promotion, the building industry and professionals did not seem to play a big part in the beginning.[996] The 3rd-party certification market is still in its infancy, with most of the GB regulations referring to the government-led GBEL certification.[997] The China Green Building Council (CGBC) as a professional association did not exist until 2008. The CGBC with its current line-up focuses mainly on GB research and building professionals training.[998] Put differently, the CGBC might not have contributed a lot to the GB movement's survival in early times; neither has it done much in GB standard setting. It is worth noting that the CGBC was born late and hence still awaits chances to do more for GB promotion. Down the road, the government can be expected to work with the industry, as GB compliance has gone beyond public agencies, and some industry-based certifications like the LEED are heading towards the growing GB market in China.[999]

1.4 Laws and policies affect GB growth

GB compliance increased as the GB laws and policies came into effect.[1000] The GB SmartMarket report 2016 has shown that environmental

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[992] Shi (2013), *supra* note 974, *at 6*.
[993] Ministry of Science and Technology of the PRC (MOST), '十二五绿色建筑科技发展专项推进情况介绍(Promotion of Science and Technology Development Projects of Green Building during the Twelfth-Five-Year Plan)', in CSUS (ed.), *China Green Building 2016* (Beijing: China Architecture & Building Press), at 17-20.
[994] MOHURD (2015), Assessment Standard for Green Buildings, *supra* note 956.
[995] More about the GBEL and the LEED see Khanna, Nina et al. (2014), *supra* note 51, at 16-22.
[996] Li and Li (2016), *supra* note 985, at 56; Wang, H, '经济法视野下的绿色建筑发展 (Green Building Development from an Economic Law Perspective)', 1 (2013) *齐鲁学刊 (Qilu Journal)*, at 109.
[997] See *infra* Section 4.1.3.
[998] More about the China Green Building Council (CGBC) see CGBC, 'Introduction,' available at http://www.chinagb.net/chinagbc/committee/20080505/26603.shtml, last visited September 2017.
[999] See *infra* Section 4.1.3.
[1000] CBRE (2015), supra note 946, at 5-6; USGBC, 'LEED in Motion: China', published on 17 October 2017, at 22-60. Full text available at https://www.usgbc.org/resources/leed-motion-china, last visited July 2018.

regulations are one of the most important triggers in China.[1001] This is in line with findings in a report on China's BEE market, which shows that changes in policies and laws can help to boost the GB market on different levels.[1002] For instance, the 11th FYP led the Chinese government to invest more than CNY 15.4 billion (around $2.5 billion) in energy efficiency retro-fitting. In response to the central energy efficiency policies, local governments made their move to fund pilot projects of lower energy consumption. Those government-funded projects have made 55% of the existing projects built in compliance with the national standards.

In the meantime, the 11th and the 12th FYP in support of energy efficient doors and windows have created a higher profit margin with a profit rate around 15% on average, compared to the 5% profit rate of traditional products. The past decade has also seen more extensive use of high-performance HVAC systems in buildings, as the new building codes and policies were phased in. With the money flowing from the Chinese government, the amount of retro-fitted floor-space exceeded the target by 20% during the 11th FYP, which made the tougher targets in the 12th FYP more likely to be achieved. Such government-driven demand in some way diverted the consumers' demand from A/C to HVAC for better heating and ventilation in their homes.[1003] As with the HVAC industry, the energy efficient lighting market also owes its success to the country's energy policies.

On the flip side, the GB law in its current form seems to divert all too much effort from green renovations to new GBs. As with the Regulations on Building Energy Conservation,[1004] most of the GB laws make GB compliance mandatory for new GBs, while green renovations can be done on a voluntary basis.

[1001] Dodge Data & Analytics (2016), *supra* note 6, at 42. Likewise, environmental regulations have also turned out to be one of the most important drivers for green construction in China, as shown empirically in a survey. See Qi et al. (2010), *supra* note 945, at 1363.

[1002] Yu, S., Evans, M., and Shi, Q., 'Analysis of the Chinese Market for Building Energy Efficiency,' the USDOE report no. PNNL-22761, March 2014, at 22-32; National Development and Reform Committee (NDRC), '半导体照明产业"十三五"发展规划 (The 13th FYP for the Semi-conductor Lighting Industry in China)', NDRC document No.1363, July 10, 2017, p.2. Full text available at http://www.ndrc.gov.cn/zcfb/zcfbghwb/201707/t20170728_856271.html, last visited September 2017.

[1003] Heating, ventilation, and air-conditioning (HVAC) system is said to provide thermal comfort and acceptable indoor air quality throughout the year and can be tailored to the users' needs. By contrast, an air-conditioning (AC) system only deals with the temperature and humidity of the air, and in some areas, the AC systems work only during a certain period. Usually, the AC is ready-made, and it would be costly to change the setup.

[1004] SC, 民用建筑节能条例 (Regulations of Energy Conservation in Residential and Commercial Buildings, SC order No. 530), effective on October 1, 2008

Figure 3 GB Compliance during the 11th FYP

Year	Gross Square Footage (million m^2)	GB Design Compliance rate	GB Construction Compliance rate
2006	10.6	95.7	53.8
2007	21.2	97	71
2008	28.5	98	82
2009	40.8	99	90
2010	48.6	99.5	95.4

(MOHURD 2012)

2. China law basics

In theory, the law will partly determine how GB rules are made, and the incentives for the rules to be (well) played out. Before looking into what the law says about GB compliance, the section gives a brief introduction to the legal system in mainland China.

The Constitution of the People's Republic of China (hereinafter 'The PRC Constitution') spells out the political structure of China. China is a socialist country ruled by the Communist Party of China (CPC), in collaboration with other democratic parties.[1005] The state power resides with the People at large and is exercised in a centralized manner.[1006] In exercise of the power vested in them, the People choose their representatives in the legislative branch of the State ('the People's Congresses'), in the way of direct and indirect elections.[1007] The elected legislators, by the authority laid down in the PRC Constitution, will make laws to create and oversee the administrative branch of the State ('the People's governments'),[1008] the judicial branch of the State ('the People's Courts and the People's Procuratorates'), and the supervisory branch of the State ('The State Committee of Supervisory of the PRC' and its local committees).[1009]

[1005] NPC, 中华人民共和国宪法 (Constitution of the People's Republic of China), effective on December 4, 1982; last amended on March 11, 2018), Preamble, available (in English) at http://www.npc.gov.cn/englishnpc/Constitution/node_2825.htm, last visited June 2017.
[1006] NPC (2018), PRC Constitution, *supra* note 1005, Preamble.
[1007] Elections in China are based on a hierarchical electoral system, whereby People's Congresses at the lowest level are directly elected, and all higher levels of People's Congresses up to the National People's Congress, are indirectly elected by the People's Congress of the level immediately below. See NPC, PRC Constitution, *supra* note 1005, Article 57 and Article 97.
[1008] NPC (2018), PRC Constitution, *supra* note 1005, Sec.1 and Sec.5
[1009] *Id.*, Sec.7. The 'procuratorates' in China are public entities in charge of the prosecution of crimes; in a few cases, they also carry out investigations on some duty-related crimes, prominently those concerning corruptions. See NPC, 中华人民共和国人民检察院组织法 (*The Organic Law of the People's Procuratorates of the People's Republic of China*, effective on July 5, 1979; amended

Vertically, each of the four branches will be instituted at the central and local level and run in the hierarchy. For instance, for the administrative branch, the State Council of the PRC (hereinafter the 'SC') as the central government will supervise governments at the local level. The legislative branch and the judicial branch are shaped similarly.

In light of the political structure, the legislative, administrative and judicial branch play different roles in the Chinese legal system. The legislative branch makes and interprets the law, [1010] the administrative branch implements and enforces the law, and the judicial branch applies or enforces the law. [1011]Yet when it comes to lawmaking, the administrative branch can also make regulations as part of the law.[1012]

At the central level, the National People's Congress (NPC) and its Standing Committee (NPCSC) make legislation that addresses the

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on September 2, 1983), Article 5.

It is noteworthy that the political structure in China has gone through some radical changes in 2018. The 13th NPC on March 11 passed the amendment of the PRC Constitution, establishing the State Committee of Supervisory (SCS) of the PRC. The SCS is meant to oversee public agents as members of the China Communist Party and to investigate job-related wrong-doing, in deference to the due process principle. The SCS and its local counterparts barely play a role in lawmaking, and hence will not be much concerned in this study. See NPC (2018), PRC Constitution, *supra* note 1005, Article 125; NPC, 中华人民共和国监察法 (Supervision Law of the PRC, passed and effective on March 20, 2018).

In the meantime, the 13th NPC also approved the reorganization of the State Council of the PRC. The reform of the SC and its ministries is taking shape at the central and local levels, and it may take a long time for the reorganization to be accomplished. In that sense, the existing legal framework of GB at this point is still primarily based on the old institutional framework in China.

[1010] In China, the three branches can in some ways 'interpret' laws in terms of application. But 'the power of legal interpretation' resides only with the NPCSC, meaning that only the NPCSC interpretation has the same binding force as legislative laws. See NPC, 中华人民共和国立法法 (Legislation Law of the People's Republic of China), effective on March 15, 2000, Article 47, *available (in English) at http://www.npc.gov.cn/englishnpc/Law/2007-12/11/content_1383554.htm, last visited June 2017*

[1011] In addition to the three branches, the State's structure also includes the Central Military Committee and the President of the PRC. Both are appointed by the NPC. The Central Military Committee directs the armed force of the Country. The President is responsible to "promulgate statutes; to appoints or removes the Premier, Vice-Premiers, State Councillors, Ministers in charge of ministries or commissions, the Auditor-General and the Secretary-General of the State Council; to confer State medals and titles of honor; to issue orders of special pardons; to proclaim entering of the state of emergency; to proclaim a state of war; and to issue mobilization orders." See NPC (2018), PRC Constitution, *supra* note 1005, Sec 2, Article 8; Sec 4, Article 93.

[1012] The judicial branch does not have the power to make law, according to the Legislation Law 2000. However, the Supreme People's Court (SPC) is entitled to interpret legislation ('judicial interpretation'). The SPC's interpretation is binding only on courts at lower levels, in which case the interpretive documents laid out by the SPC will be largely quoted in the rulings or verdicts. In that sense, the SPC's interpretation is taken by scholarship as 'quasi-law.' See NPC, 中华人民共和国人民法院组织法 (Organic Law of the People's Courts of the People's Republic of China), effective on March 15, 2000, Article 32.

fundamental aspects of the country.[1013] Usually, it takes three steps for a bill to become legislation. First, the Presidium of the NPC needs to decide whether or not a bill proposed will be put on the NPC's agenda for discussion.[1014] Once brought up on the agenda, the bill will be delivered to the NPCSC, which is at the helm of the second step before the bill is put forward for final voting. At this stage, the bill will be reviewed by the NPCSC, on account of reports given by the bill proposer(s) and the NPC's Law Committee.[1015] At that point, the Law Committee will have the bill to be reviewed by experts or by people of interest, including the bill proposers, the NPC's Special Committees,[1016] the representative groups, governments at the central/local level and the public.[1017] A hearing of the bill will be held where necessary, particularly when parties at stake cannot agree on a sticking point. After the discussion-and-review process, the Law Committee is responsible for coming up with a final draft for the NPC to vote on.[1018] Finally, the NPC will vote to determine whether or not the bill can become law. If the majority (50% or above) of the NPC representatives vote for the bill, it will get passed and be signed by the

[1013] As laid down in the Legislation Law (2000), "the following affairs shall only be governed by law: (1) affairs concerning State sovereignty; (2) formation, organization, and the functions and powers of the people's congresses, the people's governments, the people's courts and the people's procuratorates at all levels; (3) the system of regional national autonomy, the system of special administrative region, the system of self-government among people at the grassroots level; (4) criminal offences and their punishment; (5) mandatory measures and penalties involving deprivation of citizens of their political rights or restriction of the freedom of their person; (6) requisition of non-State-owned property; (7) basic civil system; (8) basic economic system and basic systems of finance, taxation, customs, banking and foreign trade; (9) systems of litigation and arbitration; and (10) other affairs on which laws must be made by the National People's Congress or its Standing Committee." See NPC (2000), Legislation Law, *supra* note 1010, Article 8.

[1014] The Presidium of the NPC is a 178-member body of the National People's Congress (NPC). It is composed of senior officials of the CPC, the state, non-Communist parties and All-China Federation of Industry and Commerce, those without party affiliation, heads of central government agencies and people's organizations, leading members of all the 35 delegations to the NPC session including those from Hong Kong and Macao and the People's Liberation Army (PLA).

The Legislation Law (2000) allows a wide range of entities to submit bills to the Presidium, including the NPCSC, the NPC Committees, the SC, the Central Military Committee, the Supreme People's Court (SPC), The Supreme People's Procuratorate (SPP), and a representative group of no less than 30 deputies from the People's congresses at the local level. See NPC (2000), Legislation Law, *supra* note 1010, Article 14.

[1015] *Id.*, Article 29.

[1016] The NPC has 9 special committees, namely the Environmental Protection and Resource Conservation Committee, the Ethnic Affairs Committee, the Law Committee, the Internal and Judicial Affairs Committee, the Financial and Economic Affairs Committee, the Education, Science, Culture and Public Health Committee, the Foreign Affairs Committee, and the Overseas Chinese Affairs Committee. Those committees, among other goals, are mainly responsible to "study, examine and draw up bills related to their fields and to assist the NPC and its Standing Committee in their work of legislation, supervision. For more information about the NPC, see NPC, 'Special Committees,' available at http://www.npc.gov.cn/englishnpc/Organization/2013-03/29/content_1790771.htm, last visited June 2017.

[1017] NPC (2000), Legislation Law, *supra* note 1010, Article 37, 38, 39 and 40.

[1018] *Id.*, Article 41, sec. 1.

President to become a legislative law. If the bill fails, it will either go back to the second step for a further revision or be put out when the lawmaking process has been in an impasse for more than two years.[1019]

The State Council (SC) as the central government is empowered by the NPC/NPCSC to enact administrative regulations ('*xingzhengfagui*').[1020] The administrative regulations can be made to better enforce the laws that are general and vague; other times, they can lay out the specific rules for specific regulatory tasks.[1021] Yet the SC's power to make law has its limits, in the sense that the administrative regulations cannot address issues that should otherwise be determined by the legislatures.[1022]

In addition to the administrative regulations, each of the SC ministries can make departmental rules ('*bumenguizhang*')[1023] to lay out the nuts and bolts for the enforcement of other laws and regulations.[1024] The Ministry as the drafter makes decisions on the hearing and the passage of the proposed departmental rules. It should be noted that the administrative regulations are promulgated in the name of the SC as a whole, while the departmental rules are promulgated in the name of a specific ministry under the SC.

By and large lawmaking at the local level works likewise, in which case the People's Congresses (PCs) and their Standing Committees (PCSCs), as well as the local People's Governments, can make laws within their jurisdictions.[1025] This study does not explain the local lawmaking at length. A further point to note is that the Chinese legal system is shaped in the hierarchy, in which case rules made by the different authorities may differ in their legal effects. In principle, laws made by the legislative branch are superior to those made by the administrative branch; laws made by entities at a higher level are superior to those made by entities at a lower level.[1026] The application of Chinese law is much more complicated, especially when different rules clash with one another. The table below gives a simple way to *name* the Chinese legal documents (Table 10), based on

[1019] *Id*., Article 42.
[1020] *Id.*, Article 9.
[1021] *Id*., Article 65.
[1022] *Id*., Article 9.
[1023] *Id*., Article 73.
[1024] *Ibid.*
[1025] See NPC (2000), Legislation Law, *supra* note 1010, Chapter IV, Section 1.
[1026] For more details about the application of China law see NPC (2000), Legislation Law, *supra* note 1010, Chapter V.

which a legal framework for GB compliance can be sketched out in Section 3.[1027]

Table 7 Lawmaking in mainland China

Central		**Local**	
NPC & NPCSC	Laws	**PCs & PCSCs**	Regulations
SC	Regulations	**Local People's governments**	Rules
Ministries in the SC	Rules		

3. GB legal framework

Most of the building activities in China are subject to environmental laws and regulations, [1028] which require stakeholders to reduce the environmental impacts of buildings.[1029] In the light of the Chinese legal system, GB laws can be made at the central or local level. At the central level, there is not a single piece of law precisely made for GB compliance. Instead, the central GB laws are dispersed and have more to say about environmental impacts assessment (EIA) on building projects and BEE; by contrast, indoor air quality pales in significance in the central GB laws.

The Environmental Impact Assessment Law of the PRC (hereinafter 'EIA Law 2016'), along with the lately-amended regulation for EIA,[1030] tends to address negative externalities around building activities, such as GHGs emissions, C/D wastes and environmental impacts on habitats. Those environmental impacts will be assessed in a report as a requirement to get building permits or some financial incentives provided by the

[1027] In this study, the 'laws' refer to rules made by the legislatures, viz the PC (or PCSC) at all levels; the 'regulations' are made by the governments at all levels, and the 'regulatory rules' are made by the departments (or ministries) within the governments of all levels.

[1028] NPCSC, 中华人民共和国建筑法(Construction Law of the People's Republic of China, enacted on November 1, 1997; amended on April 22, 2011), Article 4 and Article 41.

[1029] Some environmental laws at the central level in China have made environmental protection a national goal and hence an obligation borne by the People at large. In order to make the environment better, individuals and entities ought to produce, supply, use and dispose of green. In that sense, China environmental law has tilted the balance from an end-of-pipe approach to a from-cradle-to-cradle one, which will also be used to green the building industry. NPCSC, 中华人民共和国环境保护法(Environmental Protection Law of the People's Republic of China, enacted on December 26, 1989; amended on April 24, 2014), Article 4, 5 and 6; NPCSC, 中华人民共和国清洁生产促进法 (*Law of the Promotion of Cleaner Production of the PRC*, the PRC President Order No.72), effective on January 1, 2003, Article 13. Full text available in English at http://www.npc.gov.cn/englishnpc/Law/2007-12/06/content_1382101.htm, last visited July 2017.

[1030] SC, 建设项目环境保护管理条例 (Regulation of Environmental Protection for Building Projects), effective on November 29, 1998; amended on July 16, 2017.

government.[1031] Another big part of the central GB laws focuses on building energy efficiency, given the energy saving potential of GBs and China's growing energy demand. [1032] Another two laws at the central level, namely the Energy Conservation Law (2008),[1033] and the Renewable Energy Law (2009),[1034] lay out the main rules for building energy efficiency. To further implement the central legislation for building energy efficiency, the SC made the Regulations of the Energy Conservation of Buildings (hereinafter 'RECB 2008'),[1035] based on which the MOHURD through some departmental rules lays out the nuts and bolts to carry out the instruments laid down in the legislation.

In response to the central GB laws, local GB lawmaking appears to start with regulations made by governments, most of which deal with building energy efficiency or GB labeling in the first place. As of 2015, local legislatures began to make local legislation in which GB compliance is taken as a whole. To date, legislation at the local level still accounts for a small part of the local GB laws. More local GB legislation is on the way, as is the case in Shanghai and Fujian. Of particular note, as GB compliance has gone citywide, some local legislation and regulations are made for GB compliance in a demo GB community that could jointly be built as a transnational project, e.g., the Sino-Singapore Tientsin Eco-city.

In the light of the legal system pictured before, this section investigates GB laws at the central and local levels. Section 3.1 maps out the central GB laws, including legislation made by the NPCSC, regulations made by the SC and the rules made by the ministers of the SC. Similarly, Section 3.2 proceeds as two parts to present the local GB laws. Section 3.2.1 gives an overview on how the local GB laws shape, followed by Section 3.2.2 that illustrates with some local GB Laws in Jiangsu, Zhejiang, Guangdong, Guangxi and Tientsin Municipality.

[1031] NPCSC, 中华人民共和国环境影响评价法 (Environmental Impacts Assessment Law of the People's Republic of China, enacted on October 28, 2002; amended on July 2, 2016), Section II and III.
[1032] Auffhammer and Wolfram (2014), *supra* note 983, at 575-580.
[1033] NPCSC, 中华人民共和国节约能源法 (Energy Conservation Law of the People's Republic of China, effective on April 1, 2008), Chapter III, Section 3.
[1034] NPCSC, 中华人民共和国可再生能源法 (Renewable Energy Law of the People's Republic of China, effective on January 1, 2006), Article 17.
[1035] SC, 民用建筑节能条例 (Regulations of Energy Conservation in Buildings, SC order No. 530), effective on October 1, 2008.

3.1 Central GB laws

3.1.1 Legislation concerning GB compliance

Legislation at the central level lays out some instruments for environmental compliance in general, of which the environmental impact assessment (EIA) seems to be the most relevant to GB compliance.[1036]As the Environmental Protection Law (2014) does not have much to say about the EIA, the Environmental Impact Assessment Law of the PRC (hereinafter 'EIA Law 2016) was made to rule individual building projects up to the national planning.[1037] The EIA Law 2016 further lays down what needs to be assessed, when the EIA should be done, and who is responsible for the EIA.[1038] Apart from those rules applicable to GB compliance as a whole, there are other environmental laws in some ways addressing one or more elements of a GB, including energy efficiency, land use, indoor air quality (IAQ), waste disposal and water use.

Building energy efficiency is mainly addressed in the Energy Conservation Law of the PRC (hereinafter the 'Energy Conservation Law 2008'),[1039] and the Renewable Energy Law of the PRC (hereinafter the 'Renewable Energy Law 2009').[1040] The Energy Conservation Law 2008 singles out building energy efficiency as an essential part of the energy conservation initiative. The Energy Conservation Law 2008 does not set standards for GB; instead, it empowers the MOHURD to make uniform standards for building energy efficiency, meanwhile allowing local governments to set standards that are more stringent than the central ones.[1041] Public agencies shall take the lead in compliance with the standards, while private projects are encouraged to comply.[1042]

For GB compliance, the Energy Conservation Law 2008 puts in place instruments such as planning on building energy efficiency renovations in public buildings,[1043] building permits,[1044] public procurement for GB

[1036] NPCSC (2014), Environmental Protection Law, *supra* note 1029, Article 19 & 41; NPCSC (2003), Law of the Promotion of Cleaner Production, *supra* note 1029, Article 18.
[1037] NPCSC (2016), Environmental Impact Assessment Law, *supra* note 1031, Section II and III.
[1038] *Id.*, Section III.
[1039] NPCSC, 中华人民共和国节约能源法 (Energy Conservation Law of the People's Republic of China, effective on April 1, 2008), Chapter III, Section 3.
[1040] NPCSC, 中华人民共和国可再生能源法 (Renewable Energy Law of the People's Republic of China, effective on January 1, 2006), Article 17.
[1041] NPCSC (2008), Energy Conservation Law, *supra* note 1039, Article 14.
[1042] *Id.*, Article 39.
[1043] *Id.*, Article 48.
[1044] For instance, the government should not grant a permit for the building work to begin unless the project is carried out in compliance with the energy efficiency standards. For projects in progress, the government is entitled to pause the projects due to non-compliance, and to require the project stakeholders to correct the wrongdoing in a given period. In the case of completed projects, they would

products,[1045] energy auditing,[1046] and mandatory information disclosure in the housing contract.[1047] The Renewable Energy Law 2009 does not deal much with buildings. But it may in a way influence GB compliance, as it encourages renewable energy use in power generation and hence reductions in the GHGs emissions of buildings. The Renewable Energy Law 2009 laid out a 'clean-energy-all-in' policy, by which all the energy made out of clean energy would be purchased by the State Grid and be put before non-clean energy in distribution.[1048]

There are two basic ways to GB compliance regarding land use, one of which is to make GB projects part of land use planning. A land use plan made by the government would not be allowed to run without an EIA,[1049] according to the Environmental Protection Law 2014. Correspondingly, the Urban and Rural Planning Law 2008 requires all the planning work to be in the interest of environmental impact reduction as well as smart use of the land resource.[1050] For each of the projects, the entitlement of land will be primarily granted by the government on account of the land use planning.[1051]

GB compliance regarding land use also requires reductions in environmental impacts on areas of ecological concern**.** The Environmental Protection Law 2014 draws an eco-redline ('*shengtaihongxian*') against building activities that would harm wildlife habitats, historic sites, wetlands or any other similar vulnerable ecosystems.[1052] On that account, regulators approving the EIA should consult entities in charge of wildlife protection at the same level.[1053] Apart from planning, the property regime in China also lends some support to GB land use. The Property Law 2007 lays out a 'live and let live' rule for using adjacent properties ('*xianglinguanxi*'). The rule requires that owners or occupiers living in the vicinity should allow each other to have accesses to the properties; anyone

cease to be put into use or for sale if found non-compliant. *Id.*, Article 15, 34 and 35.

[1045] Public agencies should preferably purchase energy-saving products that are listed in categories made by governments at the provincial level or above. By no means should governments at all levels purchase retired or scrapped building products that are no longer energy-efficient. *Id*., Article 51.

[1046] *Id*., Article 49 and 50.

[1047] Building developers should provide expressly in conveyance the information about the energy saving measures of properties for sale, and are liable for giving fake or false information. *Id.*, Article 36.

[1048] NPCSC (2009), Renewable Energy Law, *supra* note 1040, Article 14.

[1049] NPCSC (2014), Environmental Protection Law, *supra* note 1029, Article 19.

[1050] NPCSC, 中华人民共和国城乡规划法 (The Urban and Rural Planning Law of the People's Republic of China, effective on January 1, 2008), Article 4.

[1051] *Ibid.*

[1052] NPCSC (2014), Environmental Protection Law, *supra* note 1029, Article 29.

[1053] NPCSC, 中华人民共和国野生动物保护法 (Wildlife Protection Law of the People's Republic of China, enacted on November 8, 1988; amended on July 2, 2016), Article 13.

who causes nuisance or damage to the property will be liable to reduce or to pay for the harm to others. [1054]

Concerning land use, construction/demolition wastes (C/D waste) disposal has in part resulted in China's increasing land contamination and underground water pollution.[1055] Legislation at the central level requires that building stakeholders should produce, transport, store and dispose of C/D wastes in compliance with environmental standards. [1056] Non-compliance with the standards will lead to fines and injunctions. In the light of the EIA, a building project ought to be built in tandem with waste treatment facilities that have been approved by the authorities.[1057] More precaution should be taken when it comes to hazardous waste disposal.

By contrast, the central legislation does not have much to say about GB compliance regarding water use and indoor air quality. Similar to waste disposal, the central legislation requires all the building projects to be done in conjunction with water-saving measures or facilities; a failure to do so will lead to administrative penalties.[1058] The Environmental Protection Law 2014, which literally defines the 'environment' as the outdoor environment,[1059] barely deals with indoor air quality (IAQ). Neither has any other piece of legislation been made to precisely address IAQ. For the time being IAQ is mostly required in some technical standards for indoor pollutants such as formaldehyde and VOCs. However, this does not mean that indoor air quality is of little importance. The SmartMarket report 2016 has shown that in pursuit of GB compliance, indoor air quality matters more in China (47%) than it does on the global average (17%).[1060]

[1054] NPC, 中华人民共和国物权法 (Property Law of the People's Republic of China, The President Order No. 62), effective on October 1, 2007, Article 89 and 90.

[1055] See MEP & MLR, '全国土壤污染状况调查公报' (Report on the contaminated land in China), MEP Report on April 17, 2017, at 4. Full text available at http://www.zhb.gov.cn/gkml/hbb/qt/201404/W020140417558995804588.pdf, last visited July 2017; China News, '万泉河遭上千吨垃圾入侵河床被填高 10 多米' (Wanquan Riverbed rose by 10m due to the outpouring of construction and demolition wastes), China News report, 28 May 2016, available at http://news.xinhuanet.com/fortune/2016-05/28/c_129022824.htm, last visited July 7, 2017; Zhang, G., '建筑垃圾之殇' (The Unbearable Weight of C/D Wastes in China), on the Solid Waste Website, 13 October 2017, available at http://www.solidwaste.com.cn/news/247372.html, last visited July 2017.

[1056] NPCSC, 中华人民共和国固体废物污染环境防治法 (Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Waste', effective on April 1, 2005), Article 33.

[1057] *Id.*, Article 14.

[1058] NPCSC, 中华人民共和国水法 (Water Law of the People's Republic of China, effective on 1 October 1 2002).

[1059] NPCSC (2014), Environmental Protection Law, *supra* note 1029, Article 2.

[1060] Dodge Analytics (2016), *supra* note 6, at 43.

3.1.2 Administrative regulations: building energy efficiency at heart; public agencies take the lead

The central administrative regulations focus more on building energy efficiency and put public agencies to the fore in GB compliance. The Regulation of the Energy Conservation of Buildings (hereinafter 'the RECB 2008') was passed by the State Council of the PRC (SC) in 2008.[1061] The RECB 2008 aims at energy efficiency in commercial, residential and public buildings.[1062] The RECB 2008 speaks of standard setting, the instruments for compliance with the standards, and the accountability of stakeholders. The RECB 2008 empowers the MOHURD, along with other SC ministries, to set uniform standards on BEE at the central level, meanwhile allowing local governments to make standards that are more stringent than their central counterparts.[1063]

Compliance with the central standards may differ across different types of buildings. All the new buildings should be built in accordance with the national standards, regardless of the building types.[1064] In the case of renovations, compliance is mandatory for government buildings; residential and commercial buildings are encouraged to undertake green renovations on a voluntary basis.[1065]

Apart from standard setting, the RECB 2008 makes use of various instruments to promote GB compliance. In the interest of mandatory GB compliance, a planning or building permit can be granted by the government if and only if a project design meets the central standards.[1066] At the post-construction stage, mandatory energy information disclosure is required. All the governmental agencies, plus the owners of large-scale public buildings, should report to the public about energy use in their buildings.[1067] Developers of private projects should inform buyers about the amount of energy needed and the right way to use the energy-saving systems of buildings. In the case of no information or misinformation, the developers will be fined or their license will be revoked by the government, and will probably be liable for the losses of the buyers who make claims.[1068]

[1061] SC (2008), Regulation of the Energy Conservation of Buildings, *supra* note 1035.
[1062] *Id*., Article 1 and 2.
[1063] *Id*., Article 7.
[1064] *Id*., Article 12 and 21.
[1065] *Id*., Article 26 and 27.
[1066] *Id.*, Article 12.
[1067] *Id*., Article 21 and 32.
[1068] *Id*., Article 43.

The mandates aside, the RECB2008 also puts in place tax reductions for voluntary retrofitting, yet the law does not bring up any other market-based instruments. When it comes to accountability, the RECB 2008 may somewhat help to integrate the dispersed stakeholders in GB compliance, in the sense that it has as potentially responsible parties the governmental bureaucrats, developers, designers, constructors and supervisors.[1069]

Among other GB stakeholders, the RECB 2008 seems to emphasize the role of governments in GB. Correspondingly, the SC passed the Regulation of the Energy Conservation of Public Buildings (hereinafter the RECPB 2008),[1070] which is made to further tell what public agencies shall do in improving building energy efficiency. [1071] More specifically, the RECPB 2008 requires all the public agencies to, first of all, make plans on energy conservation, laying out annual goals, e.g., a cap on the amount of energy consumed, and the means used to reach the goals.[1072] Second, public agencies at all levels shall purchase products with environmental labels or those listed on the category made by governments at the provincial level or above.[1073] Third, all the public agencies should carry out energy auditing and reporting, to demonstrate how the energy saving systems work, whether or not the actual energy use is in line with the conservation plans, and what can be done to improve BEE in public buildings.[1074] In addition, all the public agencies are encouraged to buy energy services from suppliers on the market, prominently via energy performance contracting (EPC).In order to oversee compliance, the RECPB 2008 empowers the government to carry out inspections on public agencies of their level.[1075]A further point to note is that inspections on buildings of the government per se will be done by the administration affair office of that government.[1076] In this way, the RECPB 2008 is more like a self-enforced code on the government side, and is not meant for the regulators to oversee the regulated.

3.1.3 Department rules

A large part of the Chinese GB laws takes the form of departmental rules, mostly made by one or more SC ministries, prominently the MOHURD, the MEP, and the NDRC. GB compliance as a whole will mainly be

[1069] *Id*., Articles 35 - 44.
[1070] SC, 公共机构节能条例 (Regulation of the Energy Conservation in Public Buildings, SC Order No. 531), effective on October 1, 2008.
[1071] *Id*., Article 2.
[1072] *Id*., Article 10, 12, 13 and 16.
[1073] *Id*., Article 18 and 19.
[1074] *Id*., Article 15 and 23.
[1075] *Id*., Section 5.
[1076] *Ibid.*

achieved via EIA and labeling. The Rule of EIAs for Building Projects at the Post-occupancy Stage (2015)[1077] requires a follow-up EIA to see whether or not a project works in line with the EIA approved at the pre-construction stage. A post-construction EIA as such ought to be conducted within 3 to 5 years after the project is put into use.[1078] The rule applies to projects located in a vulnerable ecological area, projects that generate hazardous substances, and any other project that would cause environmental risks.[1079] Building stakeholders, primarily developers, and operators, are responsible for carrying out the post-construction EIA and submitting it to the authority.[1080] If they fail to test and improve the environmental protection measures where necessary, environmental regulators can require the building stakeholders to make amendments in a given period, or expose their non-compliance to the public if the stakeholders do not seem to make a move.[1081]

Apart from the mandatory post-construction EIA, GB labeling is another major instrument in the GB rules. The Rules of Green Building Labeling (hereinafter the GBLR 2007) lay the ground for GB labeling.[1082] The GBLR (2007) sets the tone that GB labeling is government-led and voluntary for private building stakeholders. For a building to be certified or labeled green, the building stakeholders need to apply and hand in the documents required, which will be reviewed by the government to see whether or not the building meets the Assessment Standard for Green Building (2015).[1083] If it does, the government will grant and oversee the use of the label (or the certificate).[1084] The certificate or the label may be invalidated when the stakeholders do not renew the certificate every three years, or when the government suspends or withdraws it due to false certification or misuse.[1085] However, more detailed rules are needed to implement the labeling program laid down in the GBLR (2007).[1086]

Likewise, the Rules of Green Building Materials Labeling (hereinafter the GBMLR 2014) also appear to be vague and general.[1087] The GBMLR 2014

[1077] MEP, 建设项目环境影响后评价管理办法（试行) (Rule of EIAs for Building Projects at the Post-occupancy Stage, MEP Document No. 37), December 10, 2015.
[1078] *Id.*, Article 8.
[1079] *Id*., Article 3.
[1080] *Id*., Article 11.
[1081] *Id*., Article 11.
[1082] MOHURD, 绿色建筑评价标识管理办法（试行）(Rules of Green Building Labeling, MOHURD Document No. 206), August 21, 2007,
[1083] MOHURD (2015), Assessment Standard for Green Buildings, *supra* note 956.
[1084] MOHURD (2007), Rules of Green Building Labeling, *supra* note 1082, Article 10-15.
[1085] *Id*., Article 18.
[1086] *Id*., Article 21.
[1087] MOHURD & MIIT, 绿色建材评价标识管理办法 (Rule of Green Building Materials Labeling,

resembles the GBLR 2007 on some fronts, except that the GBMLR 2014 is meant for building materials only, and not for GB compliance as a whole. In 2015, the MOHURD came up with the Rules for the Implementation of Green Building Materials Labeling, [1088] which further clarify the evaluation, application, certification, and supervision of the labeling program. Of particular note, the GBML Implementation Rules 2015 makes third-party evaluation part of the labeling program. In that case, building stakeholders should apply to a third-party agency at first,[1089] and the third-party agency will then review and hand in an evaluation report for the government to grant the label.[1090] The third-party agency should beware of falsifying or manipulating the evaluation report; otherwise it will get blemishes on its credibility recorded and disclosed by the regulator. [1091]

Other department rules may address one aspect of GB compliance, of which the Rules of Energy Conservation in Residential and Commercial Buildings (hereinafter the ECRCB 2006) was made to improve building energy efficiency in residential and commercial buildings. [1092] The ECRCB 2006 requires the central government, mainly the MOHURD, to establish building energy efficiency standards that are economically and technically feasible.[1093] Local governments can only make standards that are more stringent than the central ones.[1094] All new buildings should be built in line with the standards; while renovations for building energy efficiency are not mandatory to the existing buildings. Yet if renovations for other purposes are meant to happen anyway, the building stakeholders should make improvements for building energy efficiency part of the renovation scheme.[1095]

The ECRCB (2006) mandates not only the governments but also private parties to build green. Governments at the local levels are required to do planning on building energy conservation, on account of the overall urban or rural planning.[1096] In the meantime, the law requires governments to come up with categories of energy-efficient building products, given the

MOHURD Doc No. 75), effective on May 21, 2014.

[1088] MOHURD, 绿色建材评价标识管理办法实施细则 (Rules of the Implementation of Green Building Materials Labeling), October 14, 2015

[1089] *Id*., Article 12.

[1090] *Id*., Article 16.

[1091] *Id*., Article 27.

[1092] MOHURD, 民用建筑节能管理规定 (Rules of Energy Conservation in Residential and Commercial Buildings, MOHURD Order No. 142), effective on January 1, 2006.

[1093] *Id*., Article 6.

[1094] *Ibid.*

[1095] *Id*., Article 11.

[1096] *Id*., Article 4 & Article 5.

energy saving technologies in need.[1097] The ECRCB 2006 encourages governments to provide financial incentives for GB compliance, yet the law does not say anything about any specific ways to finance GBs. On the side of private stakeholders, developers, designers, constructors, and supervisors should comply with the energy use standards. In the case of non-compliance, the building stakeholders will be fined or have their license revoked by the regulator. In the meantime, the building stakeholders should take action to make improvements so that the project building can continue.[1098]

Information is also a vital issue in the ECRCB (2006). When building projects are put in the market, sellers should provide buyers with sufficient information about the energy systems in buildings, e.g., how much energy it generally consumes, and how to use the HVAC system properly.[1099] At the post-occupancy stage, the owners and managers of the building projects should check and maintain the energy-saving systems, meanwhile recording and reporting the energy use information.[1100] Yet the ECRCB (2006) does not clarify what type of information should be provided, and what the consequences would be in the case of no information or misinformation. The Rules of Information Disclosure for the Energy Use of Residential Buildings (hereinafter the EEID 2008) fill in the void to some extent. The EEID 2008 in its appendixes spells out the energy use information shown on the construction site, as well as that incorporated in housing contracts.[1101] In the case of non-compliance, parties at stake will be punished according to the Energy Conservation Law 2008.[1102]

As with the central legislation, departmental rules made by the central government do not have much to say about indoor air quality (IAQ).[1103] More attention is given to construction/demolition wastes management, for which the MOHURD made the Rules of Construction and Demolition

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[1097] *Id*., Article 8.

[1098] For instance, the designers should change the design, and the constructors may reconstruct the building in a due way and bear the extra costs. *Id.*, Article 17, 19, 20, 21, 25 & 26.

[1099] *Id*., Article 18.

[1100] *Id*., Article 13, 14, and 15.

[1101] MOHURD, 民用建筑节能信息公示办法 (Rules of Information Disclosure for the Energy Use of Residential Buildings, MOHURD Document No. 116, June 26, 2008), Article 4, 6, and Appendix I, II.

[1102] *Id*., Article 8.

[1103] IAQ is mainly addressed in the Regulatory Rules on Interior Decorations and Renovations, which does not have much to say about indoor air quality. The Law requires that all the indoor decorations and renovations should be done in accordance with mandatory IAQ standards of all levels. In the case of non-compliance, the government can impose fines or ask decorators/furnishers to make amendments; in the meantime, the decorators /furnishers will be liable for the damages claimed. Article 9 and 17. MOHURD, 住宅室内装饰装修管理办法 (Rules of Interior Decorations and Renovations, MOHURD Document No. 110, March 5, 2002), effective on May 1, 2002.

Wastes Treatment in the Urban Areas of the PRC (hereinafter the C/D Rules).[1104] The C/D Rules make building stakeholders pay for waste disposal treatment. More often, the C/D Rules use permit the regulation of the transportation, storage, usage and disposal of construction/demolition wastes. Building stakeholders should always ask the regulators for permission for C/D waste disposal.[1105] Once approved, the building stakeholders should manage C/D wastes exactly in the way written in the documents for permit application.[1106] For instance, in terms of transportation, constructors should go along a fixed route at a certain point of time that has been approved by the regulator.[1107] A permit is also required if the constructors want to store or stack C/D wastes along the street or in any public area. In that case, C/D wastes cannot be mixed up with hazardous substances or with domestic wastes.[1108] In the case of non-compliance, the constructors will be fined or be required by the government to correct the wrongdoing.[1109] Apart from the sanction, building stakeholders are likely to be liable for land contamination resulting from C/D wastes mistreatment or to be responsible for land reclamation if they mean to build projects on a brownfield.[1110]

3.2 Local GB laws

3.2.1 Overview: local GB laws have more innovative instruments working for GB

GB compliance at the local level was first addressed in regulatory rules made by the local governments. Localities with GB regulatory rules include Beijing Municipality,[1111] Tientsin Municipality,[1112] Shanghai

[1104] MOHURD, 城市建筑垃圾管理规定 (Rules of Construction and Demolition Waste Treatment in the Urban Areas of the PRC, MOHURD Document No.139, March 23, 2005), effective on June 1, 2005.
[1105] *Id*., Article 7.
[1106] *Id*., Article 14.
[1107] *Id*., Article,
[1108] *Id*., Article 9, 10 and 17.
[1109] *Id*., Article 21-26.
[1110] See *infra* Section 4.5.
[1111] Beijing COHURD, 北京市绿色建筑评价标识管理办法 (Rules Green Building Labeling in the Beijing Municipality), effective on December 1, 2010.
[1112] Committee on the Transportation and Urban-rural Development of the Tientsin Municipality ('Tianjin CTURD'), 天津市绿色建筑建设管理办法 (Rules of New Green Buildings in the Tientsin Municipality), effective on May 1, 2012.

Municipality, [1113] Jiangsu, [1114] Guangdong, [1115] Anhui, [1116] Jiangxi, [1117] Henan, [1118] Hunan, [1119] Sichuan, [1120] Guizhou, [1121] Gansu, [1122] Qinghai, [1123] Ningxia, [1124] Hainan, [1125] and Jilin. [1126]

As of 2015, the local People's Congresses or their standing committees (PCSCs) have been working on GB legislation. [1127] To date, legislation at the local level has been available in Jiangsu, [1128] Guangdong, [1129]

[1113] Committee on the Housing, Urban-rural Development of Shanghai Municipality ('Shanghai COHURD'), 上海市绿色建筑评价标识实施*办法* (Rules of Green Building Evaluation and Labeling in the Shanghai Municipality, Shanghai CTURD document No. 195, on February 3, 2008.

[1114] People's Government of Jiangsu Province ('Jiangsu Government'), 江苏省建筑节能管理办法 (Rules of Building Energy Conservation in the Jiangsu Province, effective on December 1, 2009),

[1115] Guangdong DOHURD, 广东省绿色建筑评价标识管理办法 (Rules of Green Building Labeling in the Guangdong Province), effective on August 15, 2011

[1116]Anhui DOHURD, 安徽省绿色建筑评价标识实施细则 (试行) (Rules for the Implementation of Green Building Evaluation and Labeling in the Anhui Province, on trial), effective on April 28, 2012.

[1117] People's Government of Jiangxi Province ('Jiangxi Government'), 江西省民用建筑节能和推进*绿色建筑*发展办法 (Rules of Building Energy Conservation and Green Building Promotion in the Jiangxi Province), effective on January 16, 2016.

[1118] Henan DOHURD, 河南省绿色建材评价标识管理办法 (Rules of Green Building Materials Labeling in the Henan Province), effective on November 27, 2011.

[1119] Hunan DOHURD, 湖南省绿色建筑评价标识管理办法 (试行) (Rules of Green Building Evaluation and Labeling in the Hunan Province, on trial), effective on March 28, 2011.

[1120] Sichuan DOHURD, 四川省推进绿色建筑行动实施细则 (Rules of Green Building Movement in the Sichuan Province), effective on December 1, 2014.

[1121] Guizhou DOHURD, 贵州省绿色建筑评价标识管理办法 (试行) (Rules of Green Building Labeling in the Guizhou Province), effective on August 6, 2012.

[1122] People's Government of the Gansu Province ('Gansu Government'), 甘肃省民用*建筑*节能管理规定 (Rules of Building Energy Conservation in the Gansu Province), effective on September 20, 2008.

[1123] People's Government of the Qinghai Province ('Qinghai Government'), 青海省促进绿色建筑发展办法 (Rules of Green Building Promotion in the Qinghai Province), effective on April 2017.

[1124] Ningxia DOHURD, 宁夏回族自治区绿色建筑管理办法 (Rules of on Green Buildings in the Ningxia Autonomous Region), effective on August 21, 2014.

[1125] Hainan DOHURD, 海南省绿色建筑评价标识实施细则 (Rules of Green Building Evaluation and Labeling in the Hainan Province), effective on June 4, 2012.

[1126] Jilin DOHURD, 吉林省绿色建筑评价标识管理办 (Rules of Green Building Evaluation and Labeling in the Jilin Province), effective August 4, 2014.

[1127] In Fujian and the Shanghai Municipality, GB bills still await the approval of the local legislatures

[1128] People's Congress Standing Committee of the Jiangsu Province, 江苏省绿色建筑发展条例 (Regulations of Green Building Development in the Jiangsu Province, effective on July 1, 2015)

[1129] People's Congress Standing Committee of the Guangdong Province (Guangdong PCSC), 广东省民用建筑节能条例 (Regulations of Building Energy Conservation in the Guangdong Province, effective on July 1, 2011.

Zhejiang, [1130] Guangxi, [1131] Shandong, [1132] Hebei, [1133] Hunan, [1134] Guizhou, [1135] Shaanxi, [1136] Shanxi, [1137] Jilin, [1138] and Tientsin Municipality.[1139]

In response to the central GB legislation, the local governments have also made GB standards that better fit into the local settings. [1140] Those standards mostly refer to the GBEL, a 3-star GB rating system made by the MOHURD, as has been the case in the Guangdong and Jiangsu Provinces. In a few cases, the local governments create their rating systems, which can be seen in the Zhejiang province. In either case, the industry-based certifications barely play a role in local GB regulations.

Also, building permits and land use planning have been available as the CAC instruments for GB promotion. Subsidies, government awards and energy performance contracting are more often brought up as market-based instruments. Apart from instruments used in isolation, local GB laws are more innovative in inventing some instrument mixes. For instance, regulation, information disclosure, and punitive pricing are combined

[1130] People's Congress Standing Committee of the Zhejiang Province (Zhejiang PCSC), 浙江省绿色建筑条例 (Regulations of Green Buildings in the Zhejiang Province), effective on January 1, 2016.

[1131] People's Congress Standing Committee of the Guangxi Zhuang Autonomous Region (Guangxi PCSC), 广西壮族自治区民用建筑节能条例 (Regulations of Building Energy Conservation in Guangxi Province), effective on January 1, 2017.

[1132] People's Congress Standing Committee of the Shandong Province (Shangdong PCSC), 山东省民用建筑节能条例 (Regulations of Building Energy Conservation in Shangdong), effective on March 1, 2013.

[1133] Hebei PCSC, 河北省促进绿色建筑发展条例 (Regulations of Green Building Promotion in the Hebei Province), effective on 1 January 2019.

[1134] People's Congress Standing Committee of the Hunan Province (Hunan PCSC), 湖南省民用建筑节能条例 (Regulations of Building Energy Conservation in the Hunan Province), effective on November 27, 2009.

[1135] People's Congress Standing Committee of the Guizhou Province (Guizhou PCSC), 贵州省民用建筑节能条例 (Regulations of Building Energy Conservation in the Guizhou Province), effective on October 1, 2015.

[1136] People's Congress Standing Committee of the Shaanxi Province (Shaanxi PCSC), 陕西省民用建筑节能条例 (Regulations Building Energy Conservation in the Shaanxi Province), effective on September 28, 2006; amended on November 24.

[1137] People's Congress Standing Committee of the Shanxi Province (Shanxi PCSC), 山西省民用建筑节能条例 (Regulations of Building Energy Conservation in the Shanxi Province), effective on December 1, 2008.

[1138] People's Congress Standing Committee of the Jilin Province (Jilin PCSC), 吉林省民用建筑节能与发展新型墙体材料条例 (Regulations of Building Energy Conservation and Green Wall Material Promotion in the Jilin Province), effective on September 1, 2010.

[1139] People's Congress Standing Committee of the Tientsin Municipality (Tientsin PCSC), 天津市建筑节约能源条例 (Regulations of Building Energy Conservation in the Tientsin Municipality), effective on July 1, 2012.

Regions with local GB standards include Beijing, Tientsin, Hebei, Shanxi, Heilongjiang, Shanghai, Jiangsu, Zhejiang, Fujian, Jiangxi, Shandong, Henan, Hubei, Hunan, Guangdong, Guangxi, Sichuan, Chongqing Municipality, Guizhou, Yunnan, Shaanxi, Gansu, Qinghai, Hainan, and Jilin.

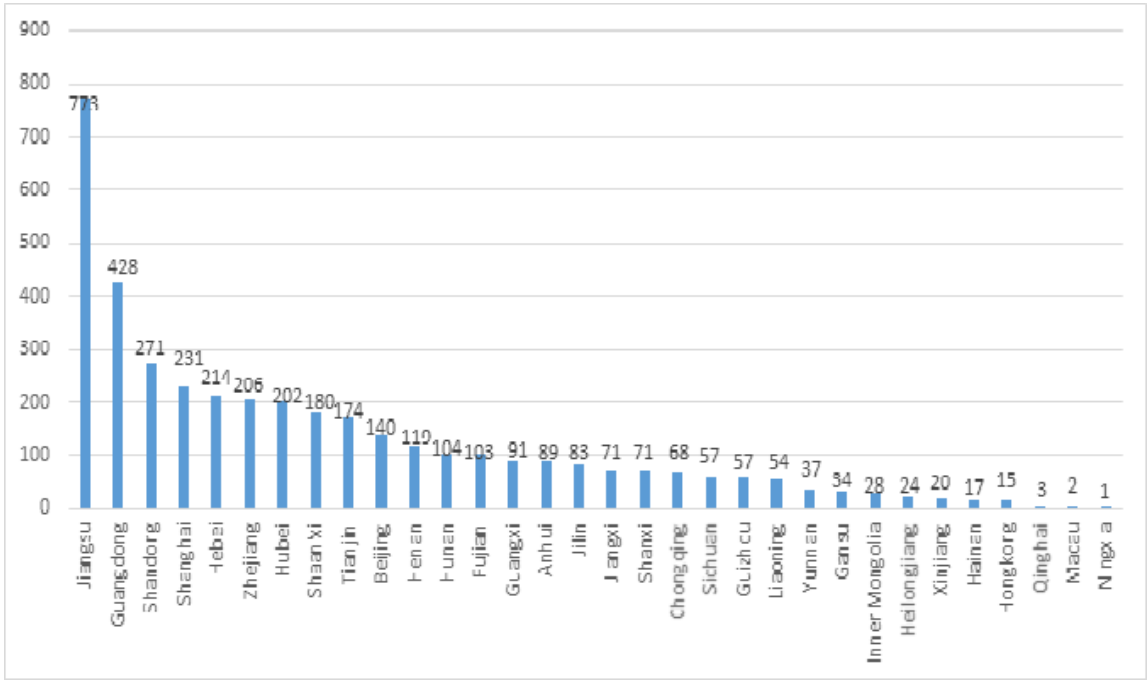
against energy overuse in buildings. The study will further look into each of the instruments in Section 4.

Table 8 Local Instruments for GB in China

Region	Instrument										
	Primary land conveyance	planning	Subsidies	Taxation	Loans	FAR	Permits	awards	licensing	GB R&D	Steering consumer Preferences
Jilin	○	●	○	○	○	○			●		○
Beijing	○		●			○					○
Tientsin			●								
Hebei			○								
Shandong			●	○	○	○		●			○
Shanghai	○	○	●	○	○		○				
Jiangsu	○		●	○		○	○				
Zhejiang			○	○		●	○				
Fujian			●		○	●	●				
Guangdong		●	●			○				○	
Hainan											
Shanxi	●		○	○		●					○
Inner Mongolia						●	●	●	●		
Henan	○	●	○	○		○		○			
Shaanxi	○	●	●			○		●			
Anhui	○		●		●	○		●		○	●
Jiangxi	○		○	○	○			●			
Hubei				○		○	●	●	●		○
Hunan			○	○	○	○	●	●	○	○	
Guangxi	●	●	○		○	○		●			○
Chongqing				○				●			
Sichuan	○	●	○	○	○						
Guizhou	○	●	○		○			●			○
Qinghai	○	●	○			○					
Ningxia			○	●	○		●	●		○	
Xinjiang	○		○								

● Instruments available and well-enforced
○ Instruments available but under-enforced
(Source: derived from Xu 2014, and the local GB laws made as of 2014)

Figure 4 Number of certified GBs in the provinces/municipalities of the PRC



(Wang et al. 2016)

3.2.2 Local GB laws illustrated

To illustrate how GB laws shape at the provincial and local/municipal level, this section takes as examples the GB laws in the Jiangsu Province, the Zhejiang Province, the Guangdong Province, the Guangxi Province and the Tientsin Municipality. Those jurisdictions are selected on account of the GB growth and GB lawmaking in each jurisdiction. Jiangsu, Zhejiang, and Guangdong are three of the top ten provinces by the number of certified GBs. Moreover, GB lawmaking appears to be active in the three regions, where GB legislation, regulations or local standards are available and diverse in terms of using instruments. The Tientsin Municipality is renowned for its transnational model eco-city jointly developed by the MOHURD and the Singapore government, for which special laws have been made to mandate GB compliance in the Eco-city, in addition to laws applicable at the municipal level. The Guangxi government is said to outperform other regions in providing financial incentives for GB compliance.[1141] In contrast, the number of GBs there remains low compared to the top ten GB regions, which in a way hints that simply giving financial incentives (e.g., subsidies) might not suffice to boost GB compliance.

3.2.2.1 Jiangsu

In 2015, the People's Congress Standing Committee of the Jiangsu Province (hereinafter the 'Jiangsu PCSC') passed Regulations of Green Building Development in the Jiangsu Province (hereinafter 'Jiangsu GB Regulations').[1142] GB compliance therein should be achieved throughout the life cycle of buildings, which will be certified into the 1-, 2- or 3-star GBs. [1143] Compliance with the standards is mandatory for new buildings;[1144] non-compliance will lead to fines.[1145] By contrast, green renovations are voluntary for existing buildings. To date, only standards for GB design are available, which is at odds with the life-cycle compliance laid down in the law.[1146] In that case, GB compliance in Jiangsu may rely more on the central GB standard.

[1141] *Ibid.*
[1142] Jiangsu PCSC (2015), Jiangsu GB Regulation, *supra* note 1128, Article 1 and Article 2.
[1143] *Id.*, Article 2.
[1144] *Id.*, Article 48.
[1145] *Id.*, Article 52-56.
[1146] Jiangsu DOHURD, 江苏省绿色建筑设计标准 (Design Standards for Green Buildings in the Jiangsu Province, DGJ32/J173—2014), published on September 22, 2014.

The Jiangsu GB Regulations put in place a wide range of instruments for GB promotion. City planning as a CAC instrument should take into account GB compliance in terms of resource use, public transportation, and waste treatment.[1147] Among other things, land use is the centerpiece in GB planning. As part of the land use planning, GB standards will, on the one hand, be met in the granting of land entitlements by the local government.[1148] On the other hand, developers, designers, constructors and supervisors of building projects will be responsible for GB compliance over the lifecycle.[1149] Of particular note, a permit is required to dismantle public buildings before their due condemned time.[1150] In this way, building stakeholders are encouraged to make the most of a building and reduce C/D wastes.

Apart from the CAC instruments, the Jiangsu GB Regulations also provides financial incentives for the R&D of GB technologies, e.g., demand-based electricity pricing for the GBEL 2-star public buildings,[1151] tax reductions for buildings using a ground source heat pump,[1152] green loans to finance the GBEL 2-star residential GBs, [1153] and energy performance contracting for public buildings. Information-based tools seem to work more for building energy efficiency. On the one hand, government agencies, along with the owners and users of large-size public buildings, shall undertake energy auditing and report their energy use to a government-made database, by which the housing department can track and disclose non-compliance.[1154] On the other hand, the government is using private information disclosure to oversee or nudge GB compliance, e.g., to demonstrate and award certified GBs,[1155] or to require GB sellers to well-inform the buyers about the GB certification level and the technologies used in contracts.[1156]

It can be seen that in support of GB compliance, the Jiangsu GB Regulations use the CAC instruments like planning and permits, the

[1147] Jiangsu PCSC (2015), Jiangsu GB Regulation, *supra* note 1128, Article 8 & 9.
[1148] Under a state property regime, the ownership of land in urban areas mostly resides with the People at large in China. Along this line, a land user obtains only the right to use, and the entitlement will be given through a contract between the land user and the land administration department of the people's government at municipal or county level. See NPC (2007), Property Law, *supra* note 1054, Article 47; NPCSC, 中华人民共和国城市房地产管理法 (Urban Real Estate Administration Law of the PRC), last amended and effective on August 30, 2007, Article 8-13.
[1149] Jiangsu PCSC (2015), Jiangsu GB Regulation, *supra* note 1128, Article 17-24.
[1150] *Id*., Article 33.
[1151] *Id*., Article 42.
[1152] *Ibid.*
[1153] *Ibid.*
[1154] *Id*., Article 30.
[1155] *Id*., Article 43.
[1156] *Id.*, Article 24.

market-based instruments such as tax reductions, green loans, and contracting, as well as information-based instruments like labeling, reporting, and energy auditing. Similarly, the Rule of Building Energy Conservation, which was made by the Jiangsu government in 2009, also aims to promote building energy efficiency, and not at GB compliance as a whole.

At the municipal level, energy use is also a centerpiece of GB lawmaking, as has been the case with the Regulations of Building Energy Conservation in the Nanking City (hereinafter 'Nanking BE Regulations'). [1157] According to the Nanking BE Regulations, all the new buildings should be built in line with GB standards at the central and provincial level.[1158] Green renovations in existing buildings are not mandatory in principle and should not be done without the consent of property owners.[1159] Similar to its provincial counterpart, the Nanjing BE Regulations use planning and permitting to mandate GB compliance *ex ante*.[1160] In the meantime, tax reductions,[1161] public procurements,[1162] special funds[1163] and subsidies[1164] are given to finance green renovations and energy saving technologies; private investments in GB renovations are encouraged.[1165] The carrots and sticks aside, information disclosure also has a place. The municipal government is required to build up a database to keep an eye on energy use in all buildings, and where necessary, to undertake energy auditing for buildings of large energy consumption.[1166] Private building stakeholders such as developers or sellers are required to inform expressly in contracts the energy use and saving measures of buildings.

The Nanjing BE Regulations also address some issues that have been included in the law at the provincial level. First, the Nanjing BE Regulations impose fines on third-party agencies who fake or manipulate reports on energy saving tests for buildings.[1167] Second, energy saving renovations are not allowed to take place in buildings that will be torn

[1157] People's Congress Standing Committee of the Nanking City (Nanking PCSC), 南京市民用建筑节能条例（Regulations of Building Energy Conservation in the Nanking City), effective on January 1, 2011.
[1158] *Id.*, Article16.
[1159] *Id*., Article 34.
[1160] *Id*., Article 20 and 21.
[1161] *Id.*, Article 12.
[1162] *Id*., Article 42 and 43.
[1163] *Id*., Article 5.
[1164] *Id*., Article 36
[1165] *Ibid*.
[1166] *Id*., Article 21 and 42.
[1167] *Id*., Article 47.

down anytime soon according to the city planning.[1168] Third, GB renovations, prominently the adoption of solar energy systems, should stand in harmony with properties in the vicinity, in ways that will not damage the right to use or foul the community landscape.[1169] Yet the Nanking BE Regulations have little to say about the protection of historical sites or vulnerable ecosystems.

3.2.2.2 Guangdong

GB compliance in Guangdong centers on building energy efficiency. As required by the Guangdong BE Regulations, standards for GB and green communities should be made by the Guangdong DOHURD,[1170] which then delegates the standard-making task to the industry,[1171] meanwhile retaining the power to approve and enforce.[1172] Compliance with the standards is mandatory for all the new buildings, in which case the developers, designers, constructors, and supervisors will be responsible for different parts throughout the lifecycle.[1173] On a voluntary basis, GB renovations in line with the standards are encouraged in all the existing buildings, especially in government or other public buildings over-using energy.[1174]

Given the standards, the Guangdong BE Regulations put in tandem mandates and market-based instruments to promote GB compliance. The government should make GB compliance part of the land use planning;[1175] building permits will not be given in the case of non-compliance.[1176] Non-compliance with the mandates will lead to fines, which will be the inputs of the special funds for the R&D of GB products.[1177] Market-based instruments like funds, tax reductions,[1178] and green loans[1179] are available for enterprises which invest in energy-saving infrastructure.

[1168] *Id*., Article 34.
[1169] *Id*., Article 35.
[1170] Guangdong PCSC (2011), Guangdong BE Regulations, Article 6.
[1171] See more about Guangdong Provincial Academy of Building Research Group Co., Ltd., available at http://www.gdjky.com/jituan/about.aspx?NodeCode=101033001, last visited August 2017.
[1172] Department of Housing, Urban-Rural Development of the Guangdong People's Government (Guangdong DOHURD), 广东省绿色建筑评价标准 (Standards for Green Buildings in the Guangdong Province, Yuejian Announcement No. 6), published on March 14, 2017.
[1173] Guangdong PCSC (2011), Guangdong BE Regulations, *supra* note 1129, Article 10-15.
[1174] *Id*., Article 21.
[1175] *Id*., Article 8.
[1176] *Id*., Article 11.
[1177] *Id*., Article 34.
[1178] For instance, constructors in charge of the building work of a certified GB can have reductions in enterprise income tax. Id., Article 36 and 37.
[1179] *Id*., Article 38.

In some cases, the mandates and the market-based instruments will work jointly with informational instruments. An example could be the joint use of energy auditing and fees. The local governments in the Guangdong Province are required to do energy auditing in government buildings or other large public buildings, and should in the meantime inform the public about the results. If the results show that the energy consumption of the buildings exceeds the due amount set by the Guangdong Government,[1180] the owners or end-users of the buildings ought to pay extra fees,[1181] and take measures to improve energy efficiency.[1182]

As another informational instrument, labeling is working with mandates, in the way of requiring all the government agencies to test and certify energy efficiency of their buildings. Labeling is also part of the tax reduction programs, in which constructors in charge of a certified GB will be provided with income tax reductions.[1183]

In response to the increasing use of GB labeling in the law, the Guangdong DOHURD made Rules of Green Building Labeling (hereinafter 'Guangdong GBL Rules').[1184] GB labeling therein enlists the 3-star GBEL system made by the MOHURD.[1185] The labeling program should take into account the central and provincial GB standards, which will be further categorized into standards for GB design and those for GB at the pre-occupancy stage. At the request of owners or constructors, the housing department will put together a panel, including GB experts and a third-party agency, to test and review the projects at stake.[1186] When all the standards are met, and no objection arises, the government will grant a certificate/label and oversee the use of the label through random investigations.[1187] Suspension or de-certification will be imposed in the case of faking, manipulating or misusing the certificate.[1188]

At the municipal level, the People's Government of Guangzhou City (hereinafter 'Guangzhou government') also puts more weight on building energy efficiency in the Guangzhou GB Rules.[1189] The Guangzhou

[1180] *Id*., Article 26.
[1181] *Ibid*.
[1182] *Id*., Article 25.
[1183] *Id*., Article 37.
[1184] Guangdong DOHURD, 广东省绿色建筑评价标识管理办法 (Rules of Green Building Labeling in the Guangdong Province), effective on August 15, 2011
[1185] *Id*., Article 3.
[1186] *Id*., Article 12.
[1187] *Id*., Article 15.
[1188] *Id*., Article 19.
[1189] People's Government of the Guangzhou City (Guangzhou Government), 广州市绿色建筑和建筑节能管理规定 (Rules of Green Buildings and Building Energy Conservation in the Guangzhou City), effective on June 1, 2013.

DOHURD s make GB standards more stringent than those at the central and provincial level.[1190] Compliance with the standards is mandatory for four building types listed;[1191] new building projects other than the four types are encouraged to comply.[1192] For existing buildings, renovations for building energy efficiency are voluntary in principle, but mandatory for government buildings that do not meet the standards or other public buildings whose energy consumption exceeds the given amount.[1193] As with the Guangzhou GB Regulations, the Guangzhou GB Rules make use of planning [1194] and permitting [1195] as the CAC instruments. In the meantime, special funds and subsidies are given to promote energy performance contracting and certified GB projects up to the 2-star level. [1196] The government buildings and other large public buildings should carry out energy auditing and reporting,[1197] based on which the government can tell whether or not renovations are necessary for some public buildings, [1198] and assign the total amount of energy used annually.[1199]

3.2.2.3 Zhejiang

The legislative branch of the Zhejiang Province takes GB compliance in its full meaning in the Local Law of Green Buildings in the Zhenjiang Province (hereinafter 'Zhejiang GB Regulations'). Based on the national GB standards, more stringent standards should be made to fit into the local setting.[1200] Correspondingly, the Design Standard for Green Buildings in the Zhejiang Province (hereinafter 'Zhejiang GB Standard') was made by the Zhejiang DOHURD. Based on the local standards, the Zhejiang DOHURD developed its 3-star rating system, instead of referring to any industry-based certification or the national GB evaluation system.[1201] All the new government buildings or any other government-invested public

[1190] *Id*., Article 10.
[1191] *Id*., Article 11.
[1192] *Ibid*.
[1193] *Id*., Article 36.
[1194] *Id*., Article 9 and 11.
[1195] *Id*., Article 20.
[1196] *Id*., Article 38-42.
[1197] *Id*., Article 33.
[1198] *Id*., Article 35.
[1199] *Ibid*.
[1200] *Id*., Article 6.
[1201] Department of Housing, Urban-Rural Development of the Zhejiang People's Government (Zhejiang DOHURD), 浙江省民用建筑绿色设计标准 (Design Standards for Green Buildings in the Zhejiang Province), published in March 2016.

buildings shall be at least 2-star certified; buildings of other types shall reach at least 1-star level, preferably higher.[1202]

Compliance with the standards will be part of the land use planning and be well-informed by the government during the primary conveyance of land to developers.[1203] The developers need to hand in an Energy Use Assessment for the housing department to grant a building permit.[1204] Once permitted, the construction and supervision of the building should live up to the design pinned down in the assessment;[1205]When the building is for sale, the seller should explicitly inform the buyer about the GB information and the due way to operate.[1206] In the case of non-compliance, developers, constructors, supervisors or sellers of the project will be fined and be required to correct the wrongdoing.[1207]

Apart from mandates for new buildings, information and financial incentives are also available in the Zhejiang GB Regulations to motivate voluntary GB compliance. Green renovations are not mandatory, but government agencies are the key places to begin with, for which government agencies are required to gather real-time information about their energy use and report it to the public. The information will then be used to determine the expected amount of energy used, an excess of which will lead to mandatory renovations or a punitive price for electricity over-use in the government buildings.[1208] Financial incentives such as funds, subsidies, green loans, and time-based electricity pricing are available for those who are willing to invest in GB compliance. For instance, GB buyers with provident housing savings *('zhufanggongjijin'*) as securities can borrow more in loans;[1209] buildings using a ground source heat pump can pay less for their electricity use during low-demand hours ('time-based price').[1210]

As with the Zhejiang GB Regulations, GB lawmaking at the city level focuses more on building energy efficiency. Mandates and informational instruments appear to weigh more in Rules of Building Energy

[1202] Zhejiang PCSC (2016), Zhejiang GB Regulations, *supra* note 1130, Article 7.
[1203] *Id*., Article 8 and 10.
[1204] *Id*., Article 12.
[1205] *Id*., Article 13-16.
[1206] *Id*., Article 19.
[1207] *Id.*, Article 45 and 47.
[1208] *Id*., Article 24.
[1209] *Id*., Article 38, sec. 4. In China, provident housing savings are part of the Central Provident Fund (CPF), which is employment-based and mandatory for residents. The CPF, along with other five types of mandatory social insurance, is a public-run savings plan to back up the medical care, housing needs and the after-retirement life of citizens.
[1210] *Id*., Article 38, sec. 3.

Conservation in the Ningbo City (hereinafter 'Ningbo BE Rules'),[1211] primarily taking the form of building permits,[1212] mandatory information disclosure in contracts or on construction sites,[1213] energy auditing and reporting.[1214]

The Ningbo BE Rules differ from the provincial GB regulations on the following fronts. First, information is more used as a persuasive tool, and not merely for GB regulation by the government. An example could be GB product inventories, by which the governments are meant to inform the public about the cutting-edge GB technologies and those that should be scrapped.[1215] Another example could be compliance records documented by the government, which will be open to the public to measure the reputation and credibility of firms.[1216] Second, the Ningbo BE Rules encourage citizens to turn any violator to the authority, which indicates that the government wants to enlist private parties to detect regulatory violations.[1217] Lastly, special funds are provided with GB as a financial incentive, according to the Regulatory Rules of Special Funds for Building Energy Conservation in the Ningbo City.[1218]

3.2.2.4 Guangxi Zhuang (Ethnicity) Autonomous Region

Local GB standards in the Guangxi province were in existence before the Guangxi local GB laws came into effect. In 2009, the Guangxi DOHURD and the Guangxi Institute of Building Research & Design jointly made the Green Building Evaluation Standards in the Guangxi Zhuang Autonomous Region (hereinafter 'Guangxi GB Standards').[1219] The Guangxi GB Standards define what qualifies as a GB, as an attempt to end those wishy-washy GBs in the market.[1220] The standards apply in different ways across

[1211] Ningbo People's Government (Ningbo Government), 宁波市民用建筑节能管理办法 (Rules of Building Energy Conservation in the Ningbo City, Ningbo Government Order No.176), effective on August 1, 2010.
[1212] *Id.*, Article 16.
[1213] *Id.*, Article 19.
[1214] *Id.*, Article 33 and 34.
[1215] *Id.*, Article 9.
[1216] *Id.*, Article 36.
[1217] *Id.*, Article 41.
[1218] Department of Housing, Urban-Rural Development of the Ningbo People's Government(Ningbo DOHURD) and the Department of Finance of the Ningbo People's Government (Ningbo BOF), 宁波市建筑节能专项资金管理办法 (Rules of Special Funds for Building Energy Conservation in the Ningbo City, Ningbo BOHURD Document No. 198), published on December 27, 2016.
[1219] Department of Housing, Urban-Rural Development of the Guangxi People's Government (Guangxi DOHURD), 绿色建筑评价标准 (Green Building Evaluation Standards in the Guangxi Zhuang Autonomous Region, GB/T 50378-2014), published on February 23, 2009.
[1220] See 广西出台标准整治房地产业伪"绿色建筑" ('New standards made against fake green buildings in the Guangxi Province,' ifeng news on March 14, 2009, available at http://finance.ifeng.com/roll/20090304/417288.shtml, last visited September 2017.

building types, based on which buildings will be certified as 1-, 2- or 3-star buildings. At that point, the local law did not address GB compliance shortly after the standards came out, but in another way, the government provided a more extensive range of financial incentives than any other localities around the country.[1221] However, those incentive programs did not seem to jump-start GB compliance.[1222]

In 2017, the Guangxi PCSC passed the Regulations of Building Energy Conservation in the Guangxi Zhuang Autonomous Region (hereinafter 'Guangxi BE Regulations'), which make compliance with the Guangxi GB Standards mandatory for government and other large-scale public buildings.[1223] Yet the Guangxi GB Regulations focus more on building energy efficiency and thus do not have much to say about GB compliance as a whole. The Guangxi GB Law refers to the building energy efficiency standards at the central level,[1224] which should also be taken into account in the city planning.[1225]

For individual projects, all the new buildings should be built in line with the central standards; while buildings of the listed types should put in place renewable energy systems, which will be designed, built and commissioned in tandem with the buildings.[1226] Non-compliance will not get developers any building permit or will lead to fines otherwise laid down in the GB laws at the central level.[1227] By contrast, renovations for building energy efficiency are voluntary in principle, for which the government is required to make available financial incentives.[1228] The Guangxi BE Regulations also put informational instruments on a par with the mandates and the financial incentives. On the one hand, the Guangxi BE Regulations mandate that all the government buildings or other public buildings of 20,000 m^2 or above, should be tagged with a building energy efficiency label within two years after commissioning; buildings of other types are encouraged to do green renovations. On the other hand, on-site information about energy use is required in buildings under construction/renovation. In the case of no information or misleading information, governments will ask for corrections or impose fines. Besides,

[1221] Xu, Z., 绿色建筑、节能建材"优惠政策大汇总 (Review of Financial Incentives for Green Building and Materials), on China Energy, 3 June 2016, available at http://www.cnenergy.org/hb/jzyth/201606/t20160603_312493.html, last visited June 2018.
[1222] *Ibid.*
[1223] *Id.*, Article 27.
[1224] *Id.*, Article 8.
[1225] *Ibid.*
[1226] *Id.*, Article 36.
[1227] *Id.*, Article 7 & 37.
[1228] *Id.*, Article 18-21.

the government buildings or other large-size public buildings must provide real-time information about their building energy use,[1229] based on which the government will undertake energy auditing and report the results to the public. Any third-party agency that fakes, manipulates or fabricates reports on energy use will be required to correct the wrongdoing or be fined.[1230]

3.2.2.5 Tientsin

The Tientsin Municipality becomes a locus of GB for its well-known demo GB community, [1231] namely the Sino-Singapore Tientsin Eco-city (hereinafter the Eco-City).[1232] The Tientsin Eco-city well plays out GB rules at different levels. At the municipal level, the Tientsin PCSC legislature passed *Regulations of Building Energy Conservation* (hereinafter 'Tientsin BE Regulations'), [1233] which mainly deals with building energy efficiency. The Tientsin government takes the lead in GB standard setting for GB compliance as a whole. [1234] The Tientsin government also came up with the Rules of New Green Buildings in the Tientsin Municipality (hereinafter 'Tientsin GB Rules'). [1235] Of note, Standards for Green Building in the Eco-City (hereinafter 'Eco-city GB Standards)[1236] and Rules of Green Buildings in the Eco-City (hereinafter 'Eco-City GB Rules') [1237] were made precisely for the Eco-City development.

[1229] *Id.*, Article 23.
[1230] *Id.*, Article 40.
[1231] The Tientsin Municipality is governed as one of the four direct-controlled municipalities of the PRC and is thus under direct administration of the central government. In this way, laws at the municipal level in the four municipalities can be parallel to those at the provincial level.
[1232] The Eco-City is a joint project between the governments of Singapore and China. It was planned in 2007 and undertaken as of 2008, and now is still growing to demonstrate how GB compliance is going citywide. All the buildings therein are mandated to be green and run under a well-knit energy and water use network (the 'Green and Blue Network'), which allows the buildings to stand in harmony with each other. For more about the Eco-City see 'Sino-Singapore Tianjin Eco-City: A Model for Sustainable Development,' available at http://www.tianjinecocity.gov.sg/bg_intro.htm, last visited September 2017.
[1233] Tientsin PCSC (2012), Tientsin BE Regulations, *supra* note 1139.
[1234] Committee on the Transportation and Urban-rural Development of the Tientsin Municipality (Tianjin CTURD), 天津市绿色建筑评价标准 (Standards for Green Buildings in the Tientsin Municipality, DB/T29-204-2010), published on January 1, 2011.
[1235] Tianjin CTURD, 天津市绿色建筑建设管理办法 (Rules of New Green Buildings in the Tientsin Municipality), effective on May 1, 2012.
[1236] Eco-City Administrative Committee (ECAC), 中新天津生态城绿色建筑评价标准 (Standards for Green Buildings in the Tientsin Sino-Singapore Eco-City), No. DB/T29-192-2016), published on November 17, 2016.
[1237] ECAC, 中新天津生态城住宅装修管理暂行规定 (Rules of Residential Buildings in the Tientsin Sino-Singapore Eco-City), effective on June 1, 2011.

The municipal GB laws, viz the Tientsin BE Regulations and the Tientsin GB Rules, are alike in terms of the instruments used for GB. For the existing buildings, renovations are not mandatory in principle, but government agencies are expected to take the lead. Notably, the Tientsin BE Rules also clarify who should bear the costs of renovations. Renovation costs are to be borne by the governments or the owners and users of the buildings. For residential buildings, owners, users, heating suppliers will pay for the renovations, which may partly be funded by the governments. While for commercial buildings like office buildings or hotels, renovation bills will be paid by the owners and users.[1238]

As far as new buildings are concerned, GB compliance is mandatory and should be achieved throughout the lifecycle of the buildings. [1239] Compliance will be overseen through building permits or post-occupancy inspections.[1240]A GB certificate under the National GB Rating System[1241] will be granted if a building can pass the test done one year after the building begins to run. With the certificate, building stakeholders can apply for subsidies provided by the government. Non-compliance will lead to fines or revocation of license, in which case the designers and constructors of the project will be liable for the damages when claimed.[1242] The third-party evaluation agency of the project will get a ban on business for six months apart from the fines and the loss of license.[1243] It can be seen that even in the use of mandates, the Tientsin BE Regulations in a novel way holds sticks against non-compliance, while giving carrots for compliance.

The carrots-and-sticks combo aside, informational tools like inventory, labeling, mandatory information disclosure, and energy auditing, are also put in place in the Tientsin BE Regulations. The governments are required to draw an inventory of some scrapped building products,[1244] and impose fines.[1245] Building energy efficiency labeling is required for government and other large public buildings.[1246] Energy use information should be

[1238] Tientsin PCSC (2012), Tientsin BE Regulations, *supra* note 1139, Article 39.
[1239] *Id.*, Article 31-33.
[1240] *Id.*, Article 16.
[1241] Implementation of the National GB Rating System is further detailed in the Rules of Green Building Labeling in Tientsin Municipality. See Committee on the Transportation and Urban-rural Development of the Tientsin Municipality, 天津市绿色建筑评价标识管理办法 (Rules of Green Building Labeling in the Tientsin Municipality), published on October 13, 2010.
[1242] Tientsin PCSC (2012), Tientsin BE Regulations, *supra* note 1139, Article 54-55.
[1243] *Id.,* Article 56.
[1244] *Id.,* Article 11.
[1245] *Id.,* Article 52.
[1246] *Id.,* Article 13.

explicitly disclosed at the construction sites[1247]or in housing contracts.[1248] Energy auditing will work with total control over energy use in residential and public buildings. The Tientsin BE Regulations empowers the Tianjin CTURD to draw a total amount of energy use, an excess of which will be shown in an energy auditing report.[1249] Based on the results of energy auditing, the owners and users of the buildings will be required to carry out energy efficiency renovations,[1250] and will be charged a higher price for the electricity overused.[1251] Apart from drawing a bottom line, the Tientsin BE Regulations also encourage technology innovation by allowing good performers to trade their un-used amount.[1252] This might be akin to the emission trade system.

4. Instruments for GB promotion

In Section 3, it could be seen that the central GB laws mainly address two issues, one of which is to empower the MOHURD to set GB standards at the central level, meanwhile allowing localities to make standards that are more stringent than the national ones. Another issue is about the instruments used for GB compliance. Mandates incorporating EIAs are often stressed in promoting new GBs, non-compliance with which will lead to fines and removal of licensing. In the use of market-based instruments, public procurement shows the government's leadership in GB compliance. Besides, favorable electricity pricing may avail financial incentives for end-users. Information-based instruments take the form of energy reporting/auditing by the governments, as well as labeling and information disclosure in contracts to the consumers.

Correspondingly, some localities have made GB standards that better fit into the local settings. Those standards mostly refer to the GBEL, a national 3-star GB rating system made by the MOHURD. In a few cases, the local governments create their own rating systems. In this way, the industry-based certifications barely play a role in GB regulations. In pursuit of GB compliance, building permits and land use planning have been around as the CAC instruments for GB promotion. Subsidies, government awards and energy performance contracting are more often brought up as market-based instruments. Apart from instruments used in isolation, local GB laws are better at inventing some instrument mixes, in

[1247] *Id.,* Article 19.
[1248] *Id.,* Article 24
[1249] *Id.,* Article 45
[1250] *Id.,* Article 57.
[1251] *Id.,* Article 46.
[1252] *Ibid.*

which regulation, EID and punitive pricing against energy overuse are combined.

This section further looks into each of the instruments to see how they work jointly or in isolation, based on the theoretical framework as well as some empirical information. As with environmental compliance in general, standard setting is the doorstep to GB compliance. Therefore this section first looks into how standards are made for GB compliance in China. Specifically, this section proceeds as five parts. Section 4.1 deals with GB standard setting in China. Section 4.2 gives a look at the CAC instruments for GB compliance, including land use planning and building permits. Section 4.3 investigates the market-based instruments, including subsidies, green public procurements, demand-side electricity pricing, and liability. Section 4.4 examines the information-based instruments working for GB, prominently demonstration projects, labeling, and reporting. An instrument mix is given in Section 4.5 to see how regulation and liability are combined for the reclamation of brownfields, which has increasingly become a part of GB compliance.

4.1 GB standard setting

Standard setting is a doorstep to environmental compliance, for which standard makers should consider the pros and cons of the different types of standards. In theory, environmental standards can be classified into target standards, performance standards and specification standards.[1253] Target standards often require reductions to a certain point and are said to be the most cost-effective. But they have nothing to say about what individuals should do to achieve the goals. Performance standards can be costly to formulate, but they make clear how much harm a firm can do, or how much good a firm should do. In this way, the performance standard allows regulators to check and spot violations at the firm level. Specification standards are meant to tell parties precisely what methods or technologies they should use to achieve compliance, in which case innovations might not be fully encouraged and parties that can abate at a lower cost may not work to their advantage.

Environmental standards can also be categorized into uniform and differentiated standards, which may become an issue about the level of standard setting (‘central or local') in China. Uniform standards draw one line for all, regardless of local settings. They are cheap to make and enforce, but might easily be manipulated and subject to private interests. By contrast, differentiated standards differ in time (‘grandfather clauses’)

[1253] See Chapter III, Section 6.1.

and across places. In that sense, differentiated standards can be tailored to local needs, but may fall victim to a 'race to the bottom' or fail to take into account trans-boundary externalities.

Moreover, if regulation and self-regulation are meant to work together, the government should also take into account how regulations and private standards are combined, in case the regulatory power becomes overly delegated to the industry. In light of the theory, the GB standard setting in China seems to have the following features.

4.1.1 Target standards are set in policies; while performance standards are more common in laws and regulations

Throughout the GB movement in China, the GB policies and laws go hand in hand in setting standards. On the one hand, the Chinese GB policies, prominently the three GB Five Year Plans (FYPs), lay out the number of GBs and the GB compliance rate to be achieved.[1254] Most of those requirements are target standards for building energy efficiency. As pictured in theory, target standards have little to say about compliance at the individual level, in which case targets set by the policymakers are likely to be achieved in a twisted way at the local level. As energy consumption matters a lot in measuring building energy efficiency, some local governors in China even tried to cut off the power in order to save energy ('*lazhaxiandian'*).[1255]

On the other hand, GB legislation and regulations use performance standards in pursuit of the policy targets. A case in point is the National Standard for Green Building Assessment (hereinafter 'National GB Standard 2015'),[1256] which spells out the measurement of GB compliance in individual buildings. In some cases, the National GB Standard 2015 may draw on other existing standards. For instance, the National GB Standard 2015refers to the National Design Standard for Energy Efficiency of Public Buildings.[1257] As with their national counterpart, local GB standards mostly take the form of performance standards, which are

[1254] See Section 1.1.2.

[1255] See, e.g., He, H., '十一五节能指标考核耗电量,地方政府选择限电'(Local governments power down cities to save energy during the 11th FYP), article on the Sina News, November 12, 2010, available at: http://news.sina.com.cn/green/2010-11-12/140221461016.shtml, last visited October 2017; Zhuang, Q., '温州顶风上演"断电风暴" ('Wenzhou City blackouts: emission reductions by other means?'), article on the China Youth, September 27, 2010, available at http://zqb.cyol.com/content/2010-09/27/content_3418401.htm, last visited October 2017.

[1256] MOHURD (2015), Assessment Standard for Green Buildings, *supra* note 956.

[1257] MOHURD, 公共建筑节能设计标准 (Design Standard for Energy Efficiency of Public Buildings, GB 50189-2005), implemented on July 1, 2005.

incorporated into building permits or GB labeling, as has been the case in Guangdong and Beijing.[1258]

Specification standards are barely seen. In theory, specification standards are not that desirable in environmental compliance, especially when regulators are aiming too high in the use of GB technologies. In China's case, there has been a study showing that technical standards are likely to increase the costs of waste management and hence increase the construction product price.[1259] The higher price will probably be borne by the building stakeholders, in which case it costs more to build clean than to build dirty.[1260] It has been shown that, as far as China's waste management market is concerned, a higher gate fee of recycling will attract much investment into the recycling industry, and will result in over-competition among lobbyists.[1261] In this case, a specification standard may not work very well for GB compliance, yet it might not be true to say that GB standards should be vague without any specificity.

Though specification standards are not desirable in theory, a certain degree of specificity may help GB compliance. Through data from an experiment, specificity in the form of examples is found necessary to achieve not only the required compliance but also better performance.[1262] But those examples should be phrased in an informative manner, rather than a constraint list that may lead to the resentment of rule players.[1263] In this way, the specificity could work without the problems associated with over-focusing and the lack of flexibility.[1264] Those findings are not precisely about GB compliance, but they in a way hint that some useful guidance can motivate compliance or even better performance in general. Perhaps on that account, the central government has released and keeps updating the technical guidelines to detail the way to comply with the national standards for GB assessment and GB renovations.[1265]As with their central counterpart, some local governments in China have made available

[1258] Beijing COHURD, 北京市绿色建筑评价标准 (Evaluation Standard for Green Buildings in Beijing, DB11/T825-2015), published on December 30, 2015; effective on April 1, 2016.
[1259] Zhao, W., Leeftink, R. B., and Rotter, S., 'Construction and Demolition Waste Management in China: Analysis of Economic Instruments for Solving a Growing Problem,' 109 (2008) *WIT Transactions on Ecology and the Environment*, at 478.
[1260] *Ibid.*
[1261] *Ibid.*
[1262] Boussalis, C, Feldman, Y. and Smith, H. E., 'An Experimental Analysis of the Effect of Standards on Compliance and Performance,' 12 (2018) *Regulation & Governance*, pp.277-298.
[1263] *Ibid*.
[1264] *Ibid*.
[1265] MOHURD, 绿色建筑评价技术细则 (Guidance for the Implementation of the National Assessment Standards for Green Buildings, MOHURD document No. 205), published on August 21, 2007; updated in February 2015.

technical guidelines to show how compliance with the national GB standards can be achieved at the individual level, using examples of technologies/products in the local contexts.[1266]

4.1.2 Differentiated standards with a bottom line as well as a grandfather clause

The GB law in China often draws a minimum standard at the central level,[1267] meanwhile allowing localities to set standards to their local settings. It could be seen that the National GB Standard (2015) has been the basis on which localities also have made their own GB standards. Standards for a certain element of GB compliance also take shape likewise. For instance, the ECRCB 2006 requires the central government, mainly the MOHURD, to establish standards for building energy efficiency, making compliance with the standards economically and technically feasible; the local governments can only make standards that are more stringent than the national ones.[1268] In this way, uniform standards and differentiated standards may cancel out each other's problems pictured in theory.

The GB standards at the central level not only work as a bottom line but also help to spread GB knowledge and steer the public preference towards GB.[1269] In this way, localities may not stray too far away from the overall goal, given the fact that most of the central GB laws only allow localities to set more stringent standards than the central ones.

Equally important, the central standard as a minimum requirement may deal with trans-boundary externalities. A case in point could be the National GB Standards, in which energy efficiency and GHG emissions weigh more in measuring GB performance throughout the lifecycle.[1270]

[1266] See e.g. Shanxi DOHURD, 陕西省绿色建筑评价标准实施细则 (Rules for the Implementation of the National Assessment Standard for Green Building in the Shaanxi Province), published in June, 2010; Shanxi DHOURD, 绿色建筑设计专篇（居住、公共建筑示范）(*Design Standard for Green Buildings in Shanxi: Residential and Public Buildings Illustrated*, Shanxi DHOURD document No.83), published on April 27, 2015; Hubei DHOURD, 湖北省绿色建筑省级认定技术条件 (Certification Standard for Provincial Green Buildings in the Hubei Province, Hubei DHOURD document No. 72), published on December 25, 2014; Hainan DHOURD, 海南省绿色建筑设计基本规程(Guidance on Green Building Design), published on May 29, 2015.

[1267] See, e.g. SC (2008), RECB, *supra* note 1035, Article 7; NPCSC (2008), Energy Conservation Law, *supra* note 1033, Article 14.

[1268] *Ibid.*

[1269] Baumol and Oates (1988), *supra* note 100, at 295.

[1270] Chen, S. et al., '基于绿色建筑评价标准的碳排放指标研究 (Carbon Emission Index System under the National Green Building Evaluation Standard)', 21 (2013) *科技视界 (Science and Technology Vision)*, at 36-37.

Yet the national standards may not be reasonable in any region, as physical conditions can vary across the different jurisdictions. In early times, GB standards in China were meant for the hot-summer-cold-winter areas. Those standards could hardly fit into the needs of GB compliance in the northeastern severe cold areas.[1271] Perhaps on that account, differentiated standards have been made at the local/regional level, powered by the 12th GB FYP.[1272]

A grandfather clause is a differentiated standard by another means, which can also be seen in GB standard setting in China. Technical standards for the newly-built and the existing buildings have both been produced.[1273] GB laws at different levels mostly make compliance mandatory for all the new buildings, while renovations are encouraged. This way is followed by GB laws like the RECB (2008) at the central level,[1274] as well as those in the Jiangsu Province,[1275] the Guangdong Province,[1276] and the Zhejiang Province.[1277] In theory, the grandfather clause makes it possible for vested-interest holders to escape from new and stricter regulations and hence may create entry barriers for newcomers. The grandfather clause is also likely to discourage innovations, in the sense that it allows out-of-date technologies or standards to continue to work independently of the new rules.[1278] This seems to be the case for GB compliance in China. It has been reported that certified GBs still account for only a minimal part of the existing buildings, despite the high GB compliance rate in new buildings.[1279]

4.1.3 GB regulations mostly refer to government-made certifications; the industry-based standards are becoming popular among commercial projects

Among other ways of standard setting,[1280] the government-led way is more common in China. GB standards in China mostly refer to the GBEL

[1271] Feng, G. and Kang, Z., '东北严寒地区建筑节能关键技术研究与示范' (Key technologies for building energy efficiency in the severe cold regions in China), in CSUS (ed.), *中国绿色建筑 2016 (China Green Building 2016)* (China Architecture & Building Press, 2016), at 174.
[1272] Lin, H., Cheng, Z., and Ye, L., '绿色建筑评价体系与标准规范技术研发' (The R&D of green building evaluation systems and standards), in CSUS (ed.), *中国绿色建筑 2016 (China Green Building 2016)* (Beijing: China Architecture & Building Press, 2016), at 213.
[1273] See MOHURD (2015), Assessment Standard for Green Buildings, *supra* note 956; MOHURD (2016), Standard for GB Renovations, *supra* note 989.
[1274] SC (2008), RECB, *supra* note 1035, Article 12 and 21.
[1275] Jiangsu PCSC (2015), Jiangsu GB Regulations, *supra* note 1128. Article 52-56.
[1276] Guangdong PCSC (2011), Guangdong BE Regulations, *supra* note 1129, Article 10-15, 21.
[1277] Zhejiang PCSC (2016), Zhejiang GB Regulations, *supra* note 1130, Article 7.
[1278] Ogus (1994), *supra* note 180, at 169.
[1279] See CBRE (2015), *supra* note 946.
[1280] See Chapter III, Section 6.1.3.

created and administered by the MOHURD.[1281] Some local governments may tend to create their own rating systems, e.g., the GB standards made by the Zhejiang DOHURD, who developed its 3-star rating system, instead of referring to any industry-based certification or the GBEL as a central GB standard.[1282] In either case, the industry-based certifications barely play a role in GB compliance, especially in the evaluation of public and residential buildings.[1283]

The government-led standard setting may render GB standards less subject to private interests and rent-seeking; in the meantime, GB regulations would be less likely to be accused of creating a monopoly and delegating lawmaking power without due process.[1284] However, it can be costly and technically difficult to set the standard this way, due to incomplete/imperfect information possessed by the GB regulator. On the one hand, the government may not keep track of the up-to-date knowledge about GB compliance. Perhaps for that concern, the Guangdong government, as required by the Guangdong BE Regulations,[1285] chose to leave the standards-drafting task to the industry,[1286] meanwhile retaining the power to approve and enforce.[1287] On the other hand, making a government-led certification the only choice in GB compliance may reduce competition and create barriers for better standards to work.[1288]

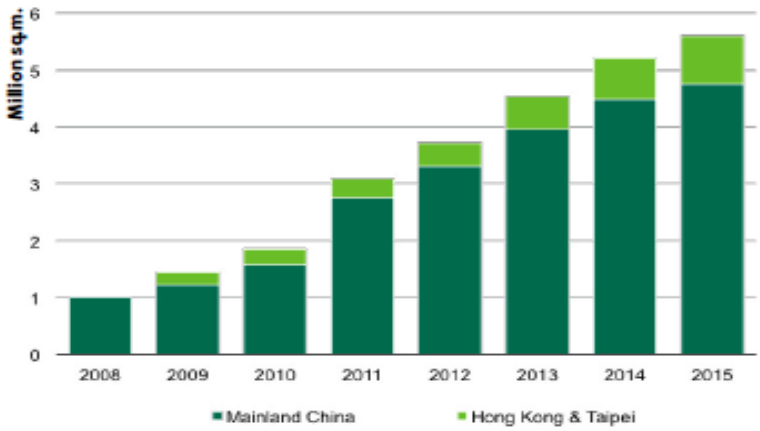
Therefore, the government may enlist GB standards made by the industry. As noted in theory, the possibility that self-regulated agencies may seek rents or government-run monopolies may not be the reason to overly exclude private GB certifications.[1289] Increasingly, it can be seen that industry-based certifications are having a place in China. Of the

[1281] See e.g. Jiangsu PCSC (2015), Jiangsu GB Regulations, *supra* note 1128, Article 2; Guangdong DOHURD (2011), Guangdong GBL Rules, *supra* note 1184, Article 3; Beijing COHURD (2010), Rules of Green Building Labeling in the Beijing Municipality, *supra* note 1111; Qinghai People's Government (2017), *supra* note 1123, Article 2; Guizhou PCSC (2015), *supra* note 1135, Article 39.
[1282] Zhejiang DOHURD (2016), Design Standards for Green Buildings in the Zhejiang Province, *supra* note 1201.
[1283] CBRE (2015), *supra* note 946, at 8.
[1284] See Chapter III, Section 6.1.3; Chapter IV, Section 4.1.2.
[1285] Guangdong PCSC (2011), Guangdong BE Regulations, *supra* note 1129, Article 6.
[1286] More about Guangdong Provincial Academy of Building Research Group Co., Ltd., available at http://www.gdjky.com/jituan/about.aspx?NodeCode=101033001, last visited August 2017.
[1287] Guangdong DOHURD (2017), Standards for Green Buildings in the Guangdong Province, *supra* note 1172.
[1288] See Chapter III, section 5.3. Yet the LEED may not be better than the GBEL in any case. Some research has been done to compare the LEED and the GBEL. In the CBRE Report (2015), the LEED is said to score better than the GBEL in terms of a life-cycle evaluation and more refined subcategories; while the GBEL appears to take into account and weigh almost equally each of the GB elements, as opposed to the LEED in which BEE remains the centerpiece. See CBRE (2015), *supra* note 946, at 8-9.
[1289] See Chapter III, Section 5.3

certifications at work, the LEED is said to outshine the GBEL in terms of a life-cycle evaluation and better categories.[1290] A large number of commercial buildings in China choose to be LEED-certified, for its globe-spanning business and high reputation on the market.[1291] With the LEED certificate, GB developers and landlords can sell themselves green and get market differentiation; in the meantime, they may benefit from a rental premium.[1292]

Apart from the commercial GB developers, some local governments in China have also opened their eyes to the industry-based certifications. For instance, the Chaoyang District Government in Beijing introduced a subsidy policy to reward projects with the LEED certification and became the first government to incorporate the LEED into a GB incentive policy.[1293]

Figure 5 Total market size of LEED-Certified Grade in Commercial Buildings



Source: CBRE, Q2 2016

[1290] CBRE (2015), *supra* note 946, *at* 8.
[1291] CBRE, 'Toward Excellence: Market Performance of Green Commercial Buildings in the Greater China Region', CBRE research report, July 2016, at 3. Full text available at https://www.cbre.com/research-and-reports/China-Major-Report---Towards-Excellence---Market-Performance-of-Green-Commercial-Buildings-in-the-Greater-China-Region, last visited October 2017
[1292] *Id.*, at 3-5.
[1293] *Id.*, at 2.

4.2 CAC instruments for GB

4.2.1 Building permit with environmental impacts assessment (EIA)

In pursuit of compliance at the individual level, the GB laws at the central and the local level make use of building permits, incorporating EIAs in some cases.[1294] Yet it is too often the case that building permits are given without an EIA, partly because the EIA Law (2003) allowed an ex-post EIA to exist. The ex-post EIA gave the violators a second chance to hand in an EIA after the project begins to run. EIAs are ex-ante in character and hence meant to prevent non-compliance from the very beginning. The possibility that permits can be revoked will be a more effective incentive to minimize social harm than monetary sanctions imposed ex post.[1295] In that sense, the ex-post EIA in its original form appears to be a contradiction in terms and may water down building permits as ex-ante checks on GB compliance.

Perhaps on that account, the Environmental Protection Law (2014) has put an end to the ex-post EIA. Article 61 of the Environmental Protection Law (2014) requires that a building permit can be granted if and only if an EIA is ready, non-compliance with which will immediately lead to fines.[1296] Ever since the new EIA rule came into effect, environmental regulators in 13 provinces have scrapped the post EIAs. However, in practice, the ex-post EIA is still around in 8 jurisdictions applying the EIA Law (2003).[1297] This may have something to do with the new EIA rule itself. On the one hand, the new Environmental Protection Law (2014) does not make it clear whether or not the post EIAs and fines will coexist; neither does the Law draw a clear line about how much the fines should be. In that case, localities tend to apply the EIA rule couched in the EIA Law (2003). On the other hand, the new EIA rule in principle does not apply to violations

[1294] For instance, the government should not grant a permit for the building work to begin unless the project is carried out in compliance with the energy efficiency standards. For projects in progress, the government is empowered to pause the projects due to non-compliance or to require the project stakeholders to correct the wrongdoing in a given period. In the case of completed projects, they would cease to be put into use or for sale if found non-compliant. NPCSC (2008), Energy Conservation Law 2008, Article 15, 34 and 35. Some localities also combine building permits with EIAs, as has been the case in the Zhejiang Province, where the developers need to hand in an Energy Use Assessment for the housing department to grant a building permit, see Zhejiang PCSC (2016), Zhejiang GB Regulations, *supra* note 1130, Article 12. Also see e.g. NPCSC (2016), EIA Law, *supra* note 1031, Section II and III; Jiangsu PCSC (2015), Jiangsu GB Regulations, *supra* note 1114, Article 17-24; Guangdong PCSC (2011), Guangdong BE Regulations, *supra* note 1129, Article 11; Tientsin PCSC (2012), Tientsin BE Regulations, *supra* note 1139, Article 16.

[1295] Ogus (1994), *supra* note 180, at 229.

[1296] Wang, C., *'新<环境保护法>实施情况评估报告' (Report on the implementation of Environmental Protection Law 2014 in China') (*China University of Political Science and Law Press, 2016), at 34.

[1297] The eight jurisdictions include Beijing, Tientsin, the Inner Mongolia region, the Jiangsu Province, the Guangdong Province, the Yunnan Province, and the Heilong Jiang Province. *Id.,* at 41.

that occurred before the new law came into effect in 2015. The new rule aside, some localities still stick to the ex-post EIA that can shield the regulated from fines, so as to be on good terms with firms that can contribute to the local tax revenues.[1298]

A further point to note is that the regulatory process does not end after a permit is given. In some cases, the local GB laws may require a permit throughout the design, construction and commissioning stage of a building project.[1299] In a few cases, demolition also needs permission, as has been the case in Jiangsu, where a permit is required to dismantle public buildings before their due condemned time.[1300] But still, building permits mostly put checks at the pre-occupancy state.

For a life-cycle assessment, the Regulatory rules on the Post-construction EIAs of Building Projects (2015),[1301] along with the new Regulation of EIAs for Building Projects,[1302] requires a follow-up EIA to see whether or not a project works in line with the EIA approved at the pre-construction stage. The follow-up reviews on EIAs ought to be conducted within three to five years after the project is put into use,[1303] especially for projects that will generate hazardous substances or cause environmental risks.[1304]

4.2.2 Planning and zoning

GB compliance has been required in land use planning [1305] and in planning for renovations to improve building energy efficiency.[1306] The *Urban and Rural Planning Law 2008* requires all the planning work to take into account environmental impacts mitigation and smart use of land

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[1298] *Id*., at 46.

[1299] See, e.g. Guangdong PCSC (2011), Guangdong BE Regulations, *supra* note 1129, Article 10-15; Zhejiang PCSC (2016), Zhejiang GB Regulations, *supra* note 1130, Article 12-16; Guangxi PCSC (2017), Guangxi BE Regulations, *supra* note 1131, Article 36.

[1300] See, e.g. Jiangsu PCSC (2015), Jiangsu GB Regulations, Article 33.
It is not rare in China that buildings are dismantled before their time. Those not built-to-last buildings have led to an increasing amount of C/D waste, which accounts for more than 30% of the total amount of waste in China. The C/D law in its current form deals more with the disposal of C/D wastes, and has little to say about the reduction and re-use of building wastes, which has otherwise been brought up in the National Assessment Standard for Green Buildings. See MEP & MLR (2017); Huang, B. et al., 'Construction and Demolition Waste Management in China through the 3R Principle', 129 (2018) *Resources, Conservation, and Recycling*, at 36-44.

[1301] MEP (2015), Rules of EIAs for Building Projects at the Post-occupancy Stage, *supra* note 1077.

[1302] SC, 国务院关于修改建设项目环境保护管理条例的决定 (SC's Approval for the Amendment of the 'Regulations of EIA for Building Projects,' SC Order No. 682), effective on July 16, 2017, Article 12.

[1303] MEP (2015), Rule of EIAs for Building Projects at the Post-occupancy Stage, *supra* note 1077, Article 8.

[1304] *Id.,* Article 3.

[1305] Li and Li (2016), *supra* note 985, at 57.

[1306] NPCSC (2006), Energy Conservation Law, *supra* note 1039, Article 34.

resources.[1307] The land use planning often works with building permits, in the way of granting land entitlement based on the land use planning.[1308] The 'plan-before-building' approach is meant to make individual projects fit into the whole picture.

Another way to GB compliance in land use is to minimize the environmental impacts on the land of ecological concern, which is also a part of GB compliance. The Environmental Protection Law 2014 draws redlines ('*shentaihongxian*') against building activities that would harm wildlife habitats, historic sites, wetlands or to any other vulnerable ecosystems alike.[1309]

At the local level, planning not only works for model GB communities, e.g., the Tientsin Eco-city, but also for GB compliance regarding resource use, public transportation, and waste treatment.[1310] But plans on the different aspects of GB need to work in harmony to achieve GB compliance as a whole. Accordingly, the government of Ningbo City has put in place the three-in-one planning ('*sanguironghe*'), in which case different government agencies at stake need to work together to come up with one plan that integrates the overall planning, land use planning, and emission reduction planning of the city.[1311]

As noted in theory, the property regime laid down in the law may to some extent complicate GB planning. A case in point is the central government's attempt to tear down the fences of residential communities and schools, for a smarter public transportation network as part of GB compliance.[1312] The idea is that too many compounds in the urban area will create a lot of dead-end streets, and lead to a less efficient transportation network. Therefore, the government came up with a plan to open up closed communities and connect the roads and lanes in the community to the

[1307] NPCSC (2008), Urban and Rural Planning Law, supra note 1050, Article 4.
[1308] *Id*., Article 4.
[1309] NPCSC (2014), Environmental Protection Law, *supra* note 1029, Article 29. Also, regulators approving the EIA should consult entities in charge of wildlife protection at the same level. See NPCSC, 中华人民共和国野生动物保护法 (Wildlife Protection Law of the People's Republic of China, enacted on November 8, 1988; amended on July 2, 2016), Article 13.
[1310] Jiangsu PCSC (2015), Jiangsu GB Regulations, *supra* note 1114 Article 8 & 9.
[1311] Green Building Panel of the Ningbo Government, '绿色建筑总体情况介绍' (General Situation of Green Building in Ningbo, in CSUS (eds.), *中国绿色建筑 (China Green Building 2016)* (China Architecture and Building Press, 2016), *at* 305.
[1312] Central Committee of the Communist Party of China and State Council of the PRC, '关于进一步加强城市规划建设管理工作的若干意见' (Guidelines on the Management of Urban Planning and Development), 6 Feb 2016, Article 16. Full text available at http://www.gov.cn/gongbao/content/2016/content_5051277.htm, last visited August 2016; Full text available at http://www.npc.gov.cn/englishnpc/Law/2009-02/20/content_1471118.htm, last visited August 2016.

public transportation network. Shortly thereafter, the plan got a backlash from property owners of the communities, taking the opening-up as trespassing on private properties, since "the roads in the district of a building shall be jointly owned by all the owners."[1313] Also, those living on the campus worried about the safety issue, with vehicles all passing by.[1314]

The assignment of property rights is also important in the planning for building energy efficiency renovations. In principle, the costs of renovations for energy efficiency in residential buildings will be borne by the governments as well as the owners of the buildings. However, in the case of public-private affordable housing ('*jizijianfang*'), [1315] the ownership may vary over time and with the ways in which the residential projects are funded. In that case, it remains unclear who is supposed to undertake the renovations and bear the costs when property rights are not well-defined. It is also likely that renovations will be held up when property rights are overly broken down among building stakeholders.

4.3 Market-based instruments

4.3.1 Subsidies

In response to the central GB policies, subsidies are provided by the MOF and the MOHURD for GB projects. Those subsidies are used to pay for

[1313] NPC (2007), Property Law of the PRC, *supra* note 1054, Article 73.

[1314] For the time being, the central government seems to be slowing down the plan, given the conflicts of interests that exist, and the plan still awaits further interpretations on what type of communities should be opened up. See CGBC, '住建部深夜发文明确什么样的小区要拆墙' , article on the CGBC website, published on February 24, 2016, available at http://www.chinagb.net/policy/zcfx/20160224/114641.shtml,

[1315] In early times, the public-private affordable housing was mainly carried out in two ways. In some cases, a government agency would offer its own land on which an affordable building project is built, and collect money from their employees to finance the project. In that case, the building will be jointly owned by the government as well as the employees entitled to use the building; and at some point, the government can choose to give up their ownership to the employees. In another way, the government entity can borrow money from their employees to fund the project in the first place, and the employees will get their money back with interest at a promised time and have the right to use the apartments. In this case, the government is the owner who rents the house to their employees. A point to note is that conveyance of properties built in either way above is not allowed on the market. Simply put, those houses are non-tradable among parties other than the government and the employers.

In the context of the Housing Reform in China, most of the public-private affordable houses built after 1999 are fully financed and owned by the employees, but still the government is at the helm of the affordable housing plan for their employees, and the property owners (the employees) will be provided with tax reductions or subsidies. Five years after use, those properties are allowed to be put on the market for sale, as with other commercial buildings.

More about the public-private housing see Ministry of Land and Resources of the PRC (MLR), 经济适用住房管理办法 (Regulatory Rules of Affordable Housing), effective on May 13, 2004; Ho, M. H. C., and Kwong, T., 'Housing Reform and Home Ownership Behavior in China: A Case Study in Guangzhou', 17 (2002) *Housing Studies*, pp. 229-244.

energy efficiency renovations in public and residential buildings, the purchasing of EE building products, and pilot projects using renewable energy at the local level.[1316] Local governments tend to finance GB with subsidies, tax or construction fee reductions and rewards.[1317] By and large, the amount of local subsidies is less than that provided by the central government.[1318]

Subsidies may be a solution to the higher first cost problem. Yet sometimes the subsidies may not pay off simply because the amount is not enough to incentivize building stakeholders.[1319] Perhaps for this concern, the central government, on the one hand, contracted with five localities, who will receive 9.1bn RMB as of 2011 and in return to accomplish the retro-fitting of 150 million m^2. On the other hand, the government allows green builders to get a double bonus given at both central and local level. For instance, the Beijing government has provided 100 RMB/m2 for green building renovations, which can be applied in addition to subsidies given by the central government.[1320]

On the flip side, too much of the blunt money given by the government can create perverse incentives, for which too many new GBs or unnecessary GB renovations may come. As a result, those unnecessary GBs or renovations are likely to increase the total amount of emissions.[1321] The Nanjing GB Regulations have dealt with this concern, requiring that energy saving renovations are not meant to take place in buildings that will be torn down soon in light of the city planning.[1322] In this way, the subsidies may not be misused to create perverse incentives when the amount of subsidies is much greater than the actual costs of renovations.

A further point to note is that, with too many subsidies being available, the market may overly rely on the government spending; and the government

[1316] MOF, 北方采暖区既有居住建筑供热计量及节能改造奖励资金管理暂行办法 (Regulatory Rules of Funds for Heating Measurement and BEE Renovations in Buildings in North Area of the PRC, MOF doc no. 957), published on December 20, 2007; MOF, 可再生能源建筑应用城市示范实施方案 (Action Plan on Renewable Energy Demo Projects in Urban Areas, MOF doc no. 305), published on July 6, 2009.

[1317] Yu, Evans, and Shi (2014), *supra* note 1002, at 17-18.

[1318] Kong, Lu, and Wu (2012), *supra* note 954, at 634.

[1319] The SmartMarket report has shown that the higher first cost still tops the challenge list facing GB compliance in China, where the average payback time for green investment is six years for new GBs and five years for GB renovations. Dodge Data & Analytics (2016), *supra* note 6, at 43.

[1320] Shui, B., and Li, J., 'Building Energy Efficiency Policies in China,' American Council for an Energy-Efficient Economy (ACEEE) (ed.), Global Buildings Performance Network (GBPN) Report, July 2012, at 50. Full text available at http://www.gbpn.org/sites/default/files/08.%20China%20Report_0.pdf, last visited July 2017.

[1321] See Chapter III, Section 6.3.1.

[1322] Nanking PCSC, Nanking BE Regulations, *supra* note 1157, Article 36.

may not be able to observe the actual demand and supply of GB products.[1323] During the 11th FYP, the governments put in place subsidies to boost the demand for energy efficient air-conditioners, and the cooling industry was in good shape.[1324] As of 2012, the demand went down as the subsidies were gone, and the industry was at the lowest point since 2006.[1325] At the beginning of 2013, the government resumed the subsidies, and the demand for energy efficient air-conditioners went up again. It was reported that back then 80% of the air-conditioners sold in the market were energy efficient products.[1326] Yet as of May 2013, the growth again slowed down as the subsidies phased out.[1327] It goes beyond this study to prove the correlation between the subsidies and the market performance, but the industry report gives an intuitive sense that subsidies are likely to affect the demand for GB.

The generosity aside, the way in which governments give subsidies may also impact upon the extent to which those subsidies can be effective. It can be seen that subsidies at the central and local level are mostly given in proportion to the floor area of building projects.[1328] In this way, the subsidies may fall into the hands of large developers rather than middle or smaller enterprises, to whom the higher first cost can weigh more in building green.[1329]

Moreover, subsidies for new GBs may not work well in actually changing GB behavior. As GB compliance is becoming mandatory for new GBs, building stakeholders are supposed to build green even without the subsidies. Hence the governments will be able to divert the money from new GBs to renovations, which are still voluntary for the time being.

Lastly, GB compliance is meant to be life-cycle, in support of which some governments choose to give progress-based subsidies. The idea is to give subsidies at the different stages of a building project on account of its GB compliance.[1330] In a similar vein, financial Incentives for upstream and downstream stakeholders can also be another way to achieve life-cycle GB compliance.[1331]

[1323] See Chapter III, Section 6.3.1.
[1324] CGBC, 节能补贴政策导致制冷市场进入调整期 ('Cooling industry cooling down with the subsidies gone'), article on the CGBC website, published on June 6, 2013, available at http://www.chinagb.net/policy/zcfx/20130606/97309.shtml, last visited October 2017.
[1325] *Ibid.*
[1326] *Ibid.*
[1327] *Ibid.*
[1328] Yu, Evans, and Shi (2014), *supra* note 1002, at 17-18.
[1329] See Chapter II, Section 5.2.1.
[1330] Kong, Lu, and Wu (2012), *supra* note 954, at 628.
[1331] Li and Colombier (2009), *supra* note 974, at 2445.

4.3.2 Demand-side pricing

At the heart of GB compliance, energy saving can be achieved via demand-side pricing, by which end-users will be charged different prices based on the amount or the time of energy consumption. In this way, the demand-side pricing may better reflect the actual costs of electricity.[1332]

The GB law in China has two ways of demand-side pricing, one of which is time-based ('*fenshidianjia*'). The idea is to make electricity price differ across hours, prominently during the peak and off-peak hours.[1333] This way has been followed in the Jiangsu Province, where certified public GBs will pay less for the electricity used during off-peak hours.[1334] The Zhejiang government likewise allows buildings using a ground source heat pump to pay less for their electricity use during low-demand hours.[1335] In practice, it has been proved that the time-based pricing can help to divert electricity use from peak-hour to the off-peak, by which the power grid could work better and reduce energy use and hence emission reductions.[1336]

Another way of demand-side pricing is the 'tiered electricity pricing (TEP),' by which different thresholds ('blocks') will be set based on the amount of electricity used. An excess of the blocks will lead to a higher electricity price for the end-users. In that case, large electricity consumers, e.g., manufacturers, will probably use energy more frugally. In the meantime, middle or smaller households can still pay a business-as-usual price without being overburdened by the electricity bills. The TEP was initially available in some pilot regions like the Jiangsu province,[1337] the Zhejiang province,[1338] and the Guangdong province.[1339] Increasingly, the TEP is in place nationwide.

The TEP may help to deal with the electricity shortage problem, and make the public better aware of energy saving.[1340] It remains to be seen whether

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[1332] Zhang, S., and Qin, X., 'Lessons Learned from China's Residential Tiered Electricity Pricing Reform,' The International Institute for Sustainable Development (IISD) research report, May 2015, at 4. Full text available at http://www.iisd.org/library/lessons-learned-chinas-residential-tiered-electricity-pricing-reform, last visited October 2017.

[1333] Pepper, E., 'Time-of-use Pricing Could Help China Manage Demand', 11 (2010) *Sustainable Development Law & Policy*, at 18

[1334] Jiangsu PCSC (2015), Jiangsu GB Regulations, *supra* note 1114, Article 42

[1335] Zhejiang PCSC (2016), Zhejiang GB Regulations, *supra* note 1130, Article 38, sec. 3.

[1336] He, Y., and Zhang, J., 'Real-time Electricity Pricing Mechanism in China based on System Dynamics,' 94 (2015) *Energy Conversion and Management*, at 394-405.

[1337] Jiangsu PCSC (2015), Jiangsu GB Regulations, *supra* note 1114, Article 30.

[1338] Zhejiang PCSC (2016), Zhejiang GB Regulations, *supra* note 1130, Article 24.

[1339] Guangdong PCSC (2011), Guangdong BE Regulations, *supra* note 1129, Article 26.

[1340] 新华网 (Xinhuanet)，不能低估阶梯电价对节能减排的积极作用(TEP helps energy saving and emission reductions), article on the National Energy Administration (NEA) website, published on May

or not the TEP will affect different stakeholders' behavior in energy use. The TEP differs in its impact on the poor and the rich, as with many other pro-environment programs. The TEP seems to make high-end income households or large companies pay more.[1341] The TEP, therefore, has gone through a lot of hearings, at which different vested-interest holders stood up against the blocks being too low. Though some of the blocks were increased to ease the political backlash,[1342] the TEP was held up due to the reorganization of the NDR.[1343] By contrast, low-income households are provided with a certain amount of free electricity, and hence the impacts on the medium-level income group may not be significant.[1344] In this case, the TEP may not necessarily reduce the overall energy use in residential buildings significantly.

4.3.3 Green public procurement (GPP)

Throughout 2008 to 2015, public GBs have accounted for more than 50% of the existing certified GBs.[1345] In response to the GB policies and laws,[1346] the governments spent more than RMB1.63 trillion on GPP in 2013, which accounts for 11.7% of the national spending and 2.8 % of the country's GDP in 2013.[1347] Green infrastructure projects are expected to grow for the redevelopment of brownfields.[1348] GPP is subject to the Government Procurement Law of the PRC,[1349] and the Regulation of Government Procurement GPPs are likely to jump-start GB compliance,

16, available at http://www.nea.gov.cn/2012-05/16/c_131589020.htm, last visited October 2017.

[1341] Zhang and Qin (2015), *supra* note 1332, at 12-13.

[1342] *Id*., at 16.

[1343] *Id*., at 18.

[1344] *Id.*, at 12.

[1345] Wang, J. et al., '2015 年我国绿色建筑发展情况' (China Green building development in 2015), in CSUS (ed.), *中国绿色建筑 2016* (China Green Building 2016) (China Architecture and Building Press, at 9.

[1346] See NPCSC (2008), Energy Conservation Law 2008, *supra* note 1033, Article 51; SC (2008), RECPB, *supra* note 1070, Article 10, 12, 13 & 16.

Apart from GPP for the government buildings, GPP also takes the form of affordable housing programs powered mainly by the governments. A list of affordable housing programs see CGBC, '保障房绿色行动' ('Green Affordable Housing Action'), available at http://www.chinagb.net/zt/qita/GAfSH/index.shtml, last visited October 2017.

[1347] Dejean, B., et al., 'Green Public Procurement in China: Quantifying the Benefits,' The IISD discussion paper, April 2015, at 4. Full text available at https://www.iisd.org/sites/default/files/publications/green-public-procurement-china-quantifying-benefits-en.pdf, last visited October 2017.

[1348] Dion, J. et al., 'How Green Public Procurement Contributes to Sustainable Development in China: Evidence from the IISD Green Public Procurement Model,' IISD report October 2015, at 76. Full text available at https://www.iisd.org/sites/default/files/publications/how-gpp-contributes-sustainable-development-china.pdf, last visited October 2017.

[1349] NPCSC, 中华人民共和国政府采购法 (Government Procurement Law of the People's Republic of China), effective on January 1, 2003.

increasing the government-guaranteed demand for GBs.[1350] Yet some GPP programs in China are not done in ways that may help competition and innovation for GB compliance. One of the reasons could be that the government tends to list out specific products or manufacturers in a GPP catalog, instead of clarifying the environmental benefits or characteristics of GPP products.[1351] Put differently, GPP products are not chosen based on performance standards but on specification standards that may not encourage innovation.[1352] In the case of GB products, it is likely that companies offering better products may not be part of the candidate list, whereas some medium and small enterprises whose products listed may find themselves unprepared to meet the government's standards.[1353]

Therefore, it is suggested that GPP products can be chosen based on performance standards or certifications,[1354] in order to keep up with the available technology and encourage innovations through GPP.[1355] Most of the GPP policies in China incorporate the Environmental Labeling Product (ELP) on a voluntary basis, and the Energy Conservation Products (ECP) mandatory for all the GPP products.[1356] As GB compliance has gone beyond energy efficiency, GPP programs are likely to work better for GB compliance with more stringent standards, as shown by the IISD GPP Model. The results from the air conditioners category of the IISD GPP Model shows that, if the most energy-efficient grade of air conditioners were purchased, this would be associated with over CNY 150 million in annual energy savings by the year 2025, compared to a situation in which governments buy products on an above-average level, but not the best available ones.[1357] Yet the more stringent but voluntary requirements

[1350] Denjeanet *et al.* (2015), *supra* note 1347, at 4- 5.
Through data from 193 Chinese government officials, Zhu *et al.* found that the governments providing regulations and financial incentives, as well as the private building stakeholders in China, all contribute to a wider uptake of GPP practices. Zhu, Q., Geng, Y. and Sarikis, J., 'Motivating Green Public Procurement in China: An Individual Level Perspective,' 126 (2013) *Journal of Environmental Management*, at 85-95.
[1351] Philipps, S., Espert, V., and Eichhorst, U., *Advancing Sustainable Public Procurement in Urban China: Policy Recommendations*, EuropeAid's SWITCH-Asia Programme Paper No. 14, October 2011. Full text available at https://www.scp-centre.org/publications/advancing-sustainable-public-procurement-in-urban-china/, last visited October 2017.
[1352] See Chapter III, Section 6.1.1.
[1353] Philipps, Espert and Eichhorst (2011), *supra* note 1351, at 9.
[1354] Geng, Y., and Doberstein, B., 'Greening Government Procurement in Developing Countries: Building Capacity in China,' 88 (2008) *Journal of Environmental Management*, at 936-937.
[1355] For instance, the IISD GPP Model shows that the net present cost of purchasing efficient air-conditioners is CNY 5 billion higher while listing standards only improve at 0.5%per year instead of keeping up with the 1.5 percent annual energy-efficiency improvements that are expected to be delivered by market innovation. See Dion et al. (2015), *supra* note 1348, at 29.
[1356] *Id.*, at 24.
[1357] *Id.*, at 27.

may have a boomerang effect, in which case the government officials may pull out of the program because it becomes more difficult and costly.[1358]

Furthermore, GPP can be less workable for being subject to private interests and rent-seeking, since it is the individuals as part of the government that are in charge of the GPP.[1359] GPP in China may at times fall victim to venality, in ways of faking GPP, manipulating biddings, and purchasing at an extremely high price more than necessary. [1360] For instance, bureaucrats can rule out some goods and services normally listed in the Catalogue from budgets.[1361] Without a budget, the bidding process will not start, and the buyer can choose a supplier and exercise discretion over procurement spending. In a similar vein, some big projects might be divided into smaller and cheaper ones, each of which will not meet the threshold for the project to be part of a budget proposal. Exemptions from the formal bidding process can also be manipulated by saying that a GPP is confidential or an emergency.[1362] In the case of competitive bidding, some governments may limit the number of potential procurers and favor chosen candidates.[1363]

GPP compliance is suggested to be part of the job descriptions and performance appraisal of officials,[1364] who will be fined or otherwise punished for their wrong-doings in GPP. Besides, the central government has established several public procurement centers as intermediaries, which are meant to oversee service-based procurements if local governments choose to enlist them. However, the public Procurement Centers by their authority do not directly receive budgets on GPP from the local financial departments. Hence they may not have checks on GPP products.

Moreover, some of the GPP requirements are voluntary in compliance. In that case, fines and punishment may not suffice to induce good performance in GPP, on account of which awards have been offered for GPP officials in return for buying cheap and nice.[1365]

[1358] Zhu, Q., Geng, Y., and Sarikis, J., 'Motivating Green Public Procurement in China: An Individual Level Perspective', 126 (2013) *Journal of Environmental Management*, pp. 85-95.
[1359] See Chapter III, Section 6.3.4.
[1360] See CCGP, 政府采购严重违法失信行为信息记录 ('Record on Major Malpractice in Government Procurements'), available at http://www.ccgp.gov.cn/search/cr/, last visited October 2017.
[1361] Dejean et al. (2015), *supra* note 1347, at 25.
[1362] Gong, T., and Zhou, N., 'Corruption and Marketization: Formal and Informal Rules in Chinese Public Procurement,' 9 (2014) *Regulation & Governance*, at 63-76.
[1363] *Ibid.*
[1364] Dion et al. (2015), *supra* note 1348, at 30.
[1365] Philipps, Espert and Eichhorst (2011), *supra* note 1351, at 13.

4.3.4 Liability for indoor air pollution and the law of nuisance

As one of the GB elements, indoor air quality is in a way addressed through contract and product liability, whereas liability for environmental torts in its current form can do little in this regard.[1366] The reason behind this is that the Environmental Law (2014) takes the 'environment' as merely an outdoor environment.[1367] Along this line, the environmental tort liability laid down in the Tort Law (2010) might not lay the ground for claims against indoor air pollution.

Increasingly, IAQ-related harm has occurred, in which case courts in China base the damages on a contract or product liability.[1368] In *Chen v. Gongmeitiancheng Decoration Co.*, [1369] a plaintiff suffered from respiratory diseases caused by the formaldehyde emitted from the building materials, which were used by an interior design firm (the defendant) to renovate the plaintiff's home. The plaintiff then sued the defendant, claiming that the defendant should be liable for the remedies and the consequent losses. The court of *Xiaotangshan District* in Beijing ruled that, according to the express warranty written down in the renovation contract, the defendant ought to do the renovation in ways that can ensure the plaintiff a safe stay and was liable for the repair costs given the misuse of building materials. Put simply, the damages were given on the ground that the defendant breached the contract.

In the *Jia* care,[1370] the alleged indoor air pollution was proved to result from the synergy effects of the odor emitted from building materials, the HVAC system providing poor ventilation, and of the hypersensitivity of the plaintiff. Therefore, the *Nanking Xuanwu District Court* ruled that the harm was not entirely caused by the building products per se, but by the polluted indoor environment induced by the synergy effects.[1371] On that

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[1366] NPCSC, 中华人民共和国侵权责任法 (Tort Liability Law of the People's Republic of China) (Order of the President of the PRC, No.21), effective as of 1 July 2010), Chapter VIII & IX. Full text in English available at http://www.npc.gov.cn/englishnpc/Law/2011-02/16/content_1620761.htm, last visited April 2017.

[1367] NPCSC (2014), Environmental Protection Law 2014, *supra* note 1036, Article 2.

[1368] Some of the GB laws in China require sellers to provide explicitly to buyers the information about energy use and energy saving in a building. In the case of no information or misinformation, the sellers will be fined and/or lose their license, and will probably be liable for the losses of the buyers who make claims. See e.g. NPCSC (2008), Energy Conservation Law, *supra* note 1040, Article 36; SC (2008), RECB, *supra* note 1035, Article 43.

[1369] *Ying Chen v. Gongmeitiancheng Decoration Co.*, derived from the National Judges College of the PRC (ed.), 中国审判案例要览(2002 年民事审判案例) (China Judicial Case Briefs: Civil Cases 2002) (Beijing: China Renmin University Press, 2003), at 171.

[1370] The *Jia* case is derived from Hou, J., '*中国环境侵权责任法基本问题研究' (Fundamental Issues in China Environmental Tort Law)* (Beijing: Peking University Press, 2014), at 51.

[1371] *Ibid.*

account, the damages would be granted based on environmental liability and not on the product liability rules. This further confirms the theoretical point that the causation between harm and acts is complex and hard to prove in environmental torts.[1372]

It could be seen through the two cases that courts may interpret 'environmental tort' differently in Chinese legal terms. In *Jia*, the court reasoned that the Environmental Protection Law (2014) does not necessarily pre-empt the Tort Law (2010), as they were both made by the NPCSC and played different roles in addressing environmental harm. Therefore, the environmental liability rules in the Tort Law (2010) do not have to follow how the Environmental Protection Law (2014) defines the environment. That being said, the court further interpreted the environment as 'everything that is not me.' In that sense, indoor air quality is meant to be part of the environment as a whole. This way of interpreting makes it possible to use the liability rules to address indoor air pollution.

In the context of environmental torts, the Property Law 2007 lays out a live-and-let-live rule in using adjacent properties ('*xianglinguanxi*'), which may also help GB compliance.[1373] Property Law 2007 requires property owners or occupiers to tolerate a certain degree of harm and includes both damages and injunctive remedies.

The live-and-let live rule in the Property Law (2007) is akin to the nuisance law in the common law system. However, instead of using the test of unreasonable or foreseeable action, the Chinese nuisance rule mostly uses regulatory standards to determine negligence ('negligence per se'). In other words, the inappropriate use of properties will be taken as a nuisance if and only if it turns out to be a violation of mandates.[1374] It is noted in the theory that the law of nuisance is not meant to protect hypersensitive parties, but still, it would be better to choose remedies on account of different case scenarios. The nuisance rule in the Chinese legal system literally makes mandatory standards the only criterion to tell what would be harmful to all private parties.[1375] This implies that compliance with

[1372] See Chapter III, Section 5.2 & Section 6.3.3.
[1373] NPC (2007), Property Law of the PRC, *supra* note 1054, Article 84, ["Article 84 Owners of neighboring immovables shall properly deal with their neighboring relations in adherence to the principles of conduciveness to production, convenience for daily lives, unity and mutual help, and fairness and rationality"]; Article 90, ["An obligee of immovables shall not, in violation of State regulations, discard solid waste or discharge hazardous substances, such as air and water pollutants, noises, and optical and electromagnetic radiation."]. The Property Law of 2007 is available in English at http://www.npc.gov.cn/englishnpc/Law/2009-02/20/content_1471118.htm, last visited October 2017.
[1374] Hou (2014), *supra* note 1380, at 171-172.
[1375] *Ibid.*

regulations can free parties from liability. The nuisance rule in this way, on the one hand, may cancel out the merits which the liability rule could provide, e.g., dealing with atypical environmental harm and compensating actual losses. On the other hand, it may water down the property rules as a way to protect or assign entitlements to private properties, as it relies on those standards for the government to regulate environmental harm.[1376]

It is also worth heeding that the Chinese nuisance rule works only for harm caused by individual owners/occupiers of neighboring properties, and not for pollution resulting from industrial activities.[1377] By limiting itself to domestic pollution, the nuisance rule seems to govern situations in which entitlements are clearly assigned. In that sense, the nuisance rule may not deal with the case of 'coming to the nuisance.' [1378] In theory, the liability rules and the property rules may interplay to deal with environmental harm. In practice, courts in China seem to follow the first use doctrine to reason that, in some cases, it is fair for the injured to show tolerance to the harm. For instance, In Zhao v. Anjie Waste Treatment Co., Ltd., the plaintiff had been living in the vicinity of a waste disposal site run by the defendant as of 2005. In 2008, the plaintiff was diagnosed with respiratory diseases, which were alleged to be a result of long-term exposure to toxic odor from the waste treatment site. The plaintiff thereby sued the defendant, asking for damages as well as an injunction to end the waste treatment activities. Yet the *Chaoyang District Court* refuted the pleas, ruling that the causation between act and harm was not approximate, and the plaintiff ought to tolerate to a reasonable degree, as the defendant had been there before the plaintiff came.

[1376] Yet in practice the courts in China tend to make use of the reasonableness test, rather than the industrial standards in nuisance cases, to tell whether or not the injurer should be liable for the harm. Hou (2014), *supra* note 1380, at 176-183.

[1377] In Chinese law terms, it is commonly viewed that the liability rule may vary with different sources of pollution. A negligence rule will apply in the case of harm caused by domestic pollution, which results from property use among individuals, according to the nuisance rule laid down in the Property Law 2007. By contrast, the harm done by firms as a result of industrial activities is industrial pollution, to which a strict liability with contributory negligence will apply, according to the Tort Law 2010 of the PRC. Wang, S. (ed.), '*中华人民共和国侵权责任法释义' (Understanding the Tort Law of 2010 of the PRC)* (Beijing: China Law Press, 2010), at 12. However, this dichotomy does not suffice to cover all possible case scenarios. For an in-depth discussion on the law of environmental torts in China see Hou (2014), *supra* note 1380, at 173-175.

[1378] See Wang, D., '居民告垃圾场恶臭致病，法院称居民有容忍义务' (Live with it if you had it coming: court denied damages for the harm caused by waste treatments), 中国法学网 (Institute of Law), published on May 22, 2010, available at http://www.iolaw.org.cn/showNews.asp?id=22151, last visited October 2017.

4.4 Suasive instruments

4.4.1 Pilot GB projects

In early times, GBs came as pilot projects, which could showcase the benefits of GB and persuade stakeholders to build green. Those pilot projects started as individual buildings, and then gradually morphed into demo GB communities through planning.[1379] Some of those demo GB communities are carried out by private developers, which are mostly undertaken as high-end residential communities or tourist resorts. However, some of them have few real environmental benefits.[1380]

More often, GB pilot projects are government-led through partnerships between the central and the local governments. In a few cases, GB pilot projects come as transnational projects, as is the case with the Sino-Singapore Tientsin Eco-city. The government-led projects are meant for GB promotion and environmental education, and it usually takes a formal process for a GB pilot project to be put in place. For instance, at the local level, the Beijing government has put an annual check on demo GB communities.[1381] In this way, most of the government-led GB pilot projects are in line with GB standards.

However, GB pilot projects may not always live up to their pro-environment goals and hence cannot showcase the benefits of GBs. Some of the demo GB communities are located in the suburban areas where the infrastructure is not in good shape. As a result, the demo GB communities become ghost cities with only a few residents, in which case the best available GB technologies used there would remain idle and can hardly pay off.[1382]

One of the examples is the Sino-Singapore Tientsin Eco-city, where facilities for domestic wastes treatment cannot be fully utilized due to a low occupancy rate. The facilities, meant to save more, ostensibly end up wasting more embedded energy.[1383] Another reason for the low occupancy rate could be that the GB communities are less-known to the public. This could be the case for government-led projects with little public participation.

Besides, throughout the development of GB demo cities, the governments tend to focus more on new GB projects than green renovations, and there

[1379] Li and Li (2016), *supra* note 985, at 60-61.
[1380] *Id*., at 65.
[1381] *Id*., at 65-68.
[1382] *Id*., at 70.
[1383] *Ibid*.

is a mismatch between large-scale GB projects and the actual client demands for GB.[1384] This somewhat corresponds to the theoretical point that, sometimes the central legislature/government makes policies for GB compliance, while local governments as agents may stray too far from the principal's goal.[1385]

4.4.2 Environmental information disclosure (EID)

EID can be done by two means, namely labeling and reporting. Residential and commercial buildings can also apply the GBEL certification voluntarily.[1386] Apart from the government-led labeling program, industry-based certifications such as the LEED are also having a place in GB labeling, in tandem with subsidies and other financial incentives for GB compliance.[1387] Of the 4071 GBEL-certified GBs, GBEL-design GBs account for 95%. The GBEL system in its current form evaluates GBs at the design stage only, which may fail to take into account GB compliance throughout the lifecycle. Neither does the GBEL-design label have anything to say about how the GB technologies work with other factors determining GB compliance, e.g., land use and end-user behavior.[1388] Perhaps on that account, the MOHURD made the Standard for Commercial GB Evaluation at the Post-occupancy Stage,[1389] aiming to keep track of the synergy effects of the different GB elements. As GB labeling has already been discussed in Section 4.1, here the study will further look into energy reporting for GB compliance.

Increasingly, reporting has been used for building energy efficiency, which can be done by benchmarking or auditing. Both ways need real-time energy use information on different levels. In the beginning, energy auditing was mostly required in government and other large public buildings, as laid down in the Energy Conservation Law 2006.[1390] In the service of energy auditing, governments at the central and local level have established a database to gather real-time energy use information. During

[1384] *Id*., at 56.
[1385] See Chapter III, Section 2.3 & Section 5.1.
[1386] In the Guangdong Province, for instance, labeling is working with mandates, in the way of requiring all the government agencies to test and certify the energy efficiency of their buildings. Elsewhere, labeling is a requirement in the tax reduction programs, in which tax reductions are available for constructors in charge of the building work of certified GBs. See Guangdong PCSC (2011), Guangdong BE Regulations, *supra* note 1129, Article 37.
[1387] CGBC, '盘点当前国家与地方绿色建材评价标识政策'(Local GB Material Labeling Policies), published on 5 January 2017, available at http://www.chinagb.net/policy/zcfx/20170105/117517.shtml,
[1388] MOHURD, 绿色建筑后评估技术指南 (Standard for Commercial GB Evaluation at the Post-occupancy Stage, MOHURD doc No. 15), published on 1 March 2017, Article 1.0.1.
[1389] *Id*., Article 1.0.2.
[1390] NPCSC (2008), Energy Conservation Law, *supra* note 1039, Article 49 and Article 50.

the 12th GB FYP, the MOHURD made use of the real-time monitoring system in more than 9,000 buildings across 33 provinces for GB renovations.[1391]

Back then the data collection and analysis were not done consistently, in the absence of standards for reporting and energy auditing.[1392] Perhaps for that reason, in 2017, the MOHURD laid out the Standard for Energy Use Reporting in Provincial Public Buildings.[1393] At the local level, the Shanghai government built up the first database to oversee the energy use in public buildings in Shanghai, in support of energy auditing and reporting.[1394] Elsewhere, the 'Energy Consumption Supervision Platform of Public Buildings',[1395] as a data network for energy information-sharing has been working in more than 300 buildings in Anhui for energy saving.[1396] In recent years, energy auditing is also gaining popularity for GB compliance in residential and commercial buildings.[1397]

The real-time energy use database serves energy auditing, based on which the central and local governments can forecast building energy use,[1398] and decide whether or not renovations for building energy efficiency should be undertaken.[1399] Energy auditing is working with the demand-side pricing mechanism, in order to reduce energy use in public buildings. For instance, in the Zhejiang Province, energy auditing will then be used to determine the amount of energy used annually, an excess of which will

[1391] MOHURD (2017), 13th FYP, *supra* note 946, at 6.
[1392] Xia, J. et al., 'Comparison of Building Energy Use Data between the United States and China', 78 (2014) *Energy and Buildings*, at 165-175.
[1393] MOHURD, 省级公共建筑能耗监测系统数据上报规范 (Standard for Energy Use Reporting in the Provincial Public Buildings in China, MOHURD doc No.7), published on 18 January 2017.
[1394] Shanghai CHURD and Shanghai DRC, 2016 年上海市国家机关办公建筑和大型公共建筑能耗监测及分析报告 (2016 Report on the Energy Use of Government and Large Public Buildings in Shanghai), published in May 2017.
[1395] See 安徽公共机构能耗监督平台 (Energy Consumption Supervision Platform for Public Buildings in the Anhui Province), available at http://apesm.antaiib.com:9000/provinceplat/, last visited October 2017.
[1396] Liu, L. et al., 安徽省绿色建筑总体情况简介 (Green Building Development in the Anhui Province), in CSUS (eds.), *中国绿色建筑 (China Green Building 2016)* (China Architecture and Building Press, 2016), at 273.
[1397] MOHURD, 民用建筑能耗统计报表制度 (Standard for the statistics and reporting of energy use in buildings, MOHURD document No. 205), published on 10 December 2015, available at http://www.mohurd.gov.cn/xytj/tjbbzd/xxtjbbzd/w020151217208946329732781 23.pdf, last visited October 2017; MOHURD, 民用建筑能耗和节能信息统计暂行办法 (Regulatory rules of building energy use statistics and reporting, MOHURD document No. 141), effective on 15 November, 2012.
[1398] Wei, N. et al., 'Government Management and Implementation of National Real-time Energy Monitoring System for China Large-scale Public Buildings', 37 (2009) Energy Policy at 2089.
[1399] *Id*., at 2087-2091

lead government agencies to mandatory renovations or a punitive price for electricity overuse.[1400]

For the time being the real-time energy use information seems to work more for the regulators, and less for private building stakeholders. Through data from buildings in urban areas within the five climate regions in China, a study has found the main reasons for which energy use may differ even in buildings of the same type. For instance, energy saving in a building can be achieved by the use of energy-saving lamps, or simply by turning off the air-conditioners and other office appliances after business hours.[1401] This may imply that, apart from GB technologies, end-users' behavior is also a key variable in energy use in both commercial and residential buildings.[1402] GB regulation can use real-time BEE information and peer-comparison feedback for private building stakeholders, providing information about how individuals can perform better in terms of building energy efficiency.[1403] In this way, BEE is likely to be increased by 15%, according to the China GB Industry Report.[1404]

4.5 Instrument mix: Regulation meets liability for brownfield reclamation

GB compliance has gone beyond energy efficiency, incorporating land use and sustainable sites. In this way, GB compliance is likely to work against land contamination, which has become a long-lasting problem across the country.[1405] The State Council (SC) laid out its very first policy to tackle land pollution,[1406] in light of which the MEP made the Rule of Environmental Management for Brownfields (hereinafter 'Brownfield Rule 2017').[1407] The Brownfield Rule 2017 lists the potentially responsible parties and the way to carry out the reclamation.

In the service of brownfield reclamation, government agencies at all levels, in particular the environmental regulators and planning departments, need

[1400] Zhejiang PCSC (2016), Zhejiang GB Regulations, Article 24.
[1401] Li, J., 'Energy Performance Heterogeneity in China's Building Sector', 58 (2016) *Renewable and Sustainable Energy Reviews*, at 1578-1600.
[1402] *Ibid.*
[1403] Xia et al. (2014), at 165-175.
[1404] Qiu, B., 新常态， 新绿建--中国绿色建筑的现状与发展前景 (China green building development: present and future), in CSUS (eds.), *中国绿色建筑 (China Green Building 2016)* (China Architecture and Building Press, 2016), at 6-7.
[1405] MLR & MEP, 全国土壤污染状况调查公报 (Report on land contamination in China), published on 17 April 2014, pp. 1-2
[1406] SC, 土壤污染防治计划 (Action Plan for Land Contamination Reclamation, SC document No. 31), published on 28 May 2016.
[1407] MEP, 污染地块环境管理办法 (Rule of Environmental Management for Brownfields, MEP Order No. 42), effective on 1 July 2017.

to build up a database to keep track on the brownfields. [1408] A piece of land will be taken as a presumed brownfield ('*yisiwurandikuai*') if it is used for industrial activities that are likely to cause pollution,[1409] or for storing and disposing of hazardous wastes. A presumed brownfield will then be finally detected as a brownfield ('*wurandikuai*') if it is found to be out of the line with national environmental standards concerning land pollution.[1410]

When a brownfield is detected, the government should inform the land user, who will be liable for the reclamation if s/he intends to build a residential or commercial building project on a brownfield.[1411] If there is not any user registered at the point the land is identified as a brownfield, the former users will be held liable for the harm that occurred during their use.[1412] If none of the parties above can be found, the governments will be responsible for brownfield reclamation within their jurisdictions.

For the reclamation to proceed, the responsible parties should conduct investigations and risk assessments, and report to the government the results and the means to reclamation correspondingly. A test by a third-party agency is required after the reclamation is done to check if the land is clean enough to be reused, based on the national environmental standards. If not, the government will not grant a permit for the project to be built on the land.[1413] Apart from the governments, the Brownfield Rule 2017 also allows individuals to turn injurers into the authority; in the meantime, it also encourages environmental NGOs to file public interest suits against the potentially responsible parties.[1414]

As the Brownfield Rule 2017 is relatively new, it remains to be seen how well it can work in practice for brownfield remedies being part of GB compliance. At first blush, the Brownfield Rule 2017 combines regulation and liability. The detection of non-compliance is done by both regulators

[1408] *Id.*, Article 6.
[1409] *Id*., Article 2.
[1410] The MEP is required by the Brownfield Rule 2017 to make technical standards for identifying brownfields. But the standards have not been created yet. *Id.*, Article 5.
[1411] *Id.*, Article 3.
[1412] One can find out the land users through the registry system administered by the government. In the light of the property regime in China, the entitlements of real estate, prominently those owned by parties other than the state, ought to be registered at an administrative agency in charge of the land resources. In this way, the assignment of property rights can be obtained by the authority or any interest holder at request. The registry book is thus the prima facie evidence on the entitlements of properties unless otherwise laid down in the law. See NPC (2007), Property Law, *supra* note 1054, Article 9 & 10, available in English at http://english.gov.cn/services/investment/2014/08/23/content_281474982978047.htm, last visited November 2017.
[1413] MEP, Brownfield Rule 2017, *supra* note 1407, Article 27.
[1414] *Id.*, Article 7 & 8.

and private parties. The governments identify and disclose brownfields, meanwhile enlisting individuals and ENGOs to spot land pollution activities through litigation or reporting. The reclamation work is assigned to parties on account of their entitlement to the land, in which case land users are put to the fore, and governments as the de jure owners remain secondary.[1415] This assignment appears to follow the idea that resources should be given to those who value them and can make the most of them.

Moreover, the Brownfield Rule 2017 holds responsible as many stakeholders as possible, including not only users in possession, but also users from the past. In that sense, the Brownfield Rule 2017 seems to follow the way in which the liability regime eases the under-deterrence and under- compensation problems. On the one hand, the retrospective liability would make it easier to spot a liable party, especially when it comes to long-tail damage. On the other side, more responsible parties are more likely to fully pay the damages that a single injurer cannot afford. Apart from the land users, the central government has launched a special fund for brownfield reclamation, which may help to ease the judgment proof problem.

However, the Brownfield Rule 2017 seems to have some issues left unresolved, taking into account the tort law and the property regime in China.[1416]

First of all, the Brownfield Rule 2017 does not clarify the type of remedy used in private law terms. The Brownfield Rule 2017 enlists regulation, in which case the land users will be required by the governments to reclaim the brownfields. In the meantime, the Brownfield Rule 2017 makes use of private enforcement, in which case parties at stake, or even environmental NGOs, are allowed to sue the potentially responsible parties for the harm done. In the latter case, the Brownfield Rule 2017 does not indicate which rules will come into play. Here it might make more sense to choose the liability rules over the property rules. One of the reasons could be that the Brownfield Rule 2017 have as its goal to clean land contamination as much as possible. In that sense, the Brownfield Rule 2017 is meant to

[1415] *Id*., Article 10.

[1416] The property regime in China is akin to, but not the same as, property in the transition that features the following elements: a) hierarchy of property, at the top of which is state property, followed by cooperative property and personal property. The protection levels down from the top; b) objects of socialist property – all the land in principle is unitary and the ownership resides with the People as a whole, and hence there is no clear line "who controls the land on which we stand;" c) ownership of socialist property – "Central-planning mechanisms coordinated uses, state arbitration courts, formally the Communist Party, informally resolved conflicts". For an in-depth discussion on property regime in a socialist society see Heller, M. A., 'The Tragedy of the Anti-commons: Property in the Transition from Marx to Markets', 111 (1998) *Harvard Law Review*, pp. 621-688.

address harmful externalities, in which case the liability rules may work better.[1417] Particularly, when the actual injurers are nowhere to be found, or the victims come are numerous, bargaining seems to be impossible[1418]

If the liability rules are the way to go, the question arises as to whether or not the parties at stake are jointly liable. Sometimes the users of polluted properties are not the actual injurers, who might be found after the land users take their responsibilities on land reclamation. Other times, there might be more than one user from the past. All of those users contribute to the contamination, and the contributions are indivisible.[1419] It is also likely that, in the case of GB compliance within a residential community, developers and owners of the apartments may be the co-users of the land.[1420] If, as noted before, the Brownfield Rule 2017 is meant to get the

[1417] See Chapter III, Section 5.2.

[1418] *Ibid*.

[1419] The concerns about the Brownfield Rule 2017 brought up here have in some way been reflected in some land contamination cases. A recent case in point could be the Friend of Nature v. Changlong Chem. Co., et al. The Friends of Nature as an ENGO filed a public interest suit against three chemical firms for polluting the land, on which the Changzhou Foreign Languages High School built their campus after the defendants moved out in 2010.

In 2016, around 500 students at the high school were diagnosed with ailments such as bronchitis, blood and thyroid abnormalities, and in worse cases, lymphoma and leukemia. The illness was proved to be a result of the high level of chlorobenzene in groundwater. The groundwater pollution was caused by the hazardous substances mistreated by the defendants during their stay.

The plaintiff then filed a suit against the defendants, asking them to remedy the land and compensate for the victims. The case was heard for the first time in December 2016. In February 2017, the court denied all the pleas, ruling that the Changzhou government, instead of the three defendants, should be liable for the land reclamation, as the government has taken over the land shortly after the defendants moved away. Simply put, the plaintiffs were suing the wrong parties. Also, the court did not hold the defendants liable due to the fact that the defendants had been using the land as of the 1950s. The contributions of harm is indivisible as there was a lag between the act and the harm.

After the hearing, the plaintiff was not happy with the court's decision and decided to appeal. However, the plaintiff now is crowdfunding to pay the high litigation costs (CNY 1.89 million). See Friends of Nature v. Changlong Chem. Co., et al., No.214 (2016) Intermediate People's Court of Changzhou, Jiangsu, full text of the verdict available at http://www.pkulaw.cn/case_es/PFnl_1970324845907925.html, last visited October 2017;Chun Zhang and Dawen Tang, '常州毒地案："诉讼远未结束"' (Changzhou Brownfield Case Awaits an Appeal), on Chinadialogue, 24 February 2017, available at https://www.chinadialogue.net/article/show/single/ch/9630-The-Changzhou-soil-pollution-case-is-far-from-over-, last visited October 2017; Also see '常州毒地案一审判决书是判决书中的一朵奇葩或者怪胎——蔡守秋教授对公益组织诉常州毒地案初审判决的意见' (A contradiction in terms: Comment on the Court's Ruling of Changzhou Brownfield Case)', On Ifeng News, 8 February 2017, available at http://share.iclient.ifeng.com/house/shareNews?fromType=vampire&aid=sub_8038407&channelId=, last visited October 2017.

[1420] Presumably, the right to use land in urban areas resides with the owners of properties built on the land, unless otherwise assigned through contracts or by the law. NPC (2007), Property Law of the PRC, *supra* note 1054, Article 70, 73 and 142.

harm paid, it might be proper to enlist a joint and several liability rule, according to Tort Law 2010.[1421]

Second, according to the Brownfield Rule 2017, if the government at stake is not able to find a particular liable party at the point the reclamation has to be done, it may pay for and carry out the reclamation. But it is likely that more liable parties are found afterward. The Brownfield Rule 2017 does not clarify whether or not the government at stake can ask the liable parties for damages. It depends on what role the government agency plays when a private responsible party cannot be found in the first place. It could be viewed that the government is actually cleaning up a brownfield on behalf of the state, based on the ownership conferred on the People at large by the law. [1422] Put differently, the government (the state) is the owner of the property, and it can then use the different types of rules to ask other private responsible parties later-found to compensate. In that case, the land user can give up his/her entitlement and just pay the costs for reclamation, leaving the specific reclamation work to the government.

Brownfield Rule 2017 aims to remedy and redevelop the contaminated land. In other words, it pursues more a distributional goal than corrective justice. In light of the goal, Brownfield Rule 2017 follows the idea that resources should be given to those who can value the highest and make the most of them. In the meantime, Brownfield Rule 2017 appeared to work against the judgment proof problem facing brownfield reclamation. On that account, the owner (the state) can enlist the liability rules to make the entitlement change hands, especially when the land user does not do anything with the entitlement. In this way, the owner can take back the entitlement and put the land into redevelopment without being accused of takings.

Lastly, the Brownfield Rule 2017 makes land users the only private parties liable for the reclamation, in addition to the actual injurers. In other words, the Brownfield Rule 2017 at first sight does not seem to involve other parties of interest, such as the lenders of a building project as one of the potentially responsible parties. It remains to be seen whether or not

[1421] Chapter 8 of the Tort Law 2010 states that injurers should be jointly liable for the damages to the injured. See NPCSC (2010), Tort Law of the PRC, *supra* note 1366, Article 65-68.

[1422] While in another way, the government can be seen as a regulator in charge of the environment management, and hence the reclamation work done by the government may follow the administrative law in China. In this case, there is still a chance for the government to ask the potentially responsible parties found afterwards to pay for the reclamation costs. In the context of China administrative law, if the regulated turn their back on penalty decisions, the government will in the first place do the remedy work, the costs of which can be paid off through pecuniary penalties imposed on the regulated (*'dailvxing*'). See NPCSC, Law of Administrative Enforcement of the PRC (President Order No. 49), effective on 1 January 2012, Article 12.

the lenders can be liable, given its role as a gatekeeper against dirty projects. The Brownfield Rule 2017 in the current form holds liable the liquidation team for the damages if the actual injurer is bankrupt.[1423] The Enterprise Bankruptcy Law of the PRC (2007) ranks different types of debts to be paid based on their importance, of which the debts occurred in the interest of stakeholders (*'gongyizhaiwu'*) is second to the costs of bankruptcy proceedings.[1424] However, the law does not classify into any of the categories the costs of land reclamation required in the Brownfield Rule 2017.

For the time being, lender liability seems to be baseless in the Chinese law system. However, financial institutes are increasingly coming to the picture of sustainable development in China. In practice, some environmental lawyers in China are bringing suits against banks engaged in dirty projects.[1425] The idea of lender liability also makes theoretical sense. As has been the case with lender liability in the US, getting lenders involved may make it possible for the damages to be paid. The idea of lender liability is, on the one hand, to give lenders the incentive to oversee GB compliance in building projects or even during the foreclosure as with a mortgagee. On the other hand, lender liability may help to ease the judgment proof problem when the developer (the borrower) cannot afford to pay the damages.

Lessons from the US shows that lender liability should not be so strict that it would lead to moral hazard or even scare off the lenders.[1426] For instance, lender liability can be limited to those who participate in the daily management of a borrower (the developers) and have a say in the borrower's decision on wastes disposal or other activities causing harm.

[1423] MEP, Brownfield Rule 2017, *supra* note 1407, Article 10.

[1424] '*Gongyizhaiwu'* mainly include, "(a) debts incurred because the administrator or debtor requests the other party to fulfill a contract which both parties have failed to fulfill; (b) debts to the debtor through spontaneous agency on the debtor's property; (c) debts incurred as a result of the debtor's unjust enrichment; (d) remunerations for work and social insurance premiums payable for sustaining the debtor's business operations, and other debts arising therefrom; (e) debts incurred by the administrator or an employee who causes losses to another person in the course of performing his duties; and (f) debts incurred by the debtor's property for causing losses to another person." See NPCSC, 中华人民共和国企业破产法（Enterprise Bankruptcy Law of the People's Republic of China, The President Order No. 54）, effective on 1 June 2007, Article 42. Full text available in English at http://www.npc.gov.cn/englishnpc/Law/2008-01/02/content_1388019.htm, last visited October 2017, Article 112.

[1425] See China Biodiversity Conservation and Green Development Foundation ('Green Foundation'), '向法院递交支持意见书，绿会助公益伙伴起诉涉及绿色金融环境公益诉讼案件' （Green Foundation rooted for NGOs in environmental public interest litigation against lenders）, available at http://www.cbcgdf.org/NewsShow/4857/5797.html, last visited December 2018.

[1426] More about the US lender liability see Chapter IV, Section 4.3.4.

In this way, the lenders are taken as polluters who are jointly liable for the harm with the borrowers. However, this study is not meant to propose the optimal lender liability rules in China, but to give an intuitive sense about why and how lender liability can be an instrument for brownfield redevelopment as part of GB compliance.

4.6 Summarizing the use of instruments

It can be seen that the CAC, market-based and suasive instruments all have been available for GB in China. The CAC approach mainly takes the form of land use planning and building permits, which often work in conjunction. By and large, the regulatory planning of GB compliance keeps GBs away from areas of ecological concerns and pursues a smarter use of urban land for emission reductions. However, the planning may interfere with the entitlement of private properties. The CAC instruments are said to be ex ante in character, which might be at odds with lifecycle GB compliance. Perhaps for that reason, the Chinese governments do not end the regulatory process at the design stage, granting permits for the design, construction, and commission of a building project.

Subsidies, demand-side pricing, and public procurements are the major market-based instruments for GB. A wide range of subsidies is available for GB compliance in the beginning. Most of the subsidies are given based on the area of green floor-space certified and can be applied at the central and local level. Yet those subsidies may lead the GB market to overly rely on the governments and may create perverse incentives that will increase the total amount of emissions in the building industry.

Demand-side pricing is also helping building energy saving through time-based pricing or the tiered electricity pricing. The idea is to affect energy use with differentiated electricity prices. The time-based pricing has in some cases diverted electricity use from peak-hours to off-peak hours. The tiered pricing is likely to make the public better aware of energy saving, but it remains in doubt to what extent it can reduce energy use in total as it provides free or cheap electricity for residential users. Also because the tiered pricing differs in its impacts on the poor and the rich, those large electricity consumers may stand against the pricing system.

As a way to jump-start GB, public procurements indeed help to increase the quantity demanded of GBs. However, in practice, GPPs in China can be short of transparency. As a result, the GPP programs may not be that workable in encouraging innovations and crowding in private investment in GB compliance. Moreover, the GPPs may be subject to venality, in which case officials in charge of GPPs may fake or manipulate GPPs to line their pockets.

Suasive instruments are mostly educational and informational, as is the case with GB pilot projects blooming across the country. Those GB pilot projects are meant to showcase the benefits of GBs and make GB compliance known to more people. However, the influx of pilot GB projects turns out to be ostensible when the client demands are low. Some pilot GB communities become ghost cities due to the poor infrastructure in them. The low occupancy rate will make GBs consume more energy than they can save at the post-occupancy stage.

Labeling and reporting are also suasive instruments for building energy efficiency. GB labeling is often a requirement for GB stakeholders to apply for subsidies. Energy auditing enables the governments to oversee energy use in buildings, based on which the governments can come up with plans for renovations for building energy efficiency.

However, the information collected through reporting works more for the regulator and less for private parties like end-users. Some studies have shown that energy use can differ significantly among households in the same type of buildings, which hints that end-users' behavior in energy use also matters. In the interest of behavioral interventions, real-time information and peer-comparison feedback about energy use are proposed by building professionals to achieve GB compliance at an individual level.

It can also be seen that the instruments work jointly in some cases. For instance, market-based instruments often work with persuasive instruments, as is the case with the mix of demand-side pricing and energy auditing,[1427] and with the mix of subsidies and GB labeling.[1428] Even in the use of the CAC instruments, the law in a novel way provides sticks against non-compliance, meanwhile giving carrots for compliance. In the Tientsin municipality, compliance with GB standards is mandatory, and a GBEL will be granted if a building can pass the test one year after the building begins to run. With the GBEL certification, building stakeholders can apply for subsidies. [1429] Non-compliance will lead to fines or de-certification, in which case designers and constructors will probably be

[1427] See, e.g. Guangdong PCSC (2011), Guangdong BE Regulations, *supra* note 1129, Article 26; Zhejiang PCSC (2016), Zhejiang GB Regulations, *supra* note 1130, Article 240.

[1428] The mix of this kind has been available at both central, as well as local level in Shaanxi, Jiangsu, Guangdong, Fujian, Beijing, Shanghai, Xi'an, Wuhan, Qingdao. For a list of subsidy-labeling programs see Yu, Evan, and Shi (2014), *supra* note 1002, at 17-18.

[1429] The local use of the National GB Rating System is further detailed in the Regulatory Rules on Green Building Labeling in Tientsin Municipality. See Committee on the Transportation and Urban-rural Development of Tientsin Municipality, 天津市绿色建筑评价标识管理办法 (Rules of Green Building Labeling in the Tientsin Municipality, *Jinzhengling No.2*), published as effective on 13 October 2010.

liable for the damages when claimed.[1430] For the third-party evaluation agencies, they will be given a ban on business for six months apart from the fines and the de-licensing.[1431]

A mix of regulation and liability can be found in the Brownfield Rule 2017, which may also work for brownfield redevelopment as part of GB compliance. The Brownfield Rule 2017 seems to make use of the merits of liability and regulation in terms of detecting and compensating harm. From the letter of the law, the Brownfield Rule 2017 remains unclear about the potentially responsible parties and the distribution of responsibilities among them.

5. Preliminary conclusion

Throughout the GB movement in China, the governments appear to take the lead, and the laws and policies to a large extent help GBs to grow. The Chinese GB law in early times made GB compliance mandatory for public buildings; by contrast, commercial and residential builders can comply on a voluntary basis. GB standard setting also shows the government's leadership in GB compliance. The GB laws enlist the government-made certifications, prominently the GBEL, instead of incorporating an industry-based certification.

Increasingly, industry-based certifications are having a place in the GB market in China. For instance, the LEED system has become more popular for its global-spanning business and high recognition in the commercial world. Hence down the road, the government can be expected to work more with the industry in GB, in the way of incorporating the industry-based certifications into the GB regulations.

The GB law in China appears to combine command-and-control, market-based and suasive instruments. Mandates may work better in actually increasing the compliance rate, especially in new buildings. While financial incentives are more desirable for GB renovations for the existing private buildings. Informational instruments are now working more for GB regulation. It is suggested that information tools can also work as behavioral interventions to encourage GB compliance at an individual level, using real-time information about energy use or peer-comparison feedback. With regard to instrument mixes, the GB law tends to enlist private parties to cancel out the problems concerning traditional regulation,

[1430] Tientsin PCSC (2012), Tientsin BE Regulations, *supra* note 1139, Article 54-55.
[1431] *Id*., Article 56.

particularly when it comes to GB compliance concerning indoor air quality and land use.

Chapter VI GB in the US and China: a comparative perspective

The US GB movement is not a fad, and has gone through an incremental process. [1432] In early times, GBs largely came as loosely-knit projects, by which building professionals were able to stock GB knowledge and to create the industry-based standards, prominently the LEED system. Those standards not only told different stakeholders how to build a GB but also showcased the environmental benefits of a GB. As GBs became better known, GB compliance was put on the US government agenda in response to the rising environmental concerns in the building sector. The U.S. government began to mandate, incentivize, or nudge GB compliance through laws and policies, whereby GBs not only survived but also thrived.

Meanwhile in China, the central government laid out the 9th Five Year Plan (FYP) in 1994, part of which dealt with energy efficiency. Shortly thereafter, policies for GB promotion came into play and pushed the GB movement in China forward. Those policies provided target standards for GB compliance and put in place pilot GB projects mostly in the top ten cities by GDP. In pursuit of the policy targets, the law has lent some support for GB compliance, with energy performance at heart. The GB law in early times seemed to use financial incentives more and put the governments to the fore to green their buildings. Later technical standards and regulations were made to promote residential and commercial buildings. As a result, the number of new GBs increased over the last decade,[1433] most of which were certified by the GBEL as a government-made certification program for GB evaluation. Despite the growth, GBs still account only for a minimal part in the existing buildings.[1434]

This chapter compares GB compliance in the US and China, in the light of the country studies and the theoretical framework. It has been shown in Section 1 that the GB movement in the two countries may go different ways, but both ways are likely to make GB grow. Section 2 shows how the GB laws shape in the two countries, followed by Section 3 that spells out the GB standard setting in the two countries. Section 4 compares the use of legal and policy instruments for GB compliance, including suasive, market-based, CAC instruments, and instrument mixes. The last section presents some findings from the comparison.

[1432] See Chapter IV, Section 1.1.
[1433] See Chapter V, Section 1.1 & 1.2.
[1434] *Ibid.*

1. How the GB movement evolved

1.1 Why it started: energy saving in the US; green urbanization in China

In the US, the idea of GB was a response to the energy crisis of the 1970s. The Federal Energy Administration and the USDOE made national plans for energy efficiency, part of which deals with energy conservation in buildings.[1435] At that point, GB focused on energy efficiency, and the GB movement seemed to wane as the energy crisis faded out as one of the top public concerns.

GB compliance in China can be traced back to the 1980s, as an attempt to make homes cheap. Back then, the country's economy was not in good shape, and the people could hardly afford decent places to live. In order to make homes cheaper, builders shifted to vernacular buildings made out of local structures and materials. The idea of vernacular buildings also lies next to building sustainability.

The different reasons to go green may to some degree determine the key actors on the government side. The USDOE and the USEPA used to be, and they are still the main actors, as GB was initially for the environment in the US. By contrast, GB in China appeared to be an upshot of urbanization. It started as a way to solve housing shortages, and over time GB compliance has focused on new buildings in some rich areas.[1436] Perhaps on that account, GB compliance in China relies mainly on the Ministry of Housing, Urban-Rural Development (MOHURD) and the National Development and Reform Commission (NDRC). It was not until 1995 that the Chinese government began to promote building energy efficiency in its 9th FYP, which made GB compliance a way to make the environment better off.[1437] For the time being the MOHURD has been at the helm of the GB movement in China, setting out most of the GB policies and regulations; while the Ministry of Environmental Protection (MEP) in China appeared to be less active in GB promotion.

1.2 Industry made GB survive in the US; the central government jump-started GB in China

In early times, the GB movement owed its survival to the building industry in the US. Before the US laws and policies had something to say about building green, GBs were built and assessed in line with industry-based standards. One of the most important industry-based standards is the LEED system created by the US Green Building Council (USGBC). The

[1435] See Chapter IV, Section 1.1.1.
[1436] See Chapter V, Section 1.2.
[1437] *Ibid*.

USGBC and its LEED standards not only increase the stock of knowledge about building green but also help to speed up the GB movement in ways that will avail marketing distinction and competition.[1438]

The GB movement in China appears to be more top-down, with the central government jump-starting GB. At the very beginning, the central government tried to green all the government and other large public buildings.[1439] In the meantime, the MOHURD provided many subsidies for green builders and created the GBEL as a dominant GB certification on the Chinese market.[1440] In contrast to the government's exuberance, the building industry in China did not seem to play a significant role in early times. The 3rd-party certification market is still in its infancy, with most of the GB regulations referring to the government-led GBEL certification.[1441] The China Green Building Council (CGBC) was not around until 2008. The CGBC has not created an industry-based GB certification, but it in a way helps to promote GB technologies and educate the public about GB. The environmental interest groups in China also seem to be less engaged in the GB movement, compared to those in the US who helped the USGBC fight against some trade associations.

1.3 GB Laws and policies: not only support but oversee GB promotion

The GB movement thrives as the US environmental law evolves. The 1980s saw the setback of environmental regulation as well as the USEPA.[1442] Back then environmental regulation was reduced for its high costs. By the time President Reagan was elected with his 'deregulation' philosophy, the EPA was headed by officials coming from business and firms, crowding out many senior executives and environmental professionals who used to serve the EPA. The Reagan administration also cut down the EPA's budget by more than 1/3, which led to the under-enforcement of environmental regulations.[1443] Perhaps for that reason, the GB movement also cooled down in the late 1980s. In the 1990s, environmental regulation in the US appeared to bounce back in a way. Given the high costs of environmental regulation, the US environmental law shifted from mandates to the market-based approach and voluntary compliance.[1444] It was then that the USEPA brought in the Energy Star label, which stood out of the then-initiated voluntary environmental

[1438] See Chapter IV, Section 1.2.
[1439] See Chapter V, Section 1.3.
[1440] *Ibid.*
[1441] *Ibid.*
[1442] See Chapter IV, Section 1.3.
[1443] *Ibid.*
[1444] *Ibid*.

programs and is still working to promote the energy efficiency of buildings.[1445] At the beginning of the 21st century, environmental protection at the federal level had a difficult time, and hence the local governments played a more active role in the GB movement.[1446]

In China, GB compliance has increased significantly as the GB laws and policies phased in. Prominently, the 11th, 12th, and 13th FYPs help to increase the demand for GBs or GB products and facilitate cooperation among different building stakeholders in GB.[1447] Yet on the flip side, the GB laws and policies currently seem to focus less on green renovations, which may also have potential in GB compliance.[1448]

It is not far from the truth to say that the law and policies in both countries made GB take off. But as noted in theory, law matters in GB not only because it provides incentives or steers preferences, but also because it can oversee the use of power. In the US case, for instance, the non-delegation principle put some checks on the use of industry-based standards in the GB regulations.[1449] As an instrument mix, the SEP policy was challenged by the Miscellaneous Receipts Act (MRA), which requires all the penalties to go into the Treasury rather than to fall into the hands of environmental protection agencies.[1450]

In GB promotion, the law in China does seem to provide much oversight over the regulatory power. An example in point could be the MOHURD's efforts to open up residential communities to make a more efficient transportation network.[1451] For the time being the Chinese GB law is more of a way to promote than to oversee GB. The reason could be that the governments are not yet delegating much regulatory power to the industry. Moreover, GB movement in China is still young, and there have not been cases in which GB compliance goes against private rights. However, this is not to say that the law does not matter. Over time the law in China can be expected to play a more significant role in terms of oversight on power and protection for rights, as professional associations as self-regulators are becoming involved in GB certification.

[1445] *Ibid.*
[1446] *Ibid.*
[1447] See Chapter V, Section 1.1 & Section 1.4.
[1448] *Id.*, Section 1.2.
[1449] See Chapter IV, Section 4.1.2.
[1450] *Id*., Section 4.5.1.
[1451] See Chapter V, Section 4.2.2.

1.4 Why GBs grow: market demand plus environmental regulations

In the US, client demands remain the most important factor driving the US GB market over time.[1452] Market demands and lower operating costs are second to client demands as the most important triggers over time.[1453] The right-thing-to-do reason to go green has also been on the list, with increasing importance from 2013 to 2018. [1454] Internal corporate commitment appeared to be the second important trigger before 2013. However, it appears to pale in significance in recent years, as shown in the SmartMarket report 2016.[1455] It is also shown in the global GB market report that environmental regulation has become a top trigger of GB activity as of 2016, which was not even one of the significant triggers reported in 2013.

In China, market demands are the most important trigger for GB compliance.[1456] Healthier neighborhoods weigh more in China than in any other countries in the global GB market report,[1457] which corresponds to the indoor air quality concern as one of the main environmental reasons to build green in China. [1458]

The triggers of GB in the two countries may indicate that, firstly, both the market and regulation matter in GB, and they may differ in their roles in GB over time. GB in China was initially stimulated by the laws and regulations in the first place. By contrast, GB in the US was mainly a result of the industry's efforts plus market demands in early times, but now it continues to grow by virtue of the increasing regulation on GB. Second, social norms and intrinsic motivations become more crucial in inducing GB activities. It can be seen that the respondents are going for GB not only for profits but also because it is environmentally beneficial and hence becomes part of the corporate social responsibilities. This may somewhat justify the use of suasive instruments, which make use of information and persuasion to achieve voluntary compliance.

1.5 The higher first cost plagues both; awareness of GB is rising

In the US, the higher first cost, along with the split incentives problem, remains the top reason for which the US respondents are not willing to go green in the recent decade.[1459] The higher first cost appears to weigh more

[1452] See Chapter IV, Section 1.1.
[1453] *Ibid.*
[1454] *Ibid.*
[1455] *Ibid.*
[1456] See Chapter V, Section 1.1.3.
[1457] *Ibid.*
[1458] *Ibid.*
[1459] See Chapter IV, Section 1.1.3.

in China than it does on the global average.[1460] A point worth heeding is that affordability has become a major challenge in both jurisdictions, which implies that the reduced willingness to build green not only result from the actual higher cost, but also from the perception that GB is not affordable.

The lack of public awareness is still one of the challenges facing GB compliance in general. Lack of awareness is less of a concern in the US. It is also becoming less relevant in China, according to the latest SmartMarket report.[1461] Instead, a lack of political support and incentives is perceived as a major problem. The reason why a lack of awareness matters less could be that, as the GB market becomes better-developed, the knowledge of GB is increasing and the stakeholders' preferences for green products are taking shape over the long term.

2. The shape of GB laws

2.1 Political backgrounds: federalism in the US; centralization in China

As noted in theory, for a novel change to happen, different types of rules will help to link stakeholders and actions. Of the rules at work, formal rules, which include constitutional rules, collective rules, and operational rules, determine who will play a role in GB and how decisions are made. Hence it would be interesting to see how the political structures in the two countries differ and accordingly lead to different ways of GB promotion.

The US Constitutional law lays out a federal system composed of three branches, a legislative branch that makes laws, an administrative branch that enforces laws and a judicial branch that interprets the law.[1462] The three branches put checks and balances on the power of each other. Accordingly, the US environmental law has three sources: the legislative branch as a source of statutory law, the judicial branch as a source of case law, the executive branch and administrative agencies as sources of laws of other types.

The PRC Constitution, likewise, spells out the political structure of China.[1463] China is a socialist country ruled by the Communist Party of China (CPC), in collaboration with other democratic parties. The state power resides with the People at large. The elected legislators will make laws to create and oversee the administrative and judicial branch of the

[1460] See Chapter V, Section 1.1.3.
[1461] Dodge Data & Analytics (2018), *supra* note 40, at 43.
[1462] See Chapter IV, Section 2.
[1463] See Chapter V, Section 2.

country. Vertically, each of the three branches will be instituted at the central and local levels and work in a hierarchy.

It can be seen that both countries have constitutions, legislation, regulations, and judicial decisions. The constitutional rules affect the making of collective rules (e.g., GB policies); and the collective rules affect the making of operational rules, e.g., statutory, case laws and regulations applicable to GB compliance, which will have impacts on the provision, production, distribution, appropriation, assignment and consumption of GB in specific action situations. The legal frameworks are made up of the three types of rules.

In the meantime, differences can also be found in the political structures of the two countries. The US system was established in light of the separation of power, by which the three branches can put checks and balances on each other. The separation of power this way enables courts to establish some case law doctrines that can affect the standard setting and the liability regime in GB promotion. One example could be the pre-emption doctrine that may nullify the more stringent standards at the state level for HVAC system. Another example could be the state-action immunity doctrine as a shield for the states and localities to incorporate industry-based certifications like the LEED.[1464] Also, the US case law has changed the secured interest exemptions for lender liability for land reclamation, which may have different deterrent effects.[1465]

In China, under the supervision of the ruling party, governments at the different levels work in a more hierarchical and centralized way, and they appear to play a bigger role than does the judicial branch. This can in part explain why GB promotion began with policies at the central level. Besides, the legislative branch, together with the governments, contribute to the main part of GB laws and regulations. By contrast, the judicial branch in the past decade has played a very limited role in GB promotion. One of the reasons could be that the courts are not empowered by the legislation to oversee general administrative acts, e.g., the making of regulatory rules. Also, liability has not played a significant role in GB regarding land reclamation and indoor air pollution, and hence there have been many judicial cases addressing GB compliance.

2.2 Legal framework for GB compliance

In the US, there has not been a single piece of law that is precisely made for GB compliance as a whole at the federal level. The federal laws

[1464] Chapter IV, Section 4.1.2.
[1465] *Id.*, Section 4.3.4.

relevant to GB compliance mainly come in the forms of legislation and executive orders.[1466] The legislation mostly sets general target standards on energy efficiency at the federal level. In order to meet those targets, the federal legislation requires the federal government to use its purchasing power and funding on the one hand, and to integrate different government entities as well as information regarding GB compliance on the other hand. In response to the federal legislation, executive orders signed by the US presidents may require all the government buildings to comply with the GB standards on a mandatory basis, and where possible private projects are encouraged to be green voluntarily. Given that GB performance means more than energy efficiency, GB compliance could also be subject to other federal laws applicable to each of the GB elements, e.g., the RCRA for construction and demolition waste disposal, the CERCLA for land use, the CAA for air quality and the CWA for groundwater use.[1467]

As opposed to the federal GB laws in a dispersed manner, the states and localities are active in making legislation that takes GB performance as a whole. GB legislation at the state and local level tends to set performance standards that are more stringent than those at the federal level. Those standards usually incorporate industry-based certifications. At the state level, instruments used in the law to meet the standards come in a wider range than those at the federal level, and they may vary across jurisdictions.

In China, likewise, no law at the central level is specially made for GB compliance as a whole. The central GB laws mostly deal with building energy use and environmental impact assessment (EIA) on building projects. The indoor environment as part of GB is barely brought up in the central GB laws.[1468] Another big part of the central GB laws focuses on building energy efficiency.[1469] The Energy Conservation Law 2008 and the Renewable Energy Law 2009 lay out the main rules for building energy efficiency. To further implement the two laws, the State Council made the RECB 2008, based on which the MOHURD made departmental rules to carry out the instruments laid down in the laws.

In response to the central legislation, GB lawmaking at the local level appears to start with government-made regulations, emphasizing building energy efficiency or GB labeling in the first place.[1470] As of 2015, the local legislatures began to make a move and have passed some local laws in

[1466] *Id.*, Section 3.1.
[1467] *Id.*, Section 3.1.1.
[1468] Chapter V, Section 3.1.1.
[1469] *Id.*, Section 3.1.
[1470] *Id.*, Section 3.2.1.

which GB compliance is taken as a whole. To date, the local laws still account for a small part in local GB legislation. But more local GB laws are coming, as is the case in Shanghai, Fujian, and Hebei. As GB compliance has gone citywide, some local laws and regulations are made for GB compliance in a demonstration eco-city that was jointly built as a transnational project. One of the examples could be the special regulations and standards made for the Sino-Singapore Tientsin Eco-city, which was jointly built by the Chinese and Singapore governments.[1471]

It can be seen that the two countries are similar in GB lawmaking, although they differ in terms of the political orders. At the central (federal) level, there has not been a single piece of law that is made for GB compliance as a whole in either country. Most of the laws at the central (federal) level have more to say about building energy efficiency, with an emphasis on GB compliance in government buildings. Other GB elements are addressed in a dispersed manner in the different laws. Of note, indoor air quality seems to be less of a concern in the central (federal) laws. The local laws in the two countries usually take GB compliance as a whole and tend to enlist a broader range of instruments to promote GBs.

There are also differences between the GB laws in the two countries. At the federal level, the US GB law barely uses command-and-control instruments. Instead, the federal GB law tends to finance GBs through public procurement. In China, the central GB law uses more the environmental impacts assessments and building permits as CAC instruments for GB. At the local level, GB lawmaking in the US usually started with legislation, in response to which the state and local governments made regulations for the further implementation. Yet the GB lawmaking in China seems to go the other way around. The local governments took the lead to make GB regulations first, and then the local legislatures began to make a move.

3. GB standard setting

3.1 Differentiated standards with a bottom line

In the US, the federal government sets the minimum requirements, meanwhile allowing the state and local governments to make their own standards.[1472] It seems that the US GB standards at the federal level deal more with the trans-boundary externality problem, taking into account the overall environmental quality. The race-to-the-bottom concern might

[1471] See Chapter V, Section 3.2.2.5.
[1472] See Chapter IV, Section 4.1.1

matter less in the making of federal standards.[1473] The US GB law also makes available GB standards at the state and local level, partly because some of the GB elements can be better addressed by localities, e.g., GB performance on land use.[1474] Yet the more stringent standards at the local level, particularly those for the HVAC system in buildings, have been challenged by the pre-emption doctrine.[1475]

Likewise, the GB law in China draws a bottom line at the central level, meanwhile allowing local governments to make standards that are more stringent than the central ones.[1476] Of note, a grandfather clause can also be seen in GB regulations in China.[1477] Standards for both the newly-built and the existing buildings have been in place for some time. The GB legislation at all levels mostly makes GB compliance mandatory for all the new buildings; while renovations are encouraged. [1478]

3.2 Targets plus performance standards are more common; specification standards are barely seen

In China, GB policies like the three Five Year Plans set the targets on the rate of GB compliance regarding building energy efficiency. [1479] The GB laws at both central and local level require the GBEL certification for the evaluation of individual buildings.[1480] Similarly, in the US, GB standards in the federal laws mostly come as target standards for building energy efficiency or GHGs emissions.[1481] GB mandates at the state or local level mainly go with performance standards, in combination with building permits. [1482] Specification standards are barely seen in the GB laws, especially those at the federal level.[1483]

GB standard setting in the two countries by and large confirms the theoretical points about the environmental standard setting. [1484] Target standards and performance standards are combined as they may cancel out the problems of each other. Target standards have little to say about compliance at the individual level, in which case targets set by the principals are likely to be achieved by their agents in the most twisted way,

[1473] *Ibid.*
[1474] *Ibid.*
[1475] *Ibid.*
[1476] See Chapter V, Section 4.1.2.
[1477] *Ibid.*
[1478] *Ibid.*
[1479] *Id.*, Section 1.1.2.
[1480] *Id.*, Section 4.1.1.
[1481] See Chapter IV, Section 4.1.3.
[1482] *Ibid.*
[1483] *Ibid.*
[1484] See Chapter III, Section 6.1.

and may be subject to private interest. Specification GB standards are barely seen as they provide few incentives for firms to control pollution or develop cheaper technologies for abatement. In the meantime, specification standards are said to be less workable in environmental compliance, especially when regulators are aiming too high for GB technology use.

3.3 How GB regulations work with the industry-based standards

More often, the US GB regulations tend to make use of the industry-based standards, prominently the LEED, meanwhile retaining the authority to change and enforce the standards.[1485] It turns out that this way does not necessarily go against the non-delegation principle unless it overly gives the industry the authority to permit and inspect. Some of the state and local GB laws have come up with their ways to respect the non-delegation principle, e.g., to put a regulatory control over the change of industry standards, as is the case with the GBs Act in Illinois.[1486] Another concern arises from the government-run monopoly when GB regulations incorporate the industry-based certifications. The LEED's exclusive use of the FSC rating system has been accused of violating anti-trust laws when adopted by municipal governments.[1487] Yet a remedy for the excluded parties may not always be workable as the US Supreme Court has established a state-action immunity doctrine, which allows the state and local governments to be immune from an anti-trust action against their anti-competitive standards under the FTC or the DOJ.[1488]

The government-led way of standard setting appears to be more common in China. The GB standards there mostly refer to the GBEL system created and administered by the central government. In a few instances, local governments will create and enforce their own rating systems. In neither case have the industry-based certifications played a big part in GB compliance.[1489] One of the reasons could be that the third-party GB certification market is still young and there has not been an industry-based certification that can outweigh the GBEL.[1490] In this way, GB compliance is less likely to be subject to private interest, rent-seeking, and concerns about monopoly or delegation of regulatory power. However, as noted in theory, regulators may not always have the best information to make and enforce GB standards. On that account, co-regulation may fix the

[1485] See Chapter IV, Section 4.1.2.
[1486] *Ibid.*
[1487] *Ibid.*
[1488] *Ibid.*
[1489] See Chapter V, Section 4.1.3.
[1490] *Ibid.*

problems of regulation and self-regulation. Increasingly, it can be seen that some local governments in China begin to draw on the industry expertise, and the industry-based certifications are having a place in China.[1491]

4. Instruments for GB compliance

4.1 Suasive instruments: information can also work for individuals

The US law has made use of environmental information disclosure to nudge or oversee GB compliance, particularly in the case of building energy efficiency and waste disposal. Information disclosure can differ in its forms and impacts. Sometimes the law may require the government to provide information for the public. For instance, the EPA created a Toxic Release Inventory (TRI) to make parties better aware of hazardous wastes. Labeling programs are widely at work for GB compliance in the US, prominently the LEED system and the ENERGY STAR program. Reporting so far seems to be less used for GB compliance. Apart from labeling and reporting, information can work as a non-price intervention. An example could be the Opower program.[1492] It has been shown that the monthly peer feedback could reduce energy consumption by 2.3 to 2.4 percent relative to the baseline, but the effects may die away when the feedback no longer comes. The Opower program suggests that, when it comes to changing behavior, informational programs bring better results when the treatment is available frequently for a long period. Compared to other persuasive instruments, voluntary environmental agreements are not quite common in GB promotion in the US. Currently there has not been a voluntary compliance agreement between the government and the industry.

In China, labeling and reporting are the major persuasive instruments.[1493] GB labeling is often used in a subsidy program, as a requirement for a GB project developer to get the financial incentives. Energy auditing is used for the governments to oversee energy use in buildings, on account of which the governments can come up with plans on renovations for building energy efficiency. In either case, the informational instruments in China work more for the government and less for private building stakeholders. In the meantime, the pilot GB projects help to educate and persuade the public into GB compliance, showcasing the benefits of GBs. However, the pilot projects may stray away from the pro-environment goal if they are not fully used. Some demo GB communities have become ghost

[1491] See Chapter V, Section 4.1.3.
[1492] See Chapter IV, Section 4.4.2.
[1493] See Chapter V, Section 4.4.2.

towns since the infrastructure around them is not in good shape, and hence few residents are willing to live there.

It could be seen that information disclosure plays a more significant role than voluntary environmental agreements in GB promotion. Individual behavior can have impacts on the final performance of instruments. Consumers' choices for green products, e.g., GBs and hybrid cars, may have more to do with social norms than with changes in relative prices.[1494] Those non-price concerns hint that apart from the traditional 'carrots and sticks,' regulation might work on the behavioral side by giving information to the end-users, as is the case with the Opower program.

The lower use of voluntary compliance agreements may be a result of the concerns predicted in the theory.[1495] Voluntary compliance agreements may give rise to free-ridership. In that case, parties who cannot fulfill their abatement obligations may cheat, leaving the parties who perform bona fide to bear the costs. It could also be the case that parties who can abate at a lower cost do not make their best efforts. Furthermore, a voluntary compliance agreement between the government and the industry may not fully take into account the fact that different stakeholders can have different reasons to comply, e.g., economic rationality, situational rationality, habits or reputation.[1496] Lastly, voluntary compliance agreements might be misused as a shield from regulations to come, since the government may promise not to introduce new regulations, in return for the industry's voluntary compliance.

Despite the concerns pictured in the theory, it has been shown that voluntary compliance agreements could still play a role if the costs of technology adoption do not vary greatly across firms. Also, voluntary compliance agreements can be an alternative if the political backlash against taxation is high.[1497] The two countries use more tax reductions or subsidies for green properties, rather than creating a new tax,[1498] and hence there has not been much political opposition against taxation for GB compliance. This could also somewhat explain why voluntary compliance agreements are not playing a significant role in the two countries.

[1494] See Chapter III, Section 3.3.
[1495] *Id*., Section 6.4.2.
[1496] *Id*., Section 3.3.
[1497] Lyon and Maxwell (2003), *supra* note 267, at 1480-1471.
[1498] See Chapter IV, Section 4.3.1; Chapter V, Section 4.3.1.

4.2 Market-based instruments: financial incentives play a bigger part than liability

The US GB law tends to finance GB promotion rather than to give blunt subsidies.[1499] The federal GB laws use public procurements to support GB compliance; while the state and local governments have found green loans to be a more effective way to drive money into GB projects. The choice of instruments depends primarily on the governments' financial situation, oversight structure, local political & cultural environment, and limits to power. Liability as another market-based instrument also lends some support to GB compliance, either in the way of product liability or liability for land contamination.[1500] A building can hardly be seen as a product, hence it is more likely to sue companies who produce building products that release hazardous substances. [1501] Liability for brownfield reclamation is associated with construction/demolition (C/D) waste treatment, which is mainly addressed in the CERCLA, the RCRA, and the TSCA. Building stakeholders would be held liable for land contamination when they excavate soil or engage in the actual management of hazardous substances disposal, according to the CERCLA.[1502] Overall, the US law shows a lower use of liability in GB promotion.

Subsidies play a bigger role in GB promotion in China. Subsidies are mostly granted in proportion to the area of green floor-space certified, and they are available at both central and local levels.[1503] However, subsidies may lead the GB market to overly rely on the governments. Also, subsidies may create perverse incentives that attract too many new green builders and hence increase the total emissions in the building industry. Apart from the subsidies, demand-side pricing is also helping energy saving, using time-based pricing and tiered electricity pricing. [1504] The time-based pricing can to some extent help to divert the electricity use from peak-hours to off-peak hours, so as to make the electricity grid more efficient. The tiered pricing is likely to make the public better aware of energy saving, but it remains in doubt to what extent it can reduce energy use in total as it gives free or cheap electricity to residential users. Also because it differs in its impacts on the poor and the rich, those large electricity consumers even stood up against this pricing system. As a way to jump-start GBs, public procurements for GB (products) indeed help to increase

[1499] See Chapter IV, Section 4.3.3.
[1500] See Chapter IV, Section 4.3.4.
[1501] *Ibid*.
[1502] *Ibid*.
[1503] See Chapter V, Section 4.3.1.
[1504] *Id.*, Section 4.3.2.

the demand for GBs.[1505] However, in practice, public procurements may not sufficiently encourage innovations and crowd in private investment in GB compliance. Due to a lack of transparency, the GPP programs may be subject to venality, in which case officials in charge may fake or manipulate GPPs to line their pockets.

In contrast to financing, liability seems to work less for GB compliance in the two countries. The reason why liability matters less could be that GB compliance in both countries focuses on energy efficiency. In theory, liability is better-suited to deter and compensate for harmful externalities. Building energy efficiency provides end-users with energy savings and can hardly be taken as a harmful externality.

As GB compliance goes beyond energy use, liability can have a complementary role for GB compliance regarding indoor air quality, C/D waste disposal and land contamination. Yet as noted in the theory, liability by itself might not be a sufficient tool for environmental governance, despite the deterrent effects the liability rules may have on parties' behavior.[1506] For instance, brownfields are often associated with long-tail damage. In the case of long-t damage, the causation between act and harm can be hard to prove, and it may take forever to find out the actual injurer. Even if the harm can be detected, brownfield cleanups could be costly, while the liability regime is no stranger to the judgment proof problem. Perhaps for that account, the GB laws in both countries tend to have parties other than just the actual injurers responsible for brownfield remedies. The liability rules can also make entitlements change hands when the entitlements are given to others than those who can make the most of the resource.[1507] Yet given the under-compensation and under-deterrence problem with liability, private parties may not have enough incentives to do the cleanups.

4.3 Command-and-control instruments: building permits often work with planning

The GB laws in the two countries use both building permits and planning in GB promotion, but they may differ in terms of the specific requirements.[1508] Some of the state or local GB laws in the US make GB certifications a requirement for a building permit to be issued, as has been the case in Chicago and Seattle. Usually, a permit is ex ante in character and hence some local governments have come up with a life-cycle permit.

[1505] See Chapter III, Section 6.3.4; Chapter IV, Section 4.3.2; Chapter V, Section 4.3.3.
[1506] See Chapter III, Section 5.2.
[1507] *Id.*, Section 3.1.
[1508] See Chapter IV, Section 4.2; Chapter V, Section 4.2.

Land use planning and zoning are used to promote green affordable housing. Given the higher first cost, some state or local governments couple green zoning with ex-ante subsidies to help municipalities reach their affordable housing targets. As noted in theory, land use regulations are often accompanied by taking claims. But in the US context, GB compliance regarding land use may face fewer claims than other land regulations do, as it is less likely to reduce the economic value or the utility of the properties. At some point, it even encourages property owners to make the best use of land, as is the case with brownfields redevelopment.

In China, the GB laws at the central and local level make use of building permits, incorporating environmental impact assessments (EIAs) in some cases. Similar to the building permits in the US, the regulatory process does not end after a permit is given. Some of the local GB laws in China require permits at the design, construction and commissioning stage of a building project. In a few cases, demolition also calls for permits. Yet it is too often the case that building permits are given without an EIA, partly due to the ex-post EIAs laid down in the EIA Law of the PRC (2003). The Environmental Protection Law of the PRC (2014) has *de jure* put an end to the ex-post EIAs. However, the post EIAs are still there in practice. With regard to land use, the central GB laws require that land entitlements or building permits should be granted in light of the overall land use planning. Another way to GB compliance regarding land use is to minimize the environmental impacts on the land of ecological concern, which is also a part of GB compliance. The Environmental Protection Law 2014 draws redlines along the vulnerable ecosystems against building activities that would have negative environmental impacts. At the local level, planning not only works for demo GB communities but also for GB compliance regarding resource use, public transportation, and waste treatment.

The combination of planning and building permits can be a response to transboundary GB compliance. Building permits keep an eye on GB compliance in individual buildings and hence may fail to take into account the overall plan. As such, planning can help to reach cooperation when GB compliance goes beyond one jurisdiction, as is the case with the Sino-Singapore Tientsin Eco-city in China. Furthermore, the combination of planning and building permits can also help to prevent GBs from being overly spread. After all, GB compliance aims to be green, and not to build more. Without planning, there might be too many ostensible GB communities with a very low occupancy rate. As a result, GBs may cost more than they could have contributed in terms of efficient resource use and environmental impacts reduction.

4.4 Instrument mixes: regulation works with liability

In the US, the Supplemental Environmental Project (SEP) policy partly deals with GB performance. With the SEP policy, the USEPA encourages parties to deliver GB projects or other GB strategies on contaminated properties, in exchange for penalty abatement.[1509] A settlement can be derived from a suit filed by private parties. If the settlement meets all the conditions on which a SEP can be introduced, it will be handed over to the USEPA. The USEPA by its discretion can determine whether or not a project will be accepted as a SEP, and how much of the penalty abatement can be given. The SEP policy somewhat eases the judgment proof problem by allowing the tort-feasor to pay the price in the long run, instead of paying a lump sum at once or even going insolvent. Moreover, injurers seeking SEPs not only pay the damages but also engage in the SEPs till the end. In this way, the SEP policy aims at not only compensation for harm but also environmental justice. In that sense, the SEP policy may score better than the Superfund program, in which injurers only need to write a check and leave the rest of the remediation work to the government.

Self-reporting combines mandates and voluntary information disclosure, which can be another instrument mix for GB in the US. As opposed to mandatory environmental information disclosure, self-reporting is voluntary, whereby the regulated report their violations before being detected by regulators. However, some of the self-reporters may report minor and irrelevant violations to distract regulators from the more severe violations ('red-herrings'). This can not only increase the administrative costs but also make self-reporting a shield from regulation. Besides, the regulated may not have incentives to turn themselves into the authority if the abatement or benefits are no greater than the costs, or if the reporting will give away proprietary information and be used against the regulated in other cases.

In a similar vein, the central environmental regulator in China also tries to make use of liability in brownfield reclamation.[1510] According to the Brownfield Rule 2017, if no actual injurers can be found when a brownfield is detected, the land user will be liable for the reclamation if s/he intends to build a residential or commercial building project on a brownfield. If no private responsible party can be found, the governments will be responsible for the brownfield reclamation within their jurisdictions. From the letter of the law, the Brownfield Rule 2017 remains unclear about the potentially responsible parties and the distribution of

[1509] See Chapter IV, Section 4.5.1.
[1510] See Chapter V, Section 4.5.

responsibilities among them. It remains to be seen how the mix laid down in the Brownfield Rule 2017 will work for brownfield reclamation in practice.

Apart from the regulation-liability mix, market-based instruments often work with persuasive instruments in China. One of the examples could be the mix of demand-side pricing and energy auditing. [1511] In the use of command-and-control instruments, the law provides sticks against non-compliance meanwhile giving carrots for compliance, as has been the case in the Tientsin municipality in China.

It could be seen that instrument mixes have been available in the two countries for some time. More often, a mix of regulation and liability is used for brownfield redevelopment as one of the GB elements. The instrument mix can to some extent cancel out the problems with government regulation and liability, as noted in theory. Liability alone has not worked much for GB compliance, since liability is said to deal more with harmful externalities. GB compliance has been focusing on building energy efficiency, which can hardly be taken as a harmful externality. Increasingly, GB compliance is taking into account land use and indoor air quality. In that case, the liability regime is likely to work against indoor air pollution and land contamination.

As far as dealing with environmental harm is concerned, liability has its limits, one of which is the judgment proof problem. The instrument mixes in the two countries both in some way tackle this issue. The SEP program reduces the damages that ought to be paid in the short run and allows the defendant to pay for the harm over a longer term. The Brownfield Rule 2017 in China tends to hold parties other than the actual injurers liable for the brownfield remedies. In that sense, the Brownfield Rule 2017 seems to get as many parties as possible to pay for the remedy work.

The probability of detection is also another concern in the liability regime. The two mixes appear to solve this problem in different ways. The SEP program makes use of private information to spot non-compliance, on the account that the government may not have information about individual behavior. By contrast, under the Brownfield Rule 2017 in China, the environmental regulators will detect the harm in the first place. It is too often the case that brownfields are left in the public domain and there is not a particular victim to bring a suit. This could partly be a result of the state property regime in China, by which the ownership of the land in the

[1511] See, e.g. Guangdong PCSC (2011), Guangdong BE Regulations, *supra* note 1129, Article 26; Zhejiang PCSC (2016), Zhejiang GB Regulations, *supra* note 1130, Article 240, in Chapter V, Section 3.2.2.

urban areas resides with the People at large, but it is mostly managed by the government. In other words, the government can not only be a regulator, but also the agent of the land owner (the people). Private parties will only have the right to use. Given the state property regime, the governments may have more incentives to detect harm. In the meantime, it is also reasonable to make land users responsible for the redevelopment of brownfields, as they will be the actual users and are likely to make the most of the resources.

5. Summarizing

It can be seen that the GB movement has been promising in the US and China over time, with the US slightly going ahead. Despite the higher first cost as the top challenge in both countries, the number of GBs is likely to go up, by virtue of the market demands as well as environmental regulations.

Yet the two countries appear to use different ways of GB promotion, taking into account the institutional backgrounds. The GB movement in the US was based on self-regulation in the early days, with the US Green Building Council (USGBC) as a self-regulatory agency playing a major role; whereas in China, the central government took the lead in GB promotion in the beginning. Over time, the two countries enlist both regulators and self-regulators to promote GB. GB compliance is becoming mandatory in some states or localities in the US through land use planning and building permits. Meanwhile in China, the industry actor, e.g., the China Green Building Council (CGBC), is beginning to make the public better aware of GB and showcase the benefits of GB. For the time being GB compliance is achieved not only in public buildings but also in commercial projects.

Throughout the GB movement, the law as part of the institutional framework also in some way affects GB promotion. On the one hand, the law can put checks on the use of power. The role of law is crucial given the fact that GB goes beyond public buildings and co-regulation is gaining popularity in GB promotion. A good example is GB standard setting and evaluation, where private GB standards or certification have been incorporated into regulations. In that case, the law needs to keep an eye on the delegation of regulatory power. On the other hand, the laws and regulations in both countries provide incentives and steer preferences, by putting in place the command-and-control, the market-based and the persuasive instruments.

For the different instruments to work, the two countries have set standards for GB compliance. The standards in the two countries entail mostly target

standards and performance standards; rarely are specification standards seen that specify the technologies or methods required. Also, a combination of uniform and differentiated standards has been common in the two countries. Some of the US and Chinese laws set the minimum bar on GB compliance, meanwhile allowing the localities to make more stringent standards.

But the two countries are different in terms of using private GB standards. The US GB law tends to incorporate industry-based standards, prominently the Leadership in Energy and Environmental Design (LEED) made by the USGBC. But the power to enforce and change the standards mostly remain in the hands of the regulators. By contrast, the laws and regulations in China mostly refer to the GBEL established by the central government; the industry-based standards have not been commonly used in the regulations. In a few programs at the local level, the LEED system has been required for a GB project to obtain subsidies.

In pursuit of compliance with the GB standards, the three types of instruments can all be found in the two countries, but they may differ in their roles in GB. Planning and building permits are the main command-and-control tools for GB compliance in both countries. In the US, planning works for the green affordable housing or land use; while in China planning deals more with new GB communities and building energy efficiency renovations. Building permits and land entitlements are granted in accordance with the land use planning. In this way, GBs will not overly grow and hence take into account the total environmental impacts in the building sector. Though some of the GB laws and regulations require life-cycle oversight, building permits are ex ante in character and hence might make more sense for regulating new GBs.

Financial incentives are used in both countries to reduce the higher first cost of new GBs or GB renovations. Public procurements can be an effective way to jump-start GBs in both countries. Public procurements could be one of the reasons why public buildings account for a large part of the existing GBs. Tax reductions have also been available for the green properties in both countries. Apart from public procurements and tax reductions, the US law tends to finance GB compliance through loans rather to give subsidies. By contrast, the Chinese government tends to provide new GBs or GB renovations with subsidies, most of which are given in proportion to the area of green properties certified.

Liability as one of the market-based instruments more often deals with GB regarding indoor air quality and brownfield redevelopment. In the US, product liability has played a role to compensate victims suffering from

sick-building syndromes. In the meantime, the CERCLA and the US case law make it possible to sue the owners, users or other stakeholders, e.g., lenders, of a facility or a property for brownfield remedies. However, it should be noted that those cases are less relevant to GB compliance as a whole. So far liability has not worked much for GB compliance in China. One of the reasons could be that the GB law in China focuses more on building energy efficiency, and the Chinese environmental law has not paid much attention to indoor air pollution.

Persuasive instruments mainly take the form of informational tools in both countries. Certification and reporting are more common in both countries. Informational instruments have been working for building energy efficiency in both countries, but they have different implications. In the US, information works for both public and private parties. On the one hand, information through reporting or energy auditing is available for the governments to oversee energy use in the public buildings. On the other hand, real-time information is used as behavioral intervention to encourage building energy efficiency at the individual level, as with the Opower program. In China, information is mainly for the governments to oversee energy use in the public buildings and decide whether or not renovations for building energy efficiency are necessary. Informational programs at the individual level and their effectiveness have not been fully recognized in China.

With regard to instrument mixes for GB, both countries put in place a mix of regulation and liability for brownfield remedies, as with the SEP policy in the US and the Brownfield Rule 2017 in China. The mix of regulation and liability appears to deal with the under-compensation and judgment proof problem concerning liability for land contamination. Besides, the regulation-liability mix also allows the regulators to use private information for detecting harm.

A mix of regulation and self-regulation can be found in the US GB law. The GB regulations in the US mostly incorporate an industry-based certification, prominently the LEED system. In some cases, the US GB regulations also refer to the Energy Star as a voluntary environmental program run by the federal government. However, the mix of regulation and self-regulation seems to play a minimal role in China. Most of the GB regulations in China refer to the GBEL certification established by the central government. Industry-based GB certifications like the LEED system are mostly applied by private green builders voluntarily.

Chapter VII Conclusions and recommendations

GB can have environmental benefits in terms of land use, energy use, indoor air quality, and wastes disposal. With those benefits, GB has become an instrument to environmental governance. The global GB market reports have shown that the level of GB activities may be lower than expected, due to the challenges ahead, namely a higher first cost, lack of incentives or split incentives, lack of awareness and dispersion of building stakeholders. Those challenges can come down to a matter of incentives and preferences. In other words, the challenges are not all about externalities that can be internalized via one instrument such as a Pigouvian tax. The challenges could also be a result of the institutional framework of the GB movement.

Given the challenges ahead, various legal and policy instruments have been available for GB compliance, which can be classified into command-and-control (CAC), market-based and persuasive instruments. Those instruments are put in place jointly or in isolation to pursue GB. But none of the instruments is costless, the instruments (mixes) at work bear the question why it is necessary to have them all if one is sufficient.

This chapter proceeds as two sections: conclusions (Section 1) and recommendations (Section 2). On the basis of the theoretical framework and the country studies on GB compliance, Section 1 gives answers to the research questions of this study:

(i) What does it mean to build green?
(ii) Why do instrument mixes make sense?
(iii) What are the instruments working for GB compliance? How do they work jointly or in isolation?
(iv) Which instrument (mix) may work better for GB?

In the light of the conclusions, Section 2 provides some recommendations on the use of instrument (mixes) for GB.

1. Conclusions

1.1 GB is to build green, and not to build more

GB aims to reduce the environmental impact of buildings. The idea of GB can be taken as a way to efficient resource use. In the beginning, GB primarily aims at the energy efficiency of buildings. Over time, GB has

gone beyond energy efficiency, including elements like land use, indoor air quality, and construction/demolition wastes disposal.[1512]

GB by its definition is mainly for the environment, and not for urbanization. This could be the reason why GB renovations are drawing more attention in the two countries. For instance, in the US, retro-fitting of the existing buildings is expected to be one of the sectors with GB growth.[1513] Besides, some of the US federal GB laws provide private building stakeholders with incentives for GB renovations, meanwhile mandating energy efficiency improvements in the federal government buildings.[1514]

In China merely 1% of the 40 billion m^2 existing buildings are certified green. By contrast, new GB communities are growing fast in the suburban areas, regardless of the actual client demands for GB. Now the Chinese GB law begins to pay more attention to GB renovations, with the central standard for GB renovations.[1515] A simple takeaway here is that when a new building has be to be built, it is better to be built in line with GB standards; but overall the GB compliance can increase significantly by green renovations.

The idea that GB is to build green and not to build more also hints that instrument mixes for GB should take into account the total environmental impacts of GB. In other words, GB compliance should be in line with target standards and planning, lest GBs grow too much.[1516] Perhaps on that account, building permits often work with land use planning in the two countries. Besides, the meaning of GB can also give an intuitive sense that subsidies may not necessarily work better than other market-based instruments. In theory, subsidies are likely to create perverse incentives and make the GB market overly rely on government spending. This could be one of the reasons why green loans and public procurement are preferable to overcome the higher first cost of GBs in the US.

[1512] See Chapter II, Section 1.2.
[1513] See Chapter IV, Section 1.1.3.
[1514] See Chapter IV, Section 3.1.1.5.
[1515] See MOHURD (2016), Assessment Standard for GB Renovations, *supra* note 989.
[1516] An example in point could be the ghost GB communities in China, where GBs are underused. In that case, the GBs aiming to save resources may in fact lead to inefficient use of land and energy embedded. See Chapter V, Section 4.4.1.

1.2 Regulation, liability or self-regulation on its own may not suffice to promote GB

There are various instruments for GB promotion, and they differ in time (i.e., before or after), form (i.e., monetary or non-monetary sanctions), and enforcement level (i.e., public or private enforcement). Those instruments will be played out by the different types of building stakeholders, e.g., governments, self-regulatory agencies or individuals, who will all face concerns about costs, imperfect information, private interest, or inaccuracy of measurement. Therefore, government regulation, liability or self-regulation along may not be sufficient to promote GB.

GB promotion cannot merely rely on self-regulation, given the fact that GB is mainly for the environment. Admittedly, self-regulation may have better expertise (information), more flexibility and less administrative costs, compared to regulation.[1517] This has been the case for the US Green Building Council (USGBC), to whom the GB movement in the US owed its survival in the early days.[1518] However, GB as part of environmental governance works more in the public interest, and self-regulation is no stranger to private interest concerns. Industries at first sight are likely to be indifferent or not powerful enough to take green initiatives like GB. This has been the case in China, where the building industry barely played a role in GB promotion at the beginning.[1519] It could also be the case that those self-regulatory agencies promote GB for rent-seeking, and not merely for making the environment better off. Over time, the USGBC, which was born to pursue building sustainability, ever tried to water down the LEED standards. The USGBC offered easy points for developers, meanwhile lobbying to make the LEED part of the state and local regulations on building sustainability.[1520]

Liability is able to work for GB compliance regarding indoor air quality and brownfield redevelopment, but it is not well-suited for the overall targets of GB. In theory, liability is meant to deter and compensate environmental harm. Yet GB in early times focused on building energy efficiency, which can hardly be taken as a harmful externality. Over time GB has gone beyond energy efficiency, taking into account indoor air pollution and brownfield reclamation. Perhaps on that account, product liability for harm caused by indoor air pollution, and liability for brownfield remedies come into play in the US.[1521] But as far as deterrence

[1517] See Chapter III, Section 5.3.
[1518] See Chapter IV, Section 1.2.
[1519] See Chapter V, Section 1.3.
[1520] See Chapter III, Section 5.3; Chapter IV (US), Section 4.1.2.
[1521] See Chapter IV, Section 4.3.4

is concerned, the liability rules in theory may not induce the desirable care and activity levels on both sides,[1522] which could be even more often the case when taking into account the probability of detection, [1523] causation [1524] and multi-tortfeasor scenarios. [1525] Besides, liability may under-compensate given the judgment proof problem, statutory caps on the amount of damages, and the inaccurate measurement of environmental harm. Those concerns have been present in the case of brownfield remedies in the US.[1526] Furthermore, liability is *ex post* and *ad hoc* in character, but there might be more to GB compliance than just to compensate and deter case-by-case. Particularly when it comes to GB non-compliance that can lead to health risks, liability may not suffice to prevent irreversible harm ex ante, as was the case with the high school built on a contaminated land in Texas in the US.[1527] Also GB should take into account the overall impacts and hence calls for planning beforehand, as with those transboundary GB projects.[1528]

Government regulation also has its own limits in promoting GB. Firstly, regulation can and should be general and less flexible, in deference to the rule of law. Accordingly, regulatory tools used for GB may at times be challenged by the law.[1529]

Secondly, regulation may fail to deal with atypical harm or unregulated pollutants, e.g. sick-building syndrome caused by the synergy effect of the HVAC system and the window set of a building. Due to its reduced flexibility, government regulations may not respond quickly to innovations like GB; and it also is likely that reckless regulation can do more harm than good. This could be the case when some GB standards may compromise the safety and function of buildings. Besides, regulation can face high (administrative) costs, while the government may not have the money and time to put in place an instrument. [1530] Even if the

[1522] See Chapter III, Section 5.2.
[1523] An example could be contaminated land left in the public domain in China, in which case few parties would have incentives to detect and sue polluters for remedies. See Chapter V, Section 4.5.
[1524] For instance, causation can be a difficulty in the case of liability for sick-building syndrome. See Chapter V, Section 4.3.4.
[1525] See e.g., the US lender liability in Chapter IV, Section 4.3.4.
[1526] *Ibid.*
[1527] *Ibid*.
[1528] See e.g., Chapter V, Section 3.2.2.3.
[1529] For instance, land use planning and zoning often come with taking claims. See in general Chapter III, Section 6.2.2; Chapter IV, Section 4.2.2, & Chapter V, Section 4.2.2. The USEPA's SEP policy was accused of violating the federal laws; the incorporation of industry-based standards may go against the anti-trust laws and the non-delegation doctrine in the US case law. See Chapter IV, Section 4.1.2 & Section 4.5.1.
[1530] *Ibid*. In practice, some regulatory tools may be subject to high enforcement costs. For instance, one of the concerns about the USEPA's SEP policy is higher enforcement costs. As a result, some of

government can afford to put in place an instrument, it may not always pay off due to imperfect information about the desirable level of intervention. This could be one of the reasons why it might not be enough to simply give blunt subsidies or to impose taxes on non-green properties.[1531] The imperfect information can also arise about individual behavior. Individual behavior can be one of the reasons why some well-designed instruments may not work out in practice. For instance, if the end-users of buildings do not use the HVAC system in a due way, building energy efficiency will not be achieved in the end. The Opower program in the US appeared to work to this end by providing real-time and peer-comparison information for the end-users. In this way, the end-users in the Opower program are better informed about their energy use and hence tend to have better energy use behavior. [1532]

Lastly, as with self-regulation, regulation can also be led astray if agents as part of the government pursue their own agenda other than the pro-environment goal. [1533] A case in point is the TIF for brownfield redevelopment in the US, which was misused by some local governments to turn farmland into commercial districts that bring more revenues.[1534] It can also be seen that, instead of purchasing green, some bureaucrats in local Chinese governments may take advantage of public procurement to create rents. Those bureaucrats were accused of manipulating biddings, so as to have more discretion over green public procurement. They may buy products at a higher price but do not meet the environmental standards. It is also likely that those bureaucrats simply do not buy green when it is voluntary and more costly to do so. [1535]

Summarizing, there are different instruments for GB promotion, which have to rely on government regulation, liability or self-regulation to run. But regulation, liability and self-regulation all have their pros and cons. Self-regulation provides better expertise on GB, but it is more prone to influence from private interests. GB to a large extent is good for environment quality as part of public interest, and it generates positive

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the SEPs became loose-end projects due to insufficient oversight by the USEPA. See Chapter IV, Section 4.5.1. For a life-cycle oversight on GB compliance, some local governments in China have put in place building permits with follow-up inspections, which may also lead to extra enforcement costs, see Chapter V, Section 4.2.1.

[1531] See Chapter III, Section 5.1& Section 6.3.1; Chapter VI, Section 4.2.

[1532] See Chapter IV, Section 4.4.2.

[1533] See Chapter III, Section 5.3.

[1534] See Chapter IV, Section 4.3.1. It is also likely that local governments pursue the policy goal in a twisted way. For instance in China, bureaucrats in some local governments tried to put in place city blackouts, in order to achieve the energy saving goals set by the central government and to have a good record, See Chapter V, Section 4.1.1.

[1535] More about the green public procurement in China See Chapter V, Section 4.3.3.

externalities that may not always be fully considered in individual decision making. This lays the ground for regulation to play a role in GB. Government by its power can not only support GB financially, but also steer preferences for GB through laws and regulations. In the meantime, regulation needs to be bound by the rule of law and hence is less likely to be subject to private interest. But regulation can lead to higher administrative/information costs, and it can be less flexible to stimulate innovations like GB. Liability is more decentralized and can help GB in the case of indoor air pollution or land pollution. Setting aside the under-deterrence or the under-compensation problem in dealing with harm, liability is ex post and ad hoc in character, and hence may not work for some of the GB elements such as energy efficiency or land use planning. Therefore, instrument mixes are necessary to cancel out the problems concerning regulation, liability or self-regulation in isolation.

1.3 Instruments working in the context: institutional framework matters

1.3.1 Instruments at work

Instruments for environmental compliance can be classified into command-and-control, market-based and suasive instruments. In theory, command-and-control instruments are more collective and centralized, and they mostly predetermine the parties at stake and their care & activity levels. Market-based instruments give financial incentives and disincentives and let the parties in the market decide their own care/activity levels. Suasive instruments do not directly provide incentives or impose significant costs, but make use of information to nudge compliance.

In a traditional sense, the three types of instruments are ways to reduce environmental harm. GB, however, addresses both harm and benefits, which makes it slightly different from a traditional environmental issue concerning only mitigation. Since GB is meant for environmental governance, it is not surprising that the three types of instruments are all to some degree found to be useful in GB promotion.

Land use planning and building permits as command-and-control instruments can help to carry out GB (or renovations) that avail environmental benefits, meanwhile preventing building activities generating negative environmental impacts. [1536] In the US, the federal government uses planning to build up a more efficient transportation network. As land use planning is often a local matter, GB compliance appears to be more frequently required by local planning and zoning codes

[1536] See Chapter VI, Section 4.3.

to undertake green affordable housing programs. In China, the Environmental Protection Law 2014 draws redlines against building activities that would do harm to areas of ecological importance. Planning for GB renovations has been carried out to reach the targets laid down in the GB policies in China. Local governments in China tend to use planning to build demo GB communities. However, planning and zoning may be accused of violating private rights or takings.

Unlike planning serving the overall target, a building permit is often associated with performance standards for GB compliance at the individual level.[1537] In the US, building permits make use of industry-based standards (e.g. the LEED system) or government-made standards. However, concerns arise about rent-seeking and the delegation of regulatory power to private parties when the US regulators require private GB certifications in building permits. By contrast, building permits in China are mostly granted on the basis of the GBEL as a government-made certification. Yet in this way the government may miss the industry expertise on GB.

The GB laws also put in place market-based instruments, mainly including public procurement, subsidies, tax reductions, green loans, demand-based pricing for energy use, and liability for indoor air pollution or the redevelopment of brownfields. Those instruments weigh and work differently in GB promotion in the two countries.[1538]

Public procurement plays a big role in jump-starting GB in both countries, in the way of making GB compliance mandatory for public buildings. Public procurement is said to not only directly increase the uptake of GB, but also to stimulate private investment in GB technologies. However, public procurement can sometimes fall victim to venality, in which case bureaucrats as part of the government may choose non-green products to earn under-the-table commissions.

Setting aside the general concern about deadweight losses, creating a tax usually takes a long time in deference to the rule of law and may face a political backlash. Also taxation is more of a way to internalize harmful externalities in environmental governance. Perhaps on those accounts, the US government tends to provide tax reductions for certified GBs rather than imposing a new tax for the non-green. Taxation is not commonly used for GB promotion in China.

[1537] *Ibid.*
[1538] See Chapter VI, Section 4.2.

Subsidies can lower the higher first cost of GB, but they are generally not an ideal instrument for GB promotion. Apart from the high (administrative) costs, subsidy programs may face an additionality problem, especially when GB compliance is mandatory or becomes business-as-usual. Also subsidies may create perverse incentives and lead to a larger amount of emissions in total. In practice, subsidies are barely used in the US, and are more commonly-used in China for GB promotion. In the short run, it somewhat increases the demand for GB products, e.g. energy-efficient appliances. In the long run, the market cooled down as the subsidies were gone. Besides, the money flowing from the subsidy programs may be given to larger and often wealthier project developers than those of middle and smaller size, since the subsidies are calculated on the floor area of GB projects. If subsides were to overcome the higher first cost challenge, there might be a bigger incentive if given to the less wealthy green builders. The US government, by contrast, tends to finance GB projects through loans with favorable terms, as was the case with the Property Assessed Clean Energy (PACE) loans. A PACE loan debt is tied to properties and not to property owners. In this way, a property owner would be less likely to get stuck in the cost of installing energy efficient equipment, and the transaction costs are said to be lower. However, the alleged benefits with the PACE loans were not appreciated by the potential home buyers, and the PACE program also seems to go against the underwriting restrictions regulation.

Liability rules and property rules can also indirectly contribute to GB compliance.[1539] In the US, liability under the CERCLA and its amendments holds parties that own, transport, occupy or use facilities generating hazardous substances liable for (land) pollution. To crack the judgment proof problem, lenders are enlisted as potential responsible parties on the basis of vicarious liability. In China, for instance, liability rules and property rules interplay in the case of nuisance to properties in the vicinity, according to the Property Law of the PRC (2007). It can also be seen that in both jurisdictions indoor air quality has not gained as much attention as outdoor air quality in environmental regulation. Therefore, product liability becomes a way to address harm caused by hazardous substances from building materials. Despite the under-deterrence and the under-compensation problems, liability provides better information about private behavior, and makes it possible to compensate for atypical harm that has not been addressed in regulations, e.g. the sick-building syndrome caused by the synergy effect of widow settings and HVAC systems. However, liability in theory is better at dealing with harmful externalities,

[1539] Chapter VI, Section 4.2.

and hence may not work well for GB compliance regarding energy efficiency.

Suasive instruments increasingly come into the picture, as social norms and individual behavior are found important in pursuit of effectiveness. Compared to other types of instruments, persuasive instruments also have the advantage of lower administrative costs and can be effective in some cases. In theory persuasive instruments often go with information and persuasion to nudge voluntary compliance, and they can take the form of information disclosure, voluntary environmental agreements and model projects as environmental education.

In early practice, GB labeling was more commonly-used by the industry to inform consumers and provide market differentiation for green property owners, as was the case in the US. [1540] However, GB labeling in a self-regulatory form was accused of giving easy points to projects that are not so green. As governments get involved, GB labeling becomes more of a requirement in regulation, and less of a persuasive instrument, as with the LEED system in the US and with the GBEL in China.

Reporting insofar works more for achieving building energy efficiency. In both jurisdictions, reporting is a major way for regulators to establish databases to oversee building energy use.[1541] In the US, benchmarking and energy auditing are the major ways of reporting, and they differ in their costs and the impacts on end-users' energy use behavior. Through data from reporting, it is found that how GBs are operated can sometimes matter more than GB technologies such as an energy efficient HVAC system. This hints that information can also work as behavioral intervention at the individual level. The Opower program in the US thus provided building end-users with peer-comparison report and real-time information about their energy use, and it was indeed associated with energy savings.

Pilot GB projects and voluntary environmental compliance agreements seem to be less workable as suasive instruments. In China, demo GB communities have been there to educate and showcase the public the benefits of GB. However, the low occupancy rate may signal that the client demands for residential GBs can be low. In that case, the costs of GB technologies as well as the resources used in the building work may not pay off. This somewhat makes the GB communities ostensible to its environmental goal. Voluntary environmental agreements in theory may

[1540] See Chapter VI, Section 4.1
[1541] *Ibid.*

face a problem of free-ridership and be a shield to ward off more effective regulations. In practice, voluntary compliance agreements between industries and regulators on GB compliance can barely be seen in either jurisdiction. Only some voluntary environmental agreements between government agencies are found in the US.

It is not far from the truth to say that no instrument in isolation is sufficient for GB promotion, for which instrument mixes have been available to cancel out the problems of one another. In theory, an instrument mix can take various forms, e.g. command-and-control instruments plus liability, regulation with private certification, voluntary compliance agreement with financial incentives, and command-and-control with environmental information disclosure. Of those combinations, regulation with private certification is more common in the US, incorporating the LEED system or equivalents into land use planning or building permits. Regulation with liability can be seen in both jurisdictions for the redevelopment of brownfields in both jurisdictions.[1542] Despite the advantages expected in theory, those instrument mixes also have disadvantages in practice. For instance, the regulation and self-regulation mix may face claims against the delegation of regulatory power, and it is more prone to rent-seeking and lobbying. The regulation-liability mix can help to solve the judgment proof and information problem haunting liability and increase specific deterrence, yet in some way it compromises the general deterrence.

1.3.2 How the institutional frameworks affect GB

It is worth noting that the use of instruments should take into account institutional framework. The challenges facing GB promotion in the two countries are by and large alike: a higher first costs, split incentives, and the unawareness of stakeholders.[1543] Yet those challenges may have different impacts on GB in different countries, and accordingly the way in which the instrument (mix) works may differ. This could be a result of the co-evolution of the three factors: knowledge, demographics and institutional framework, of which the institutional framework is at the heart of the incentive structure for a novel change to happen.[1544]

In pursuit of GB compliance, the formal rules, prominently laws and policies, define the way in which operational, collective and constitutional decisions on GB compliance are made.[1545] The informal rules, such as social norms, also play a role in steering preferences and changing

[1542] See Chapter VI, Section 4.4.
[1543] See Chapter VI, Section 1.5.
[1544] See Chapter III, Section 2.3.
[1545] Ostrom (2005), *supra* note 112, at 56-59.

behavior. Those rules and players all affect the final outcomes of the instruments on many fronts.

First of all, laws and policies can help GB. The processes of GB in the two countries indicate that, by and large, the laws and policies can induce GB compliance on a large scale. In the US, it can be seen that the GB movement thrived as the US environmental law evolved. Particularly, the Obama administration stimulated the passage of the ARRA (2009), and signed EO 13514, which have lent great support to GB through public spending. In response to the federal legislation, the state and local governments also laid out regulations and policies for GB, using various instruments. The number of GBs has increased significantly as of 2009.[1546]

In China, the laws and policies seem to play a more significant role in GB promotion. The central policies for energy building efficiency have helped to boost the GB market on different levels. The 11th Five Year Plan for GB led the Chinese government to invest in energy efficiency renovations. The 11th and 12th Five Year plan also set targets and availed public spending on building energy efficiency retrofitting, in response to which the local governments also provide financial incentives for green pilot projects. As a result, the GB compliance rate increased significantly to more 90% in the new buildings; and the policies for building energy efficiency to some degree increase the client demands for energy-efficient HVAC systems. Besides, the amount of retrofitted floor-space exceeded the policy target by 20%.[1547]

It goes beyond this study to show the causality between the instruments and GB growth in both jurisdictions. No instrument can be effective or efficient in an abstract way. Empirics are needed to see whether or not a particular instrument can work in a specific context. For instance, a survey has shown that environmental regulations are viewed as one of the top triggers of GB activities in the two jurisdictions over the past decades.[1548] The CBRE likewise suggested in its report that GB grew as a result of government policies and energy benchmarking legislation in several cities and the State of California.[1549] Municipal regulatory policies have been found to have significant impacts on GB compliance in the office buildings in American central cities.[1550] A relationship between the

[1546] Chapter IV, Section 1.3.
[1547] Chapter V, Section 1.4.
[1548] Chapter VI, Section 1.4.
[1549] Chapter IV, Section 1.3.
[1550] Chapter IV, Section 5.3

adoption of government GB procurement policies and the number of LEED-certified private building can also be seen.[1551]

Secondly, law as part of the institutional framework is able to oversee power and affect incentives for GB. Law on the one hand can put checks on the regulatory power, for which the incorporation of private standards into regulations will sometime be challenged by legal doctrines. For instance, the non-delegation doctrine in the US case law could be one of the reasons why local regulators usually incorporate standards like the LEED, meanwhile retaining the power to change and enforce. On the other hand, law may affect the incentive structure through the assignment of property rights and liability rules. This could be seen particularly in the case of brownfield reclamation. For instance, the Brownfield Rule 2017 in China focuses more on brownfields left in the public domain, which could be a result of the state property regime in China. The state property regime states that all the land in the urban areas belongs to the People at large; private parties can only have a right to use. In this way, private parties may have fewer incentives to sue or to cleanup. The Brownfield Rule 2017 therefore requires the central government to spot brownfields; in the meantime, the Brownfield Rule 2017 holds potential land users, e.g. a developer who intends to build a project on a brownfield site, liable for cleaning up the brownfield. If no land user can be found, the government should be responsible for the cleanup. Also the liability rules under the CERCLA in the US, which also aims for brownfield cleanups, were changed over time and hence to some degree affected the activity/care levels of listed responsible parties like lenders.

Lastly, informal rules, prominently social norms may also nudge voluntary GB compliance. In a broader sense, consumers' choices for green products or environmental compliance can be a result of social norms and intrinsic motivations. As noted before, public awareness is no longer a big problem in GB promotion in the US, which may be one of the reasons why informational instruments have played a good part for GB compliance at individual level. The Opower program in the US has been providing end-users with peer-comparison information about their energy use, which to some extent improve energy use behavior. By contrast, lack of awareness of stakeholders is one of the biggest challenges facing GB compliance in China, and GBs are oftentimes taken as high-end projects that will lead to extra costs. As a result, private parties may not well appreciate the idea of GB and hence may not have preferences for GB products. This could be

[1551] Chapter IV, Section 4.3.2.

part of the reason for which the Chinese government put many efforts into demo GBs and subsidies to jump-start GB.

As institutional frameworks matter, it might not be true to say that the bottom-up way in the US arguably scores better than the 'top-down' one in China, as both ways may work. Neither would it be true that regulation weighs more than self-regulation and liability in GB promotion, or *vice versa*. In other words, instrument mixes should run in a context-based manner.

1.3.3 Choice of instrument mixes in the different political orders

The political structures and social orders may lead the two countries to go different ways to promote GB.[1552] The US has a federal system that allows the states and localities to have the discretion and power to make and enforce rules. Also, the US society has robust open-access orders, with different self-regulatory agencies watching and competing with each other. This could partly explain why the GB movement in the US evolved in a bottom-up way. For instance, it started by virtue of the efforts from self-regulatory agencies, e.g. the USGBC and some environmental interest groups that backed up the USGBC in its infancy.

By contrast, China has a more centralized political system. At the point the GB movement started, the Chinese civic society was not that open and robust, and so was the GB industry. It was the central government in China who made the GB rating system (GBEL) and jumped-start GB compliance by using different instruments at the beginning. Meanwhile in the industry, no self-regulatory agency was around for GB promotion, neither was there a widely-used industry-based GB standard. Instead, most of the GB regulations in China referring to the government-made standards. Yet over time, the industry-based standards, e.g. the LEED, are having a place for commercial GBs and some local GB financing programs.

Although both countries go for instrument mixes in GB, the ways in which instruments are mixed may imply the specific nature of policy mixes work in democracies versus those work in a more centralized setting. For instance, in a democracy, self-regulatory agencies, e.g., professional associations or environmental groups, are more active in the lawmaking for environmental governance. As a result, GB promotion may go for a mix of regulation and self-regulation. The mix, however, may lead to concerns about the delegation of regulatory power to private parties. By contrast, in a centralized setting, GB promotion appears to be top-down, with governments taking the lead. While the building industry barely took

[1552] See Chapter VI, Section 2.1

part in the making of GB regulations, in which case lobbying and rent-seeking seem to be less of a concern.

Also, in a democratic setting, instrument mixes encourage more efforts by private parties in early times. This could partly explain why instrument mixes in the US law use green loans and informational programs at the individual level. While in a centralized setting, instrument mixes may rely more on the governments' initiatives. It can be seen that subsidies and planning for demo GB communities are the major instruments to jump-start GB in China. Informational instruments like reporting and labeling are more for the governments to oversee GB compliance; persuasion and information at the individual level have not been widely used for GB in China. The difference can also be reflected in the regulation-liability mix for brownfield redevelopment. The SEP program in the US makes use of private information through liability to detect harm and requires injurers to actually engage in brownfield reclamation. In the case of Brownfield Rule 2017 in China, the governments are the main parties to detect the contaminated land and do the cleanups if no injurer can be found. The law tends to hold more private building stakeholders such as land users liable for the damages. In that sense, the mix in the Chinese law may deals more with the under-compensation problem with brownfield reclamation.

Furthermore, by and large, instrument mixes in democracies focus more on the market initially, and hence the choice of instruments (mixes) may take into account the adaptive efficiency in the long run. In a centralized setting, the choice of instrument mixes may emphasize the role of regulation in the beginning, and hence place more value on the effectiveness. It can be seen that the Chinese governments tend to use planning for demo GB communities to increase the level of GB compliance. Consequently, GB grew fast in the suburban areas in China, but some of the GB communities became ghost cities with a lower occupancy rate. It is hard to tell whether or not the demo GBs are an improvement in terms of the total environmental impacts reduction, and whether or not the government-guaranteed demand for GB can make the GB market thrive in the long run. It should be noted that this is just an intuitive guess about the goals of instrument mixes in the two countries; the argument may not always hold for a specific instrument working in context.

1.4 Instrument mixes for GB and the possible ways to mix

As noted before, the use of instruments (mixes) should take into account the institutional frameworks, and the 'smartness' of the instruments (mixes) can be measured in multiple ways. There are tools to tell whether or not a

specific instrument mix can be smart in terms of cost-effectiveness, efficiency, or in other multi-criteria terms.[1553] Yet given the methodology used, this study is not able to tell whether or not a specific instrument mix is 'smart' in the different terms.

In this study, instrument mixes are taken as a means to GB compliance. An instrument mix can be smart if it is likely to (1) provide stakeholders with incentives for GB compliance and performance, and (2) cancel out problems of the instruments. As far as this framework study is concerned, some general findings can be drawn to make an instrument mix, based on the theory and GB practice in the two countries.

First of all, the government tends to enlist the industry in GB standard setting.[1554] In this way, the government is able to make use of the industry expertise; in the meantime, the government may provide more oversight on those self-regulatory agencies, lest they will water down GB standards. But the government should not overly delegate their regulatory power to the industry, in deference to the rule of law. Equally important, the government needs to find a way to reason or deal with rent-creation and government-run monopolies. Moreover, the government should also be aware of the costs of mixing regulation and self-regulation. The mix may take different forms, not all of which necessarily lead to a lower administrative cost and a lower information cost at the same time.[1555] On account of the three points, a general way to GB standard setting is to incorporate the industry-based standards into GB regulations, meanwhile giving some oversight on the change and the enforcement of standards. In a word, GB standard setting can lend itself to co-regulation.

Second, informational instruments can be used to stimulate voluntary GB compliance. Information and persuasion can be relatively cheap,[1556] and they may help to shape social norms and crowds in intrinsic motivations to comply. The idea behind is that different stakeholders may have different motivations to comply, e.g. economic or situational rationality, habits, a sense of law-abidingness or reputation.[1557] Some of those motivations indicate that stakeholders do not react only to price, but also upon what the community at large prefers. Laws and policies as informational rules can thus on the one hand steer preference for GB

[1553] See, e.g., Ogus (1994), *supra* note 180, at 24-25; Greco, S., and Munda, G., 'Multiple Criteria Evaluation in Environmental Policy Analysis', In Spash, C. L. (ed.), *Handbook of Ecological Economics, Nature and Society* (Routledge, 2017), pp.311-320.
[1554] See Chapter VI, Section 3.3
[1555] See Chapter III, Section 5.3; Ayres and Braithwaite (1992), *supra* note 244, at 110-120.
[1556] Ayres and Braithwaite (1992), *supra* note 244, at 26.
[1557] See Chapter III, Section 3.3.

compliance. On the other hand, public agencies can work with private parties to put in place information program working as behavioral interventions. As with the Opower program in the US, real-time information or peer-comparison information about energy use is likely to change energy use behavior.

Third, regulation and liability can go hand-in-hand to deal with harmful externalities in relation to GB compliance. Liability is likely to play a part, as GB compliance goes beyond building energy efficiency, taking into account indoor air pollution and brownfield reclamation. As far as brownfield reclamation is concerned, regulation can on the one side make use of private information to spot harm; on the other side, the government can get parties other than the actual injurers involved to pay the cleanups. It can be seen that the environmental regulators in the US and China tend to enlist land users, or parties as interest holders in building projects (e.g. lenders), to pay the damages.[1558] With regard to indoor air quality, regulations alone may not work for building-related sickness as a result of unregulated pollutants. For instance, product liability for building material manufacturers has become a way to deal with poor indoor air quality. Usually product liability goes with a strict liability rule.[1559] Yet in the case of GB compliance, the use of liability should be more aware of multi-tortfeasors scenarios. The poor indoor air quality can be a result of synergy effects, which implies that not only the manufacturers, but also the architects, the contractors and the end-users of buildings can all play a role.[1560] In that case, manufacturers may not necessarily be the ones possessing better information. Too strict a liability for the manufacturers may not give the architects or end-users incentives to take due care, and may lead to chilling effects on GB technology innovation.

2. Recommendations for GB promotion

2.1 Green public procurement to jump-start GB; mandatory GB compliance in government buildings

Public procurement can help to jump-start GB on a large scale. In theory public procurement can directly contribute to the quantity demanded. Over the long term, public procurement can help to showcase the benefits of GB and may encourage professionals to invest more in GB technology. In this way, public procurement might indirectly change the market demand for GB.[1561] In practice, public procurement has been used in both

[1558] See Chapter VI, Section 4.4.
[1559] See Chapter IV, Section 4.3.4; Chapter V, Section 4.3.4.
[1560] See, e.g., Rogers v. Keller Martin Organization, in Chapter IV, Section 4.3.4.
[1561] See in general Chapter III, Section 6.3.4; Chapter IV, Section 4.3.2; Chapter V, Section 4.3.3

countries studied, where public buildings account for a large part of the existing GBs, as GB compliance is going mandatory for government buildings. Apart from mandates for public agencies, the governments also put in place residential GBs, either in a way of green affordable housing or model GBs. It is then suggested that public procurement can be widely used when the uptake of GB is low, and when there are not so many private parties devoted to GB. Public procurement can be achieved through GB mandates for all the government buildings. A general point is that, public procurement is meant to jump-start and encourage GB innovations, and not to crowd out private investments. In that sense, public procurement should not be overly engaged in residential or commercial GB projects. In the service of green public procurement, governments might use performance standards that better encourage innovation, rather than pinning down specific products or companies as criteria. Moreover, public procurement for GB is suggested to be part of the performance appraisal for bureaucrats in charge, as public procurement is prone to venal behavior, and those bureaucrats may pull out if the standard for public procurement is too high and compliance is too costly.

2.2 GB regulations can make use of industry-based standards

The pros and cons concerning regulation and self-regulation in theory signal co-regulation in GB standard setting. The US GB law mostly refers to the LEED system as a requirement. China GB regulations so far still rely largely on the government-made standard such as the GBEL. But it is noteworthy that private parties in China have begun to go for the LEED certification for the purpose of CSRs and a good public image. GB practice in both countries hints that governments should not shut its eyes to private GB standards.

To incorporate the industry-based standards into GB regulations, governments need on the one hand to properly delegate their regulatory power to the industry. It is suggested that GB regulations can refer to the industry-based standards, e.g. to require a private certification in the issuance of building permits. In the meantime, regulators need to take control over the change and the enforcement of the standards, lest the regulatory power will be overly delegated to private parties without a due process. For instance, GB regulations and codes can articulate a specific version of the LEED standard as an appendix, rather than referring to the LEED standard being changed over time by the USGBC. Alternatively,

regulators might require that the industry rating system incorporated should be analyzed and evaluated by the Capital Development Board.[1562]

On the other hand, governments should be aware of rent-seeking and monopolies as a result of using private standards. Competition may help to erode rents, and to reduce entry barriers on more efficient GB standards.[1563] It is then suggested that governments can have different GB professional associations to compete with each other for the supply of GB certifications; in the meantime, GB regulations may refer to more than one industry-based GB standards on the market.

2.3 Co-regulation in information programs as behavioral intervention

It is suggested that governments may choose informational instruments over voluntary environmental agreements (VEA), in pursuit of more efficient energy use at individual levels. As noted in the theory, information and persuasion can be cheap and workable. The VEA might be less effective as it is often subject to free-ridership and generality, and be misused to ward off desirable regulation.[1564]

Apart from labeling that has been widely used for GB products, reporting can also be a way for the government to oversee energy use in individual buildings. There are two basic ways to report, namely benchmarking and energy auditing.[1565] Both ways can work to collect data, but benchmarking may be more preferable. It is viewed that benchmarking is able to provide performance-based information at a lower cost, and will not reveal details about property ownership or proprietary information about specific GB technologies.

More importantly, the government may carry out informational programs to nudge end-users to use energy more efficiently. Individual behavior can also have impacts on how the instruments can be played out in the end, and social norms and persuasion are likely to crowd in intrinsic motivations to go green. In practice, the Opower program also hints that information can nudge voluntary compliance. Government can work with self-regulators running data platforms, e.g. the ARC run by the USGBC, who can have better information about GB performance than the government. The data can be used to put in place programs that provide end-users with real-time information and/or peer-comparison information about energy use and indoor air quality. The information can be given by

[1562] See, e.g., 20 ILCS 3130/1, sec. 15 (g).
[1563] See Chapter III, Section 5.3.
[1564] *Id.*, Section 6.4.2.
[1565] See Chapter VI, Section 4.1.

monthly reports or by on-phone updates. For the behavior change to last, the intervention program should run over a certain period, preferably more than 1 year.[1566] In the meantime, studies could be done to keep track on programs running in different jurisdictions, so that the government can know whether or not the informational instrument can work and what improvements can be made.

2.4 Land use for new GBs should be well-planned; GB renovations should also be encouraged

As opposed to building permits for GB compliance at the individual level, planning lays out how many GBs are needed in total and where those GBs should or should not be located. In that sense, GB planners should not be improvisers, and should take into account the overall picture of land use. It may lead to a waste of the land if new GBs are built more than necessary. It can be seen that demo GBs are blooming in China not only as a result of planning and zoning, but also as an educational tool to showcase GB benefits to the public. However, those GB demo communities are mostly built in the suburban areas, where the infrastructure is not in good shape. As a result, the demo GB communities became ghost cities with only a few residents. In that case, the best available GB technologies used there would remain idle and can hardly pay off.[1567] The ostensible demo GB projects show that simply going for new GBs may not live up to the idea that GB is not meant to build more but to build green.

It is then suggested that local GB planning needs to take into account the overall targets, and also take into account GB renovations. GB standard setting might in some cases apply a grandfather clause that exempts existing buildings from GB compliance. For instance, the GB standards in China have more to say about GB compliance in the new buildings, but less about GB renovations in the old buildings. This could in part explains why GB compliance rate is high in the new buildings, but the total number of GBs still accounts for a minimal part in China overall. Governments should be aware that the grandfather clause is likely to create entry barriers, and allows out-of-date technologies or standards to continue to work,[1568] which may not encourage innovations for GB compliance.

2.5 Building permits with administrative incentives for new GBs

Building permits can be desirable for new GBs. GB compliance regarding site selection can only be achieved at the outset. The above section shows

[1566] See Chapter IV, section 4.4.2.
[1567] *Ibid*.
[1568] See Chapter III, Section 6.1.2.

that large GB projects need to be built in line with the overall city planning. Building permits are often combined with land use planning and zoning and hence can keep building activities away from the protected ecosystems or historic sites.

Also, building permits may help to achieve GB concerning the redevelopment of brownfields. As the laws tend to enlist land users for more efficient resource use,[1569] building permits or the entitlements to use can be given on the condition that the potential land user will clean up the contaminated land. In relation to the brownfield remedies, building permits can also be a tool to prevent health risks resulting from the brownfield, given the fact that liability is ex post and not well-suited to address irreversible harm.[1570]

Moreover, if a new building has to be built, it is likely to be cheaper to make it green at the beginning than to retrofit at the post-occupancy stage. This could be the case for the replacement of energy-efficient HVAC systems. Although permitting is usually viewed as a command-and-control instrument, regulators may consider providing expedited permits as an administrative incentive for GB compliance.[1571] Building activities are mostly subject to regulation, in which case the developers have to apply for building permits anyway. But the application and issuance of building permits may be cumbersome, and delays often lead to more significant risks and higher costs that developers would rather avoid. An expedited permit thus may have a significant impact on GB development.[1572]

2.6 Green loans for new private GBs; subsidies for GB renovations in residential buildings

Apart from administrative incentives, financial incentives like subsidies and green loans can help to lower the higher first cost of GB. Setting aside the high costs of those subsidy programs, governments should be aware of the incomplete information about the desirable level of intervention. Too many subsidies can lead to the additionality concern about the subsidy program and make the GB market overly rely on government spending. Moreover, subsidies are likely to create perverse incentives for too many GB projects to come, which will lead to an increase in the total environmental impacts in the building sector.

[1569] See, e.g., Chapter V, Section 4.5.
[1570] See Chapter III, Section 5.2
[1571] See, e.g., Chapter IV, Section 4.3.
[1572] Choi (2010), *supra* note 452, at 18.

Therefore, it is suggested that, on the one hand, governments may enlist lenders such as banks to provide GB projects with loans at a lower interest rate. As market and client demands become more important in GB promotion, [1573] green loans may play a role to encourage private investment in GB. Subsidies, on the other hand, can be provided for the GB retrofitting of residential buildings. In the case of retro-fitting, governments can to some degree observe the level of GB compliance in the existing buildings, especially in jurisdictions where GB compliance rate is low in the existing buildings. Also, subsidies for GB renovations may not attract too many new large-scale GBs. Subsidies for green residential buildings can be given to the end-users to carry out small renovations for energy efficiency or water efficiency, or to purchase GB products such as energy-efficient air-conditioners.

2.7 Liability as a complement to regulation for indoor air quality and brownfield remedies

Liability and the property regime are said to provide different incentives for compliance, and they can also have some implications in environmental governance. [1574] In the case of GB compliance, the liability rules may help to deter and compensate harm as a result of land pollution and indoor air quality, as liability may work better to address harmful externalities. In the absence of laws and regulations for indoor air quality, product liability can be a way to deal with building-related sickness as a result of hazardous substances released by building materials.

Liability can also work for the redevelopment of brownfields, in tandem with land use planning. Governments, environmental interest groups and individuals, can spot land pollution activities by means of litigation or reporting. The reclamation work is assigned to parties on account of their entitlements to the land. For instance, the law may require building project developers to clean up a brownfield site before using it;[1575] or may put land users to the fore.[1576] If there is no private party found, the regulator will in the first place do the clean-ups and then seek compensation whenever a liable party is detected. In this way, regulation and liability may cancel out each other's problems.[1577]

Apart from the land entitlement holders, law may hold lenders of a building project liable for the cleanups. The idea of lender liability is to

[1573] See Chapter V, Section 1.1
[1574] See Chapter III, Section 3.1, 5.2 & 6.3.3.
[1575] See Chapter V, Section 4.5.
[1576] See MEP (2017), Brownfield Rule 2017, *supra* note 1407, Article 10.
[1577] See Chapter III, Section 5.1, 5.2 & 6.5.1; Chapter IV, Section 4.5.1; Chapter 4, Section 4.5

give lenders as gatekeepers the incentive to oversee GB compliance with the projects at the pre-occupancy state, or during the foreclosure as a mortgagee. In the meantime, holding lenders liable can in a way ease the judgment proof problem that often plagues brownfield remedies. The US case has shown that a full lender liability or a too broad lender liability may lead to more accidents, which can partly result from lenders' insufficient oversight over borrowers' behavior and from parties being less incentivized to take enough care. Therefore, the lender liability here should not be so strict that it would lead to more accidents or even scare off lenders.[1578] For instance, the lender liability regime can, on the one hand, apply a strict liability applied to those who actually participate in the daily management of a borrower (the developers) and have a say in the borrower's decision on wastes disposal or other activities causing harm. In that case, the lender is jointly liable for the harm with the borrowers, analogous to environmental tort cases where more than one injurer is found. On the other hand, a negligence rule can be applied to lenders who do not participate in the actual daily management but giver a minimum level of supervision as they have secured interests in the property. In this case, the lender is taken as a supervisor and bear secondary liability. It goes beyond this section to sketch out the lender liability in China at length, but a general idea is to put forward the lender liability as a way for the Rules to learn from the liability regime.

The property regime can be used to deal with nuisance, e.g. noise or hazardous odor.[1579] This could to some extent help GB compliance in properties in the vicinity.[1580] Yet it is noteworthy that the nuisance law in theory cares more about Pareto-relevant externalities, which indicates that property entitlements holders should have a certain degree of tolerance towards each other.[1581] In that sense, courts may refuse to compensate victims when the harm largely results from the hypersensitivity of the plaintiff.[1582] Also the nuisance law should take into account how property rights change over time, and weigh benefits against losses to choose between damages (the liability rules) and injunctive remedies (the property rules). The two types of remedies can be equally desirable in a world without imperfect information, high transaction costs and parties preying on each other. However, the ideals may not exist. Generally, as far as the efficient use of resources is concerned, damages as a remedy would be better if the parties act strategically and the court knows the

[1578] See Chapter IV, Section 4.3.4.
[1579] See e.g., Chapter V, Section 4.3.4.
[1580] See Chapter III, Section 6.3.3.
[1581] See W. D. Manson (1985), *supra* note 338, at 193-194; Chapter III, Section 6.3.3
[1582] *Ibid.*

victim's damages but not the injurer's benefits. By contrast, if the court does not have enough information about both damages and benefits, then the injunctive remedy will do.[1583]

3. Limitations

It should be noted that the conclusions and recommendations in this study may hold conditionally, on account of the following limitations of the study.

First of all, the study was not able to address all the GB elements. GB performance is said to be holistic, including a wide range of elements regarding environmental impacts reduction and resource use. In this study, the meaning of GB is narrowed down to the four elements: energy use, land use, indoor air quality and construction/demolition waste disposal. Therefore, the instruments examined, and the conclusions and recommendations for the use of the instruments, may deal more with the four elements as well as with GB as a whole. The four elements are selected because they are the most commonly-evaluated elements. Moreover, GB by nature deals with both positive and negative environmental impacts, regardless of the specific elements concerned. The four selected GB elements, though limited in scope, seem to relate to both positive and negative externalities.

Second, the study only investigated GB compliance in the US and China. In the light of the research method, the study looks into GB laws and policies in the two countries, as positive analyses on instruments at work for GB compliance. The study, however, did not look into GB promotion in other jurisdictions such as Europe, Canada and Australia, where GB is also promising with multiple instruments. As was shown in the theoretical chapter, institutional framework matters to any novel change like GB. The very limited number of country studies implies that the conclusions and recommendations may be short of generality. To achieve more generality, the study then selected two countries that differ a lot in terms of the institutional backgrounds. Though GB promotion evolved differently in the two countries, the ways in which instruments are used for GB promotion show some convergences.[1584] Besides, the study also spelled out a theoretical framework, drawing on the law and economics theories about regulation, liability and self-regulation. Those theories are context-free and hence provide some general insights into the use of instruments.

[1583] See Chapter III, Section 6.3.3.
[1584] See Chapter VI, Section 5.

Lastly, the study is not able to attest the empirical evidence used to evaluate instruments. In the country studies, it draws on the findings of some empirical works to show how well a certain (type) of instrument may work in certain circumstances. However, the empirical works quoted come in a very limited number, and they may not precisely examine GB compliance as a whole. Most of the empirical works are on the effectiveness or efficiency of one instrument for one GB element, e.g. real-time information as behavioral intervention to improve building energy efficiency. Equally important, the study did not further check the methodologies nor the validity and reliability of data used in those empirical works. Therefore, some arguments based on the empirical information might be biased.

Final conclusion

GB is said to score better in energy use, land use, indoor air quality and C/D waste treatment. GB should be a way to make the environment better off, and not lead to an overall increase of emissions. There are challenges facing GB, which can boil down to a matter of incentives and preferences. The law as part of the institutional framework is at the heart of the incentive structure; in the meantime, law can steer preferences and put checks on the use of regulatory power for GB promotion.

In theory, the command-control, the market-based and the persuasive instruments can work for GB compliance. However, none of the instruments in isolation may suffice to induce the desirable level of GB activities. This could be a result of the failures with regulation, liability or self-regulation, which can be seen in each of the specific instruments at work for GB compliance.

The instruments pictured in the theory have featured in GB practice in the US and China. Though the institutional frameworks are shaped differently in the two countries, the ways in which instruments are used for GB converge to co-regulation, or to instrument mixes in a broader sense. The conclusions of this study indicate some general ways in which the different instruments can be used to promote GB. Firstly, governments may jump-start GB through public procurements. Second, green loans other than subsidies can be a way to finance new private GB projects; while subsidies may encourage the end-users of buildings to carry out small renovations or buy energy-efficient building products. Third, government can enlist self-regulatory agencies, incorporating the industry-based GB standards into regulations. Forth, information can be behavioral intervention to reap building energy efficiency at individual level, as persuasion is cheap and may better intrigue intrinsic motivations. Fifth, land use for new GBs should be well-planned; and renovations in existing buildings may have a green potential, particularly in jurisdictions that are (overly) urbanized. Sixth, building permits with administrative incentives can have significant impacts on GB compliance. Lastly, liability can be a complement to regulation for GB compliance in relation to indoor air quality and brownfield redevelopment.

Apart from the specific recommendations on instrument mixes, the study may also offer some general insights into GB as a novel change. GB in the first place is a social dilemma that cannot simply be solved by the market. GB provides private parties with energy savings and healthier neighborhoods, for which individual consumers may go for GB. Yet

individuals may not have sufficient information about GB and there is a problem of split incentives among individual parties, which may lead to self-regulation as a more collective approach to GB. Professional associations such as the USGBC may create GB standards and certifications to not only improve the sustainability of the building industry as a whole, but also to profit from GB projects.

However, GB at large provides social benefits in terms of environmental protection, which may not be fully reflected in private decision making, as a result of incomplete/imperfect information, externalities or path-dependency. Therefore, a more centralized approach through institutional changes is necessary for a social change like GB. But the institutional changes may not happen spontaneously to deal with the problems, which hints at government's role in GB promotion. In fact, government intervention can in a way be powerful and effective in increasing GB in the short run, as has been the case for GB in China. China has a relatively centralistic and perhaps paternalistic way of governing, which in itself is not good or bad to deal with a social dilemma. It can be seen that in the case of GB, it is the central government, rather than industry, that makes GB not only survive but also thrive in China.

Then the question arises as to how and to what extent government should intervene in GB. A general observation from this study is that government intervention might be better off by stimulating rather than merely mandating the GB market. The idea of GB can be associated with both negative and positive externalities, which may hint at the use of instrument mixes. In general, positive externalities lay the ground for regulation; while liability is said to deal with harmful externalities. Moreover, information and persuasion can help to nudge compliance at an individual level, as informal rules like social norms become a consideration in policy implementation. On the other hand, GB should be taken as an incremental process, in which government intervention may go for different instruments at different points in time. Regulation should be cautious and moderate, and losses hurt more than gains feel good. GB in early times can be new and uncertain, and governments tend to use public procurements for a wider uptake of GB, meanwhile giving financial incentives to private parties for GB. When GB becomes cheaper and the benefits are more visible, mandates may come in to push private parties to comply.

The need for changes to institutional arrangements and the role of governments signal the important role of law. In GB promotion, law is more of a system of incentives to induce desirable activities. For private

parties, law may not simply mandate GB by putting specific deterrence on harm-producing building activities, but tends to create financial incentives or disincentives. Furthermore, law as part of the institutional framework determines how operational, collective or constitutional decisions are made. In this way, law is able to make government act in the public interest and steer preferences by collective decision making. This could partly be reflected in the laws mandating GB compliance in public procurement or planning. When the public policy shows the way, private parties may be more likely to invest in GB. Lastly, the rule of law avails oversight on GB, which becomes more important as GB involves both public and private parties. Law may keep an eye on the misuse of regulatory power, which appears to be important when regulation lends itself to the industry, or in cases where GB planning may lead to takings against property rights.

GB is said to benefit individuals and society, and it is increasingly coming into the picture of climate change adaption. This positive study on GB is therefore of social relevance. The study not only provides a bird's eye view on the incremental process and causes of GB as a novel change to the society; but also spells out the different approaches to GB and the advantages and disadvantages of one another. The study is partly based on the GB laws and empirical evidence in the US and China, but the conclusions and recommendations here may also be relevant to policy makers who want to promote GB in other jurisdictions. This is because on the one hand a convergence to the use of instrument mixes in GB can be reasoned and found in both jurisdictions, regardless of the divergences in the different institutional frameworks. On the other hand, those conclusions and recommendations are also drawn in the light of a more general theoretical framework, using insights from the environmental law and economics.

Besides, the theoretical framework by itself may contribute to the existing body of environmental law research and hence show some academic relevance. It provides an overview of the shapes of GB laws in the US and China, which may be a reference for further research about GB. This study can also be an addition to the market versus government debate in environmental governance, or in a broader sense to the literature on smart mixes. GB is not all about dealing with harmful externalities emphasized in a traditional environmental law; instead, GB is also about generating benefits to society. In that sense, the debate on a market versus government approach seems to be more balanced, and more instruments (mixes) can be seen played out for GB. By taking into account the different aspects of GB, the study may provide a more thorough analytical framework for environmental law research. The theoretical framework starts with the idea

that law on the one hand is an incentive system for environmental compliance and for more objective goals like cost-effectiveness in the use of instruments. On the other hand, law may help to steer preferences and nudge voluntary compliance by persuasion. This general idea not only shows that law matters in environmental governance, but also implies that environmental law is not meant to pursue environmentalism at all costs. Then the framework deals with standard setting as a doorway to compliance, as well as the pros and cons of the instruments (mixes) for compliance, from a comparative law and economic perspective. In this way, the framework not only describes the instruments available, but also explains why some instruments or rules are better means to certain environmental ends.

Given the limitations of this study, future research on GB can deal more with the legal rules and instruments for GB in other jurisdictions such as Canada, Australia, the EU, or the UK. Second, more empirical research can be done to test the effectiveness or efficiency of the different instruments to promote GB. Particularly, it would be interesting to have more empirical evidence to show how information or persuasion as behavioral intervention can actually change building energy performance by end users. Third, more instruments (mixes) for GB should be investigated, given the broader meaning of GB. With particular interest in the role of self-regulation in GB, future research may come up with more ways of co-regulation, apart from regulations incorporating the industry-based certifications.

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Summary

GB is said to score better in terms of resource use and environmental impacts reduction, and hence has come into the picture of policymaking for climate change adaptation. Apart from making the environment better off, GB also provides end-users with energy bill savings and a healthier indoor environment, and it is viewed as a long-term business opportunity for building professionals. However, the level of GB activities might not be enough due to the challenges ahead, which can come down to a matter of incentives and preferences. Law as part of the institutional framework can provide parties with incentives and steer preferences for GB. For the time being various legal and policy instruments are working for GB promotion, which may differ in their costs and in the impacts on GB.

This study aims to answer why instruments should be mixed to promote GB and how. The study includes a theoretical framework and two country studies on GB compliance in the US and China, using insights from comparative law and economics. The theoretical framework reasons the need for instrument mixes and spells out the advantages and the disadvantages of the different instruments (mixes) for GB on an abstract level. In light of the theoretical framework, a comparative study is conducted to analyze GB compliance in the US and China. Each of the country studies starts with a historical look at the GB movement, and then describes the shape of GB laws and the instruments laid down in the laws. Instruments (mixes) available are evaluated on the basis of the pros and cons predicted in the theory as well as of some empirical evidence to show how effective the instruments can be in reality.

The study concludes that regulation, liability or self-regulation on its own may not suffice to induce the desirable level of GB activities. This could be a result of the failures around regulation, liability or self-regulation, which can be seen in each of the specific instruments at work for GB compliance. The instruments pictured in the theory have been around in GB practice in the US and in China. Though the institutional frameworks are shaped differently in the two countries, the ways in which instruments are used for GB converge to co-regulation, or to instrument mixes in a broader sense.

The conclusions of this study indicate some general ways in which the different instruments can be used to promote GB. Firstly, government may jump-start GB through public procurements. Second, green loans other than subsidies can be a way to finance private GB projects. Third, government can enlist self-regulatory agencies, in a way of incorporating

the industry-based GB standards into regulations. Forth, information can be a behavioral intervention to reap building energy efficiency at individual level, as persuasion is cheap and may better stimulate intrinsic motivations. Fifth, land use for new GBs should be well-planned; and renovations in existing buildings may have a bigger green potential than new buildings, particularly in jurisdictions that are (overly) urbanized. Lastly, liability can be a complement to regulation for GB compliance in relation to indoor air quality and brownfield redevelopment.

Apart from the policy recommendations, the study also avails some general insights into GB as a novel change. GB in the first place is a social dilemma that cannot simply be solved by the market. GB to a large extent avails social benefits in terms of environmental protection. Those benefits may not be fully reflected in private decision making, on account of incomplete/imperfect information, externalities or path-dependency. Therefore, a more centralized approach through institutional changes is necessary. But the institutional changes may not happen spontaneously to deal with the problems, which hints at government's role in GB promotion. A general observation from this study is that government intervention might be better off by stimulating rather than merely mandating the GB market.

As GB involves both public and private parties, law becomes increasingly important to not only incentivize but also oversee GB promotion. In pursuit of GB compliance, law is more of a system of incentives to induce desirable activities. For private parties, law may not simply mandate GB by putting specific deterrence on harm-producing building activities, but tends to create financial incentives or disincentives. Furthermore, law as part of the institutional framework determines how operational, collective or constitutional decisions are made. In this way, law is able to make government act in the public interest and steer preferences by collective decision making. This could partly be reflected in the laws mandating GB compliance in public procurement or planning. When the public policy shows the way, private parties may be more likely to invest in GB. Lastly, the rule of law avails oversight on GB, which becomes more important as GB involves both public and private parties. Law may keep an eye on the misuse of regulatory power, which appears to be important when regulation lends itself to the industry, or in cases where GB planning may lead to takings against property rights.

Samenvatting

Duurzaam bouwen zou beter scoren wat betreft het gebruik van natuurlijke hulpbronnen en de beperking van milieuverstoring en is daarom onder meer in beeld gekomen bij het beleid op het gebied van klimaatverandering. Afgezien van het feit dat het beter is voor het milieu, biedt duurzaam bouwen eindgebruikers ook besparingen op hun energierekening en een gezonder leefklimaat binnenshuis en wordt het gezien als een lange termijn opportuniteit voor professionals in de bouw. Maar de activiteiten op het gebied van duurzaam bouwen kunnen tekort schieten vanwege verscheidene problemen, die gerelateerd kunnen zijn aan een gebrek aan stimuleringsmaatregelen maar ook aan de preferenties van de bouwer. Het recht als onderdeel van het institutionele raamwerk kan partijen stimuleren en preferenties voor duurzaam bouwen aansturen. Er zijn verschillende juridische instrumenten en beleidsinstrumenten die duurzaam bouwen aanmoedigen en die uiteen kunnen lopen qua kosten en de impact op duurzaam bouwen.

Dit onderzoek wil antwoord geven op de vraag waarom er een mix van instrumenten moet worden gebruikt om duurzaam bouwen te stimuleren en op welke wijze die mix gestalte dient te krijgen. Het onderzoek omvat een theoretisch kader en twee landonderzoeken over duurzaam bouwen in de VS en China, waarin inzichten worden gebruikt uit de vergelijkende rechtseconomie. Het theoretische kader analyseert de behoefte aan instrumentmixen en schetst de voordelen en nadelen van de verschillende instrumenten (mixen) voor duurzaam bouwen op een abstract niveau. In het licht van het theoretische kader wordt een vergelijkend onderzoek uitgevoerd om duurzaam bouwen in de VS en China te analyseren. Elk landonderzoek begint met een historisch overzicht van de beweging voor duurzaam bouwen en beschrijft vervolgens de vorm van wetgeving op het gebied van duurzaam bouwen en de instrumenten die in de wet- en regelgeving zijn vastgelegd. De beschikbare instrumenten (mixen) worden beoordeeld op basis van de voor- en nadelen die in de theorie worden voorspeld, evenals op basis van empirisch bewijs om te laten zien hoe doeltreffend de instrumenten in werkelijkheid kunnen zijn.

Het onderzoek concludeert dat regelgeving, aansprakelijkheid of zelfregulering op zich tekort schiet om te leiden tot de gewenste mate van activiteiten op het gebied van duurzaam bouwen. Dit kan het gevolg zijn van de beperkingen van elk van de individuele instrumenten. De instrumenten die in de theorie werden geïdentificeerd konden worden aangetroffen in de praktijk van duurzaam bouwen in de VS en in China. Hoewel de institutionele kaders in de twee landen sterk verschillen is er

overeenstemming waarop de instrumenten worden gebruikt voor duurzaam bouwen in co-regulering of instrumentmixen in een bredere zin.

De conclusies van dit onderzoek bieden een algemene benadering aangaande de wijze waarop de verschillende instrumenten kunnen worden gebruikt voor de stimulering van duurzaam bouwen. Allereerst kan de overheid duurzaam bouwen een impuls geven via openbare aanbestedingen. Ten tweede kunnen groene leningen, anders dan subsidies, een manier zijn om particuliere projecten op het gebied van duurzaam bouwen te financieren. In de derde plaats kan de overheid certificering inzetten om de op de industrie gebaseerde normen voor duurzaam bouwen op te nemen in regelgeving. Ten vierde kan voorlichting ingrijpen op gedrag om te profiteren van energie-efficiëntie op het niveau van de huishoudens, omdat overtuiging goedkoop is en beter kan leiden tot intrinsieke motivatie. In de vijfde plaats moet het gebruik van grond voor nieuwe duurzame bouw goed worden gepland. En renovaties van bestaande gebouwen kunnen een groter duurzaam potentieel hebben dan nieuwbouw, vooral in gebieden die (te) verstedelijkt zijn. Tot slot kan aansprakelijkheid een aanvulling bieden op regelgeving voor duurzaam bouwen in verband met de luchtkwaliteit binnenshuis en de herontwikkeling van vervuilde landen.

Naast de beleidsaanbevelingen geeft het onderzoek ook wat algemene inzichten in duurzaam bouwen. Duurzaam bouwen is in de eerste plaats een maatschappelijk fenomeen dat niet eenvoudig kan worden opgelost door de markt alleen. Duurzaam bouwen leidt in grote mate tot maatschappelijke voordelen wat betreft milieubescherming. Die voordelen worden mogelijk niet volledig weerspiegeld in particuliere besluitvorming vanwege onvolledige/onjuiste informatie, externe factoren of trajectafhankelijkheid. Daarom is een meer gecentraliseerde aanpak via institutionele wijzigingen noodzakelijk. Maar de institutionele veranderingen treden mogelijk niet spontaan op om de problemen het hoofd te bieden, wat wijst op een taak van de overheid bij de promotie van duurzaam bouwen. Een algemene waarneming uit dit onderzoek is dat overheidsinterventie beter kan zijn als deze de markt voor duurzaam bouwen stimuleert in plaats van hier alleen maar opdracht voor geeft.

Omdat bij duurzaam bouwen zowel openbare als particuliere partijen betrokken zijn, wordt wetgeving steeds belangrijker om duurzaam bouwen niet alleen te stimuleren, maar om hier ook toezicht op te houden. Bij het nastreven van duurzaam bouwen is wetgeving meer bedoeld als een systeem van stimuleringsmaatregelen om gewenste activiteiten te bevorderen. In het geval van particuliere partijen moet de wetgeving

mogelijk niet eenvoudigweg opdracht geven voor duurzaam bouwen door specifieke afschrikmaatregelen voor schadelijke bouwactiviteiten, maar een financiële aansporing of ontmoediging creëren. Daarnaast bepaalt wetgeving, als onderdeel van het institutionele kader, hoe operationele, collectieve of constitutionele besluiten worden genomen. Op deze manier kan wetgeving de overheid laten handelen in het openbare belang en voorkeuren aansturen door collectieve besluitvorming. Dit kan deels worden weerspiegeld in de wetgeving voor de naleving van duurzaam bouwen bij openbare aanbestedingen of planning. Wanneer het openbare beleid de weg wijst, zullen particuliere partijen waarschijnlijk eerder investeren in duurzaam bouwen. Tot slot profiteert de rechtsstaat van toezicht op duurzaam bouwen, wat belangrijker wordt omdat bij duurzaam bouwen zowel openbare als particuliere partijen betrokken zijn.

Curriculum vitae

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Short bio	
I am a PhD candidate at the Erasmus School of Law (ESL). I did my bachelor in law at Beihang University (BUAA), and master in law at the China University of Political Science and Law (CUPL). I am also a research fellow at the Rotterdam Institute of Law and Economics and a member of China Society for Environmental Sciences (CSES). My research interests include private law, environmental governance and (comparative) law & economics.	
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Master in Law – School of Civil and Business Law, China University of Political Science and Law (CUPL)	2012-2015
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Publications	
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Research Lab	2015-2016
Collaborating with Your Supervisor	2015-2016
Introduction to Legal Methods	2015-2016
Reflection on Social Science Research	2015-2016
Wring clinic I & II	2015-2016
Specific courses	***year***
ATLAS Agora Cooperative Graduate Programming	2018
Advance Empirical Methods: Research Design: Theory and Applied	2019
Seminars and workshops	***year(s)***
European Doctorate in Law and Economics (EDLE) seminars	2016-2018
Workshops on Experiment at the Crossroads of Law and Economics	2017-2018
Erasmus Graduate School of Law (EGSL) lunch lectures	2016-2017
Behavioural Approach to Contract and Private Law (BACT) guest lectures	2016-2019
Presentations	***year***
'Smart mixes for Green Building', at the EDLE joint seminar 'Future of Law and Economics'	2018
'Green Building Compliance in the US', at the Workshop on Tax and Environment on the ATLAS Agora 2018	2018
'A joint use of instruments for Green Building: a law and economics perspective', at the EGSL lunch lecture	2018
Presentations on PhD thesis chapters at the Erasmus China Law Center biannual seminars	2016-2018
Attendance (international) conferences	***year***
Conference on the Smart Mixes in relation to Transboundary Environmental Harm	2016
The Hague Summit on CDR in China	2016
Workshop on Foreign Investment Law organized by the Netherlands China Law Association (NCLA)	2016
The 15th Annual Conference of the German Law and Economics Association	2017
Conference on Judge Made Risk Regulation	2017

The 15th Annual Conference of the German Law and Economics Association	2017
China-Singapore International Green Building Forum	2018