Business in the Age of Sustainable Development

Business in the Age of Sustainable Development

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This book is the culmination of nearly five years of research. It is a joy to now have the opportunity to explain how this dissertation was created, and to thank those that contributed along the way.

Although I formally enrolled as a PhD candidate in May 2017, the groundwork for this dissertation was laid long before. In June 2014 I moved to Nairobi to work at the United Nations Environment Programme. At that time, global collaboration still ranked high on governments' agendas. Various intergovernmental agreements aimed at advancing sustainable development were being drafted. The 2030 Agenda for Sustainable Development – which in 2015 would commit 193 countries to work to achieve 17 Sustainable Development Goals (SDGs) by 2030 - was one of those agreements. In adopting these goals, the world's leaders formally stated that the support of businesses would be critical to achieving the SDGs. But how do companies impact sustainable development? And how can companies' impacts be improved? This was interesting! So, when in August 2015 I left Nairobi to pursue a MPhil degree in Development Studies at Cambridge, I decided to study what the role is of business in attaining these 17 SDGs.

During this time, I had been keeping in touch with Professor Rob van Tulder, with whom I had been writing my master thesis in 2013/14. Rob, I fondly remember our walk around the Windsor golf course in Kenya – under the watchful eye of numerous Sykes monkeys – during which we discussed opportunities for doing research together. When, after I returned to the Netherlands in 2016 to work in consulting, you offered me a part-time PhD trajectory, I immediately got excited. And the journey that followed was rewarding. I am grateful for your never-ending, highly energetic support, your enthusiasm for the research projects that are included in this dissertation, and your demand that the research we would be doing not only contributed to the literature, but would also have an impact on the real-world. Your open mind and enthusiasm motivated me to survey diverse literatures and adopt an array of research methods to study a broad topic: the role of companies in sustainable development.

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It was the best of times, it was the worst of times, it was the age of wisdom, it was the age of foolishness, it was the epoch of belief, it was the epoch of incredulity, it was the season of Light, it was the season of Darkness, it was the spring of hope, it was the winter of despair, we had everything before us, we had nothing before us…

Charles Dickens, A Tale of Two Cities

1. Introduction

1.1 Business in the Age of Sustainable Development

We now live in the age of sustainable development (cf. Sachs, 2015). Sustainable development aims to ensure that everyone on our planet can live a fulfilling life, while simultaneously safeguarding that future generations also have the ability to meet their needs (WCED, 1987). Sustainable development thereby comprises three dimensions: promoting economic development to nurture the means for accommodating people's needs; advancing social inclusion and equality to make sure no one is left behind; and ensuring environmental sustainability to safeguard the biophysical foundations of societies and economies. Today, we have unprecedented opportunities for promoting sustainable development and accelerating progress, but we are also facing daunting challenges.

We are increasingly grasping the complexity of the sustainable development challenges threatening the world. At present, and despite significant progress made in the last decades, we are falling short on meeting the needs of all 7.6 billion people alive today. For instance, one in four people are facing food insecurity, 2.2 billion people lack access to drinking water while 4.2 billion have inadequate access to sanitation, and 440,000 people fall victim to homicides a year (UN, 2020). At the same time, we can no longer escape the reality that the impact of human activities is fundamentally altering the nature of our planet – and not for the better. Our rampant greenhouse gas emissions are changing the climate (IPCC, 2018). We furthermore altered 75 percent of the land's surface, and we impact 66 percent of the ocean, which in turn is threatening an estimated one million animal and plant

species with extinction (IPBES, 2019). These manmade impacts are pushing our planet into a new epoch: Earth is exiting the relatively stable Holocene, which allowed us as a species to flourish, and is entering the Anthropocene – the age of man (e.g., Crutzen, 2006; Lewis & Maslin, 2015). Continuing down this path could *"lead, with an uncomfortably high probability, to a very different state of the Earth system, one that is likely to be much less hospitable to de development of human societies"* (Steffen et al., 2015:1).

Yet against this bleak background, there are plenty of opportunities for turning the tide. Recent advancements in innovation and technology, organization and management, and the global exchanges of people's ideas, offer concrete and actionable solutions for tackling sustainable development challenges. For example: decreasing costs now leads renewable energy to play an increasing role in powering societies and helping mitigate climate change (e.g., IEA, 2020; UN, 2020); mobile telecommunication offers opportunities for helping the poorest people on our planet access financial services like credit and insurance (e.g., Suri & Jack, 2016); water reclamation, reuse and recycling, including rain harvesting, may help fight water stress (e.g., Gude, 2017); and innovations in healthcare help battle existing and emerging diseases, including for COVID-19 – for which the first people were vaccinated in late 2020, just a year after the virus first emerged.

Such solutions – from their innovation to their technical development and subsequent implementation at the managerial and policy levels – are urgently needed if we are to advance sustainable development. Scientists warn that the longer we wait to take decisive action, the lower the likelihood of success (e.g., IPBES, 2019; IPCC, 2018; Steffen et al., 2015). Our window of opportunity is closing: irreversible changes are expected if we do not take immediate action.

Hence, in this age of sustainable development, we are increasingly understanding the severity and urgency of the challenges facing us, yet we are simultaneously holding unprecedented opportunities for tackling them. In other words, this is the age for accelerating our understanding of sustainable development and to take action for advancing human well-being while ensuring environmental sustainability.

Businesses are key actors in this age of sustainable development. Companies produce goods and services that help people meet their needs. They also

have unique capabilities, such as in innovation, management, and finance, that can deliver sustainable development objectives (Hajer et al., 2015; Lucci, 2012; Oetzel & Doh, 2009; Porter & Kramer, 2011; UN Global Compact, 2017; van Tulder, 2018). For example, in 2007 Kenyan telecommunications company Safaricom and Vodafone launched the mobile money service M-Pesa (where M stands for mobile; *pesa* is Kiswahili for money). Since its launch, M-Pesa rapidly became an integral part of the lives of Kenyans, providing millions with an ability to transfer money, paying school fees and utility bills, and safely storing money (e.g. Lashitew, van Tulder, & Liasse, 2018), which some estimated to have helped lift 2 percent of Kenya's population out of poverty (Suri & Jack, 2016).

However, companies are not solely a force for positive change. Rather, their activities frequently also generates negative impacts on sustainable development dimensions (Frynas, 2005; Kourula, Pisani, & Kolk, 2017). Companies are key emitters of greenhouse gases, they are associated with land degradation and biodiversity loss, and they are drivers of pollution, which deteriorates the natural environment and harms the health of humans and other animals (e.g. van Zanten & van Tulder, 2020a). Corporate scandals that hit the headlines, like BP's 2010 Deepwater Horizon, the 2013 Rana Plaza factory collapse in Bangladesh, Volkswagen's 2015 'Dieselgate', the 2018 Facebook-Cambridge Analytica controversy, and the ongoing scrutiny multiple pharmaceutical companies are facing for their involvement in the opioid crisis, further testify to the complex impacts that companies may have on sustainable development. And they are just the tip of the iceberg.

Overall, this discussion indicates that companies are not only part of the problem, but also of the solution (Kolk & van Tulder, 2010).

While companies impact sustainable development, sustainable development is important for companies. Companies depend on societies and the natural environment. Many, including Nobel Peace Prize winner and former United Nations (UN) Secretary-General Kofi Annan, have proclaimed: *"business cannot succeed in societies that fail"*. Examples of this line of reasoning are not hard to conjure: poverty limits consumer spending, political instability disrupts business activity, and climate change threatens the production and distribution of goods and services. At the same time, sustainable development presents long-term business

opportunities (van Tulder, 2018). One major study valued the business opportunities that can be seized by advancing sustainable development at US$ 12 trillion annually (Business & Sustainable Development Commission, 2017). In other words, sustainable development is good for business. It is therefore not surprising that companies are increasingly managing their impacts on sustainable development. As of 2020, over 15,000 companies around the world signed up to the UN Global Compact, the "voluntary initiative based on CEO commitments to implement universal sustainability principles" (UN Global Compact, 2020).

This is markedly different than just a few decades ago. Back in the 1970s, the dominant thinking prescribed that companies are best able to benefit society by maximizing (short-term) profits. As famously argued by Milton Friedman, it is inefficient, also from a societal point of view, if companies engage in social and environmental activities, unless such activities directly benefit the company's bottom line (Friedman, 1970). This line of thinking, often referred to as the neoliberal economic paradigm, coincided with tremendous technological progress and economic growth (Nolan, 2009). But the benefits predominantly applied to rich nations (Rodrik, 2006; Collier, 2007). Growth was disappointing in developing countries and failed to reduce poverty (Chang, 2007). At the same time, this economic progress caused great social and environmental challenges, such as inequality, pollution and climate change (Nolan, 2009). As a result of ongoing globalization, governments saw their national governance structures erode. This reduced governments' effectiveness in regulating the increasingly globally active private sector (Scherer & Palazzo, 2011).

The rapid rise of social and environmental challenges led many to question the viability of subjugating social and environmental sustainability to market economics (e.g. Hopwood, Mellor & O'Brien, 2005; Nolan, 2009; Redclift, 2005). The influential Club of Rome posited there to be "limits to growth" (Meadows et al., 1972), the landmark 1987 Brundtland report called for integrating human development, poverty eradication, and environmental deterioration (WCED, 1987), and the three UN conferences on Sustainable Development (Rio de Janeiro in 1992; Johannesburg in 2002; and the Rio +20 conference in 2012), increasingly emphasized the critical role of the private sector in sustainable development (Scheyvens et al., 2016). Hence, the paradigm now has shifted, with companies, next to governments

and civil society actors, securing an important role in the sustainable development process (Blowfield & Dolan, 2014; Sachs, 2015; van Tulder & Fortanier, 2009).

The rise of companies in sustainable development provided a fertile area of academic research. One avenue of research, travelled by many, investigated the business case for companies to contribute to particular sustainable development topics (e.g., Porter & Kramer, 2011; Salzmann, Ionescu-Somers, & Steger, 2005). Another pathway looks into the contributions of companies to sustainable development. But this latter topic received far less attention. Recent literature reviews show that some studies have discussed companies' influence over individual sustainable development challenges, like poverty and inequality, energy and climate change, and peace (e.g., Kolk et al., 2017; Kolk, Rivera-Santos & Rufín, 2018). Nevertheless, few research efforts have examined how companies engage with, and positively and negatively impact, sustainable development more broadly (e.g, Kolk, 2016; Kolk et al., 2017; van Tulder, Verbeke, & Strange, 2014).

Part of this gap in the literature can be explained by the broad nature of the concept of sustainable development. Definitions of sustainable development are too general to include the diversity of challenges within the concept's scope. There are numerous economic, social, and environmental challenges that may be impacted by companies. So what to focus on? The adoption, by all UN member states, of the Sustainable Development Goals (SDGs) in 2015 provides an opportunity for improving our understanding of the role of companies in advancing sustainable development.

1.2 The Sustainable Development Goals

On 25 September 2015, the UN adopted 17 SDGs with 169 underlying targets as part of the 2030 Agenda for Sustainable Development (UN, 2015a). As shown in Table 1.1, the SDGs cover a broad spectrum of sustainable development objectives. Among others, they range from eliminating poverty and hunger, providing health, education, and decent jobs, to combating climate change and fighting biodiversity loss. The SDGs are to be achieved by 2030, thereby establishing a 15-year timeframe for progress.

Table 1.1 - The Sustainable Development Goals (SDGs)

Goal 1.	End poverty in all its forms everywhere
Goal 2.	End hunger, achieve food security and improved nutrition and promote sustainable agriculture
Goal 3.	Ensure healthy lives and promote well-being for all at all ages
Goal 4.	Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
Goal 5.	Achieve gender equality and empower all women and girls
Goal 6.	Ensure availability and sustainable management of water and sanitation for all
Goal 7.	Ensure access to affordable, reliable, sustainable and modern energy for all
Goal 8.	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
Goal 9.	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
Goal 10.	Reduce inequality within and among countries
Goal 11.	Make cities and human settlements inclusive, safe, resilient and sustainable
Goal 12.	Ensure sustainable consumption and production patterns
Goal 13.	Take urgent action to combat climate change and its impacts
Goal 14.	Conserve and sustainably use the oceans, seas and marine resources for sustainable development
Goal 15.	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
Goal 16.	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
Goal 17.	Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development

The SDGs succeed the Millennium Development Goals (MDGs). The MDGs were adopted by the world's leaders at the 2000 UN Millennium Summit. They constituted the 2000-2015 development agenda, comprising eight objectives, including a commitment to eradicate extreme poverty and hunger, achieve universal primary education, and combat HIV/AIDS. Much progress was made in this timeframe. To give a few examples: the number of people living in extreme poverty has fallen by more than half, dropping from 1.9 billion in 1990 to 836 million in 2015; the proportion of undernourished people in developing regions declined by

almost half since 1990; the number of out-of-school children fell from 100 million in 2000 to 57 million in 2015; new HIV infections were reduced by about 40 per cent between 2000 and 2013; and 2.1 billion people have gained access to improved sanitation (UN, 2015b). But many pressing sustainable development challenges remained: too many people lack the means to be able to live a good life; and environmental challenges, like climate change, pollution, and biodiversity loss, only became more pressing during the time of the MDGs.

The SDGs intend to accelerate sustainable development. They are shaped to overcome various issues associated with the MDGs. Among others, the MDGs were criticized for viewing development primarily in terms of poverty reduction (Griggs et al., 2013; Saith, 2006), for their primary focus on the developing world while neglecting development in wealthy countries (Sachs, 2012), and for having a top-down approach that did not allow for deliberative decision-making (Wisor, 2012) by which they failed to include the perspectives of those it seeks to help (Harcourt, 2005). In contrast, the SDGs integrate economic, social, and environmental dimensions of development, causing the SDGs to be *"a blueprint to achieve a better and more sustainable future for all"* (UN, 2019). Moreover, all countries – no matter how rich or poor – have agreed to work towards achieving the SDGs by 2030. Hence, they equally apply to developing and developed countries (UN, 2015a). Finally, the SDGs were established following a massive stakeholder consultation (Kharas & Zhang, 2014) that involved governments, companies, civil society organizations, and knowledge institutes, while including the voices of over a million people from around the globe (UNDG, 2013).

Another defining feature of the SDG Agenda is its calling for a global partnership as a means to achieve the goals. Not only is 'Partnerships for the Goals' a separate SDG (#17). 'Partnership' also is one of the five principles of the 2030 Agenda for Sustainable Development – next to 'People', 'Planet', 'Prosperity', and 'Peace' - seeking to *"mobilize the means required to implement this Agenda through a revitalized Global Partnership for Sustainable Development, based on a spirit of strengthened global solidarity, focused in particular on the needs of the poorest and most vulnerable and with the participation of all countries, all stakeholders and all people"* (UN, 2015a:2). Particular emphasis is placed on involving companies. The same Agenda states: *"We acknowledge the diversity of the private sector, ranging*

from micro-enterprises to cooperatives to multinationals. We call upon all businesses to apply their creativity and innovation to solving sustainable development challenges" (UN, 2015:29). This need for the involvement of companies resonated in the media. After the SDGs were globally adopted, then UN Secretary-General Ban Ki-moon commented: *"Governments must take the lead in living up to their pledges. At the same time, I am counting on the private sector to drive success"* (UN News Centre, 2015). Helen Clark, at that time leading the UN Development Programme (UNDP), added that *"the new sustainable development agenda cannot be achieved without business"* (UN News Centre, 2015). More recently, current UN Secretary-General António Guterres stated: *"We have to mobilize the private sector… Moving forward, collaboration with business – and the key CEOs in the world – is crucial when it comes to fighting climate change; but also, to meet sustainable development goals, eradicate all extreme poverty by 2030, and we're not on track on this"* (UN Global Compact & Accenture Strategy, 2019:2).

So, although the SDGs received criticism (for discussions see e.g., Horton, 2014; Waage et al., 2015), they now constitute the leading conceptualization and agenda of sustainable development (Kolk et al., 2017; Sachs, 2015; van Zanten & van Tulder, 2018). They intend to shape national policies, intergovernmental collaboration, and they explicitly call on companies to contribute towards achieving them. In the years following their global adoption, the SDGs have quickly crystalized a universal understanding of sustainable development, allowing it to move from an ill-defined notion with different interpretations, to a blueprint for a better world with 17 specific goals, 169 underlying targets, and over 200 approved and measurable indicators.

1.3 Research Questions

In this dissertation, I capitalize on the advent of the SDG Agenda as an opportunity for studying the role of companies in sustainable development. As mentioned above, I conducted this research next to my full-time job – first at a consulting firm advising companies on corporate sustainability and socio-economic impact, currently at a global asset management company where I specialize in sustainable investing, having responsibility for integrating the SDGs into investment strategies and

advancing the firm's sustainability thought leadership more broadly. I consider myself fortunate to have witnessed firsthand how many different types of companies, operating in different sectors and in diverse countries, grapple with sustainable development challenges. The reason for mentioning my professional background here is that my being immersed in the field that I have been studying has had a profound impact on my research. In this section I introduce the research questions that this dissertation aims to answer, bridging theory and practice by giving context from my professional experience.

First, when the SDGs were launched in September 2015, it quickly became clear how little we knew about the role of companies in engaging with multiple, diverse, sustainable development challenges, nor about their involvement with the global goal-setting governance efforts of governments. Extant literature touched upon companies' strategies towards certain specific sustainable development objectives like climate change or poverty. However, an overarching perspective that explores companies' engagement with sustainable development more broadly, meaning with multiple types of economic, social, and environmental topics, was found to be lacking. Relatedly, although scholars extensively studied how different types of institutions – the formal and informal 'rules of the game' (North, 1990) – induce companies to advance sustainable development, it remained unclear how the novel, goal-based, institution that the SDG Agenda represents, would move companies to engage with specific sustainable development topics. For that reason, the first research question that I address in this dissertation is:

> *1. How can the engagement of companies with specific SDGs be explained using an institutional lens?*

Second, while the fact that companies generally can exert significant positive and negative impacts on sustainable development is widely known, it is not well-understood how the different types of economic activities that companies undertake impact specific sustainable development topics. Different companies do different things. Some grow crops, others mine the earth for metals or other resources, still others manufacture textiles or machinery, and those in the services sector do anything from marketing to telecom and financial intermediation.

Research on companies' impacts on sustainable development pays little attention to how the individual economic activities that companies undertake exert impacts on different sustainable development topics. Extant research typically either focuses on the strategies that companies employ in general – without accounting for the economic activities that they undertake – or it studies the impacts of companies operating in a single sector. This leaves the heterogeneous impacts of companies conducting varying economic activities blindsided. An overarching perspective, which is so important for understanding the complex impacts that companies may have on the SDGs, is lacking.

The relevance for investigating this overarching perspective arose while working in the financial sector. Financial institutions invest in, or lend to, a wide variety of companies. And this sector, like the private sector more generally, is increasingly concerned about the way it influences sustainable development. The main impact of financial institutions is indirect: they direct massive amounts of financing to companies in the real economy. In order to operationalize sustainability considerations into their lending/investment processes, financial institutions therefore want to know more about how their (potential) clients or investees impact the SDGs. This will allow them to channel financing towards those companies that make more positive contributions, while avoiding to finance those that have particularly adverse effects. But because this easily concerns many thousands of companies, for which detailed information on their sustainable development performance is unavailable, proxies are needed that can paint a broad yet comprehensive picture on how companies positively and negatively impact specific sustainable development topics. Economic activity can be this proxy for two reasons: (1) it describes what companies' core activities are; and (2) statistical organizations – like those related to the UN, the European Union, and the financial sector itself – have been creating standardized lists of economic activities, meaning that these types of data are well available in the financial sector. Against this background, the second research question I ask is:

> *2. How do the diverse economic activities that companies may undertake generate positive and negative impacts on the targets of the SDGs, and what*

does this imply for corporate sustainability strategies that aim to advance sustainable development?

Third, although companies responded enthusiastically to the UN's adoption of the SDGs in 2015, it is unclear how they can effectively advance the 2030 Agenda for Sustainable Development. In the first five years of the SDG Agenda, surveys have consistently shown that the majority of large companies embrace the SDGs in their communications and/or operations. However, the same surveys also suggested that there is a need to assess how companies can efficiently help advance the SDGs. A main hurdle appears to be the complex interactions between different sustainable development topics like the SDGs. Contributions to one SDG may have positive, but could also have negative, impacts on another SDG. Such interactions must be understood and managed, in order for companies to positively impact the entire SDG Agenda. Existing research on corporate sustainability, the main lens for studying the strategies that companies create to advance sustainable development, offers little guidance on how this complexity can be understood and managed. Given that the SDGs are unlikely to be achieved without the effective contributions of companies, I take a step towards untangling this complexity by asking:

3. What would a theory of corporate sustainability that enables companies to improve their impacts on sustainable development, as conceptualized by the SDGs, look like?

Finally, at the end of 2019 the COVID-19 virus emerged and quickly turned into a pandemic. This unprecedented health crisis devastated the lives of millions, caused a global economic crisis, laid bare the inequalities in our societies, and vividly exposed how the degradation of the natural environment may lead to more frequent interactions between humans and other animals, thus increasing the risk of the transmission of viruses from animals to humans. Governmental responses to COVID-19 were unprecedented. Many governments locked down their societies. Tremendous amounts of money are invested in dampening the worst social and economic impacts of the pandemic. And although many countries are, at the time of writing, experiencing new 'waves' of COVID-19 cases, commentators around the

world are philosophizing what a sustainable recovery from this crisis should look like.

This question has clear relations with the research that I have been doing over the past years to complete this dissertation. I therefore ask a final question:

> *4. What can the SDGs teach us about transforming towards more sustainable and resilient societies beyond COVID-19?*

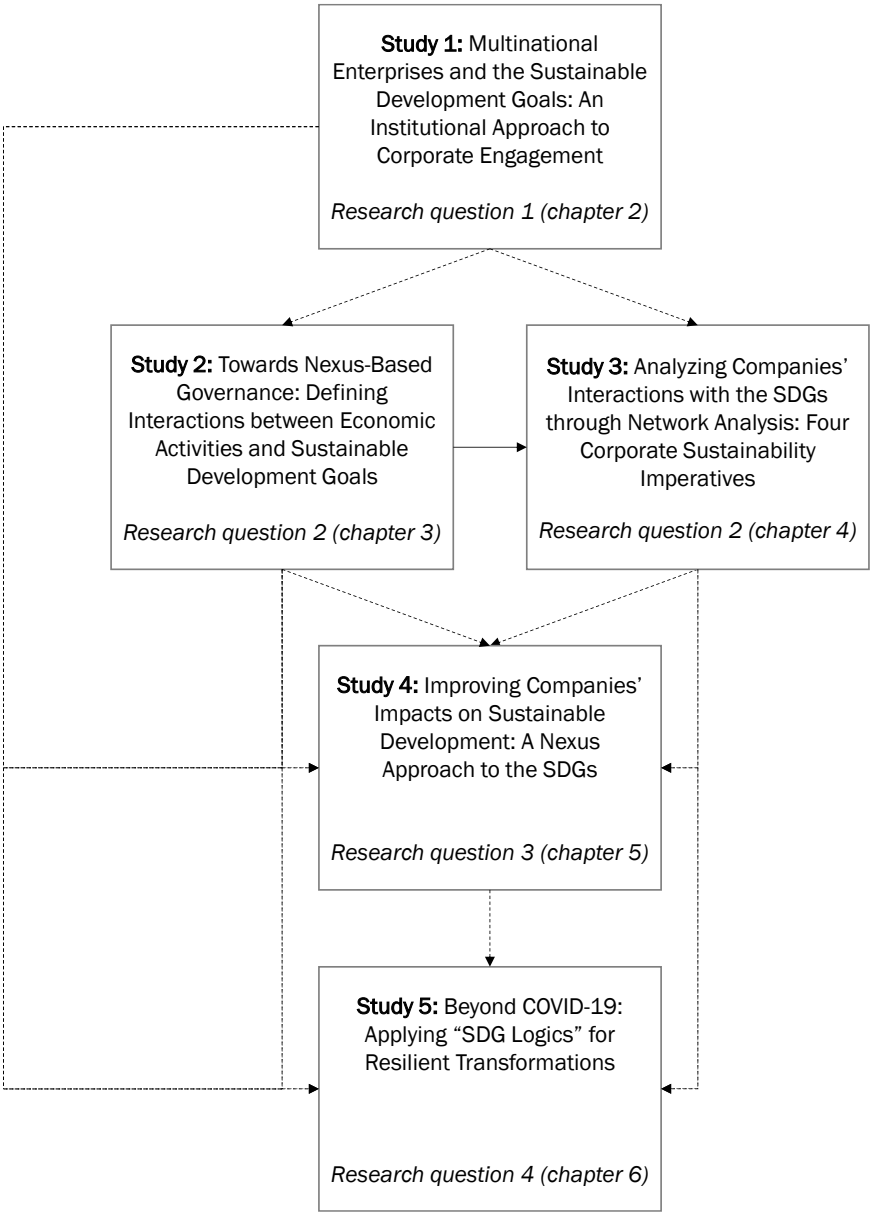
1.4 Outline of this Dissertation

This dissertation consists of five studies that investigate what role companies (can) play in sustainable development, as conceptualized by the SDGs. The studies assess which SDGs companies engage with, how companies impact the SDGs through their core economic activities, and how these impacts stand to be improved in order to move towards more sustainable and resilient societies.

This is a broad subject. On the one hand, the SDGs comprise numerous economic, social, and environmental sustainable development dimensions. On the other hand, the private sector is incredibly diverse. To tackle the diverse nature of this research topic, the studies in this dissertation draw from, and contribute to, different academic disciplines and they employ a variety of methods.

Figure 1.1 introduces the studies in this dissertation. Table 1.2 provides an overview that shows how these studies employ interdisciplinary angles and approaches to better understand what role companies play in sustainable development. Below, I provide a brief summary of each study.

Figure 1.1 – Introduction of the studies in this dissertation*



**The solid arrow indicates that a study provided inputs for another study. Dashed arrows indicate that the studies provided more general inputs into the other studies.*

Table 1.2 - Overview of the studies in this dissertation

	Study 1	**Study 2**	**Study 3**	**Study 4**	**Study 5**
Title	Multinational Enterprises and the Sustainable Development Goals: An Institutional Approach to Corporate Engagement	Towards Nexus-Based Governance: Defining Interactions between Economic Activities and Sustainable Development Goals (SDGs)	Analyzing Companies' Interactions with the SDGs through Network Analysis: Four Corporate Sustainability Imperatives	Improving Companies' Impacts on Sustainable Development: A Nexus Approach to the SDGs	Beyond COVID-19: Applying "SDG Logics" for Resilient Transformations
Aim	To adopt an institutional approach to understanding how corporate engagement with particular SDGs is influenced by traits of SDGs and by traits of MNEs.	To assess how the different types of economic activities that companies undertake impact the SDGs, and what this implies for advancing sustainable development.	To identify which types of companies are most, and which are least, aligned with the ambitions of the SDG Agenda and what the consequent strategic sustainability implications are.	To contribute to developing a theory of sustainability management that enables companies to improve their impacts on sustainable development.	To explore how the SDG Agenda can help societies navigate through and beyond the COVID-19 pandemic.
Theoretical lens	Institutions; corporate sustainability	Sustainability science (nexus approach); corporate sustainability	Sustainability science (nexus approach); corporate sustainability	Social-ecological systems; resilience; corporate sustainability; sustainability science	Institutions; social-ecological systems; corporate sustainability

Table 1.2 continued

	Study 1	Study 2	Study 3	Study 4	Study 5
Analytical method	Primary data collection via a survey; statistical analysis	Systematic literature review; statistical analysis	Network theory	Conceptual	Conceptual
Contribution	Development and exploratory testing of propositions that argue that corporate engagement with the SDGs is influenced by (i) whether an SDG is internally or externally actionable; (ii) whether the SDG aims to 'avoid harm' or 'do good'; (iii) a company's (inter)national environment; and (iv) the company's sector	Uncovering of interactions between 420 types of economic activities and the SDGs' targets, thereby adding a business (economic activity) perspective to the operationalization of a nexus approach to the SDGs.	Analyzing the positive and negative interactions between companies' economic activities and SDG targets using network theory reveals which activities are most and least aligned with the SDG Agenda. Four types of corporate activities are defined based on their SDG interactions. Strategic sustainability imperatives are identified for each.	Introducing a nexus approach to corporate sustainability which induces companies to assess and manage their direct and indirect, and positive and negative, interactions with the SDGs in an integrated manner, in order to advance multiple SDGs at the same time while reducing the risk of trade-offs. This strategy is argued to advance sustainable development by contributing to the resilience of the social-ecological systems in which a company operates.	Identifying three 'logics' that the SDG Agenda provides that can help transform towards sustainable societies: (i) a governance logic; (ii) a systems (nexus) logic; and (iii) a strategic logic.

1.4.1 Study 1: Multinational Enterprises and the Sustainable Development Goals: An Institutional Approach to Corporate Engagement

This study first conceptualizes the SDGs as a goal-based institution for international business. The SDGs are part of an intergovernmental agreement. It is therefore proposed that an institutional approach lies at the heart of the SDGs. Using this institutional lens, it is argued that the SDGs comprise a novel form of global governance through setting goals that apply to all countries, and that call upon all actors in society, including businesses, to work towards their achievement.

Second, based on this conceptualization of the SDGs as a goal-based institution, the study develops propositions that help explain how the engagement of Multinational Enterprises (MNEs) with the SDGs is influenced by traits of SDGs and by traits of the MNEs themselves. It proposes that two SDG traits are relevant: i) the actionability of an SDG target, which can be internal or external to MNEs' (value chain) operations; and ii) the ethical duties conveyed by the SDG target, which can be positive ("doing good") or negative ("avoiding harm"). Additionally, it proposes that two traits of MNEs help explain their engagement with the SDGs: i) their home- and host-country contexts; and ii) their industrial sector.

Third, the study surveys European and North American Financial Times Global 500 companies to obtain first insights on the relevance of the developed propositions. In total, 350 companies in this list of largest companies in the world were headquartered in Europe (122) or North America (228). 81 of these companies participated in the survey. The statistical analysis of results indicates that MNEs engage more with internally than externally actionable SDG targets, that SDG engagement is higher for SDG targets that seek to avoid harm rather than do good, that European MNEs engage with more SDG targets than North American MNEs, and that MNEs in industrial sectors with negative externalities engage more with SDG targets that seek to avoid harm.

This study is among the first to explore how the engagement of companies with specific sustainable development topics can for a part be explained by traits of those sustainable development topics, as well as by traits of those companies – as viewed through an institutional lens. Building on our analysis, the chapter discusses

policies for the further and more pro-active engagement of MNEs in achieving the SDGs.

1.4.2 Study 2: Towards Nexus-Based Governance: Defining Interactions between Economic Activities and Sustainable Development Goals (SDGs)

The second study systematically reviews the literature to assess how the different types of economic activities that companies undertake impact the SDGs, and what this implies for advancing sustainable development. Companies undertake numerous types of economic activities. These activities sustain livelihoods and produce goods and services that help people attain a better life, but also create negative externalities. Different types of economic activities thereby impact different SDGs. However, there is insufficient understanding of how companies' economic activities impact the SDGs, and how the SDGs themselves interact. A lack of evidence on which interactions between companies and the SDGs actually advance sustainable development complicates creating SDG strategies that steer towards improved impacts.

As there is insufficient research on how companies' economic activities are expected to impact the SDGs, this study systematically reviews 876 articles on evidence-based links between economic activities – as a proxy for corporate strategies - and sustainable development dimensions. The study uncovers relevant interactions between 420 economic activities (as listed in international statistical classifications) and the SDGs' targets. It reveals the ample opportunities, but also the many trade-offs, companies face in contributing to the SDGs. Economic activities are critical for advancing economic and social SDGs. They often are sources of economic productivity (SDG 8) and drivers of industrialization, infrastructure, and innovation (SDG 9). Specific types of economic activities help people meet their most basic needs by producing and distributing food (SDG 2), health services and medicines (SDG 3), education (SDG 4), water and sanitation (SDG 6), energy (SDG 7), housing and transport (SDG 11), and information (SDG 16). But trade-offs abound and are not just related to economic activities that are the usual suspects. Rather, the study finds that nearly all economic activities emit greenhouse gases (SDG 13). Many activities use and/or pollute water (SDG 6).

Numerous activities also generate pollution and waste more generally (SDG 12), degrading ecosystems (SDGs 14/15) and harming people's health (SDG 3). This study synthesizes economic activities' positive and negative impacts on SDG targets to provide an evidence-base for companies' SDG strategies, and for governments' SDG policies.

The findings contribute a business (economic activity) perspective to the sustainability science literature. In this literature, scholars agree that a so-called 'nexus approach' is critical for advancing the SDGs. A nexus approach manages interactions between SDGs as to advance multiple SDGs simultaneously and reduce the risk that progress on one SDG deteriorates progress on another. By studying how the economic activities undertaken by companies impact SDGs, this chapter argues that economic activities can be a lever with which policymakers can operationalize a nexus approach.

1.4.3 Study 3: The Impacts of Companies' Economic Activities on Sustainable Development Goals: A Network Analysis

The third study proposes that the alignment between corporate strategies and the SDGs can be an indicator of long-term sustainability success. By building on the findings of the second study, this article investigates which types of economic activities that companies undertake are most, and which are least, aligned with the ambitions of the SDG Agenda. The article selects 67 unique economic activities and uses a qualitative scoring framework – developed in the sustainability science literature – to assess their positive and negative interactions with 59 SDG targets. Using mathematical techniques, the identified and scored interactions are then studied as a network. The results reveal indications of centrality and similarity: (i) which economic activities are most central in terms of impacting most SDG targets; (ii) which economic activities are similar in terms of impacting the same SDG targets; (iii) which SDG targets are most central by being most frequently impacted by economic activities; and (iv) which SDG targets are most similar by virtue of being impacted by the same economic activities.

The results reveal four types of corporate activities, each facing a strategic sustainability imperative: (i) *core activities* predominantly generate positive, while having few negative, impacts on the SDGs, challenging companies to scale their

contributions; (ii) *mixed activities* have moderate/high degrees of both negative/positive impacts, posing a decoupling imperative; (iii) *opposed activities* provide few benefits yet cause significant adverse impacts, which challenges companies to sustainably transform their business models; and (iv) *peripheral activities* have immaterial positive and negative impacts, challenging companies to explore innovative avenues for creating SDG contributions.

The study contributes to the corporate sustainability strategy literature by improving our understanding of how different types of companies generate varying – positive and negative – impacts on sustainable development. Detailed network graphs are presented to expose this varying degree of alignment between companies' activities and the SDG Agenda. Corporate strategies for improving these impacts stand to be more effective if they appreciate the heterogeneity of economic activity, rather than proposing one-size-fits-all strategies.

1.4.4 Study 4: Improving Companies' Impacts on Sustainable Development: A Nexus Approach to the SDGs

The previous studies explored how companies' engagement with the SDGs can be explained using an institutional lens and how their economic activities impact the SDGs. This study goes further to ask how companies can ensure that their corporate sustainability strategies not only contribute to their bottom lines, but that they also effectively advance sustainable development. Companies face various challenges in improving their impacts on sustainable development. The challenge that this study addresses is the complexity of understanding an managing the positive and negative impacts of companies on the SDGs, and the interrelations between these SDGs.

This conceptual study thereby contributes to developing a theory of sustainability management that enables companies to improve their impacts on sustainable development, as conceptualized by SDGs. It introduces a nexus approach to corporate sustainability (at the micro-level of companies), which is traditionally applied to policymaking (at the macro-level of societies). Applied to corporate sustainability, this nexus approach induces companies to assess and manage their direct and indirect, and positive and negative, interactions with the SDGs in an integrated manner. Instead of treating SDGs as isolated silos, a nexus approach aims to advance multiple SDGs simultaneously (thus creating 'co-

benefits') while reducing the risk that contributions to one SDG undermine progress on another (thus avoiding 'trade-offs'). Two frameworks are introduced: one for mapping how a company's interactions with the SDGs lead it to influence the resilience of the social-ecological systems in which it operates; and one for operationalizing a nexus approach to corporate sustainability.

This interdisciplinary paper is grounded in the social-ecological systems literature. A nexus approach is a step towards creating systemic corporate sustainability strategies that appreciate the complexity of sustainable development. Such systemic corporate sustainability strategies are sorely needed for companies to improve their impacts on sustainable development.

1.4.5 Study 5: Beyond COVID-19: Applying "SDG Logics" for Resilient Transformations

This final study surveys how the SDG Agenda can inform the navigation of societies through and beyond the COVID-19 pandemic. This conceptual paper argues that the SDG Agenda is not without flaws. The first five years of the SDG Agenda, and even before the pandemic, witnessed (too) slow progress towards the SDGs. COVID-19 presents a further stress test for the SDG approach.

However, in this study, it is argued that the SDG Agenda provides three 'logics' that could help transform towards sustainable societies: (1) a governance logic that sets goals, adopts policies, and tracks progress to steer impacts; (2) a systems (nexus) logic that manages SDG interactions; and (3) a strategic logic that enables (micro-level) companies to develop strategies that impact (macro-level) policy goals. The paper discusses key hurdles that each of these SDG logics face. Transforming towards sustainable societies beyond COVID-19 requires that multinational enterprises and policy makers (better) apply these logics, and that they address operational challenges to overcome flaws in the present approach to the SDGs.

1.5 Ambitions and Academic Embedding

This dissertation aims to improve our understanding of how companies' activities have an impact on the ability of societies to meet people's needs – today and in the future – while simultaneously ensuring environmental sustainability. In 'The Age

of Sustainable Development' (cf. Sachs, 2015), understanding how companies can understand and manage their impacts is a pressing challenge. This is particularly the case now corporate sustainability scholarship is criticized for the limited guidance it gives companies to manage their impacts on sustainable development (e.g. Dyllick & Muff, 2016; Landrum, 2017).

The goal of this dissertation is to take a solution-oriented approach to help understand how companies impact sustainable development and how these impacts stand to be improved. Its main contributions are intended to the corporate sustainability literature – by providing a sustainable development perspective to corporate strategies – and to the sustainable development literature – by improving our understanding of the role of companies in attaining the SDGs.

It aims to achieve these objectives by employing three related approaches. First, in the first study (chapter 2) I endeavor to extend theory by creating propositions, rooted in the institutions literature, that explain corporate engagement with particular SDGs. Second, particularly in the second (chapter 3) and third (chapter 4) studies, I intend to unearth relations between economic activities and SDG targets. By digging into the available empirical data (as reported in extant literature and as collected through interviews), the ambition is to provide rich detail on the positive and negative impacts of companies on the SDGs. This detail is analyzed using empirical methods (network theory), so as to improve our understanding of the phenomenon that companies have a complex role in sustainable development. Finally, especially in the fourth study (chapter 5), but to some extent also in studies two and three (chapters 3 and 4), I take a prescriptive approach to explain how companies can create corporate sustainability strategies that improve impacts on sustainable development.

I appreciate that by employing these three approaches, this dissertation deviates somewhat from the standard in the academic field of business and management that postulates a need for "theory development". This deviation is by intent. Management's devotion to theory has been criticized for, among others, *"preventing the reporting of rich detail about interesting phenomena for which no theory yet exists. And it bans the reporting of facts – no matter how important or competently generated – that lack explanation, but that, once reported, might stimulate the search for an explanation"* (Hambrick, 2007: 1346). In response to

such criticism, various leading scholars in this field are therefore calling for more impactful research (e.g., Buckley, Doh & Benischke, 2017; Davis, 2015; Doh, 2017; George, Howard-Grenville, Joshi & Tihanyi, 2016).

I am convinced that, in addition to developing theories for organizing and explaining empirical phenomena, obtaining descriptive and prescriptive insights is crucial for understanding what role companies play in sustainable development, and for delineating how companies might expand their positive contributions. For that reason, my dissertation is inspired by sustainability science. This is an interdisciplinary field of research that is *"defined by the problems it addresses rather than by the disciplines it employs… It is thus most usefully thought of as neither 'basic' nor 'applied' research. Rather, it is an enterprise centered on the 'use-inspired basic research'… [to] serve the quest for advancing both useful knowledge and informed action by creating a dynamic bridge between the two"* (Clark, 2007: 1737). A similar phenomenon-driven approach is being called for within the academic business and management community – in an effort to improve the impacts of such research on society. This approach takes interesting phenomena as a starting point, rather than a theoretical puzzle. Starting with such "questions worth answering" is argued to be one way to deliver fruitful research that *"should both create conversations and yield cumulative insights, whether or not they advance theory"* (Davis, 2015:315). Phenomenon-driven research can contribute to understand the environment in which companies operate and would do well to shed light on the 'grand challenges' – major social and environmental problems, such as those addressed by the SDGs - facing business (e.g., Buckley et al., 2017; Davis, 2015; Doh, 2017; George et al., 2016; Wickert, Post, Doh, Prescott & Prencipe, 2020). Hence, phenomenon-driven research can help understand and raise awareness on important real-world problems, while simultaneously being able to advance science (Wickert et al., 2020).

The articles in my dissertation therefore draw from the sustainability science literature, and adopt a phenomenon-driven approach – i.e. the global adoption of the SDGs and the call upon companies to contribute to their achievement. In this age of sustainable development – where the challenges are grave but the opportunities for tackling them are within reach – I believe that

developing actionable knowledge that understand the current, and improve the potential future, role of business, is valuable.

1.6 Declaration of Contribution

Although for all chapters in this dissertation I am the leading author, having been responsible for the majority of the literature review, data collection, analyses, and writing, this dissertation would not have been possible without the contributions of others. Here, I acknowledge their invaluable inputs and declare my contribution to each of the studies:

Chapter 1 (introduction): I worked independently to complete this chapter. Dr. Frank Wijen provided valuable suggestions that were subsequently incorporated.

Chapter 2 (study 1): I collaborated with Prof. Rob van Tulder on this study. The research idea was proposed by me and matured from discussions with Rob van Tulder. The data collection and analysis were completed by me. I wrote the article's first draft while Rob van Tulder provided extensive advice and revisions. Feedback from three anonymous reviewers and the editor was incorporated into the article, which was published in the *Journal of International Business Policy* (van Zanten & van Tulder, 2018).

Chapter 3 (study 2): I developed the research idea, collected the articles, systematically reviewed the literature, and wrote the article. Prof. Rob van Tulder provided valuable inputs to the final draft, especially concerning its framing in terms of the 'nexus approach' – which at that time had become a major topic of our discussions. Dr. Frank Wijen's ideas and suggestions also proved valuable in taking the paper forward. An early version of the paper was presented at the 2019 Sustainability and Development Conference held at the University of Michigan in Ann Arbor, and I am grateful for the feedback received from the seminar participants. Two anonymous reviewers offered suggestions that were adopted into the article. The chapter was published in the *Journal of Sustainable Development & World Ecology* (van Zanten & van Tulder, 2020a).

Chapter 4 (study 3): The research idea and design, initial scoring of interactions between economic activities and SDG targets, and the analysis of interactions using network theory were my responsibility. Frequent discussions with

Prof. Rob van Tulder on the 'nexus approach' were invaluable to shaping the directions of this research. I wrote the first draft of the paper. Rob van Tulder offered extensive advice in developing the paper, gave inputs on the interactions, and helped write the final version of the article. Dr. Frank Wijen also provided valuable inputs into the thinking that forms the backbone of this paper. The feedback of two anonymous reviewers is incorporated in this version of the paper. The article was published in *Business Strategy and the Environment* (van Zanten & van Tulder, 2021a).

Chapter 5 (study 4): Prior to starting this PhD trajectory in late 2016, I proposed the idea for this paper to Prof. Rob van Tulder. Over the years, we collaborated on this study throughout our discussions to continually develop the research idea. The literature review, argumentation, and development of frameworks were first developed by me, which then benefited from the feedback and revisions from Rob van Tulder. Dr. Frank Wijen reviewed multiple versions of the manuscript and offered invaluable suggestions for improvement. A version of the paper was presented at the 2018 International Conference on Sustainable Development hosted by Columbia University in New York City. The paper had six rounds of reviews at three academic journals (four rounds at one journal, one round at two others). The feedback of a total of eight anonymous reviewers and three editors of various journals was included in the paper. The article was published in *Business Strategy and the Environment* (van Zanten & van Tulder, 2021b).

Chapter 6 (study 5): This study is a co-production between Prof. Rob van Tulder and myself. Rob van Tulder and I developed the idea together by circulating various drafts of the paper between ourselves. In addition, the suggestions of the two editors of the *Journal of International Business Policy* were included, where the chapter was published (see van Zanten & van Tulder, 2020b).

2. Multinational Enterprises and the Sustainable Development Goals: An Institutional Approach to Corporate Engagement[1]

Abstract

The Sustainable Development Goals (SDGs) cannot be achieved without the contributions of Multinational Enterprises (MNEs). However, extant international business research hardly covers the private sector's role in achieving international policy goals. This paper conceptualises the SDGs as a goal-based institution. Building on institutional theory, it develops propositions that help explain MNEs' engagement with SDGs. Exploratory survey results from 81 European and North American Financial Times Global 500 companies indicate that MNEs engage more with SDG targets that are actionable within their (value chain) operations than those outside of it, and more with SDG targets that "avoid harm" than those that "do good". Differences in SDG engagement based on MNEs' home- and host-countries, and their industrial sectors are also explored. We draw policy conclusions for a more pro-active involvement of MNEs in sustainable development, and we define avenues for future international business research. In particular, cross-sector partnerships deserve further attention.

2.1 Introduction

In 2015, all 193 United Nations (UN) member states unanimously committed to achieving the Sustainable Development Goals (SDGs) by 2030 (UN, 2015). These 17 goals were established following a massive stakeholder consultation (Kharas & Zhang, 2014) that involved governments, companies, civil society organisations, and knowledge institutes, while including the voices of over a million people from around the globe (UNDG, 2013). The SDGs aim to simultaneously advance a diverse range of sustainable development themes with universal coverage (Figure

[1] van Zanten, J. A., & van Tulder, R. (2018). Multinational enterprises and the Sustainable Development Goals: An institutional approach to corporate engagement. *Journal of International Business Policy*, *1*(3–4), 208–233. https://doi.org/10.1057/s42214-018-0008-x

2.1). Notwithstanding criticism for either being too ambitious (Copenhagen Consensus, 2016) or not being ambitious enough, especially concerning the modalities of their execution (Pogge & Sengupta, 2015), the SDGs are likely to constitute the most important frame of the global development agenda until 2030 (Kolk, 2016; Kolk, Kourula, & Pisani, 2017; Pattberg & Widerberg, 2016; Sachs, 2014).

Figure 2.1 - The Sustainable Development Goals

The SDGs present a noticeable break with earlier leading paradigms of sustainable development, including the Millennium Development Goals (MDGs), and the "Washington Consensus". The SDGs instigate a shift from a state-centred, duty-based, and negatively framed agreement aimed at "developing countries", to a partnering-centred, opportunity-based, and more positively framed ambition aimed at developed as well as developing countries. Noteworthy also is the emphasis placed on the importance of corporate efforts in realising sustainable development. Then UN Secretary-General Ban Ki-moon commented: *"Governments must take the lead in living up to their pledges. At the same time, I am counting on the private sector to drive success"* (UN News Centre, 2015). Helen Clark, at the time head of the UN Development Programme, added that *"the new sustainable development agenda cannot be achieved without business"* (UN News Centre, 2015).

Companies – many of which were involved as stakeholders in the creation of the SDGs – responded supportively. In 2015, 71 percent of businesses claimed that they were already planning how they would engage with the SDGs. 41 percent stated that they would embed the SDGs in their strategies within five years (PwC, 2015). A 2016 survey showed that 87 percent of a representative sample of CEOs worldwide believe that the SDGs provide an opportunity to rethink approaches to sustainable value creation, while 70 percent of them see the SDGs as providing a clear framework to structure sustainability efforts (Accenture & UN Global Compact, 2016). The World Business Council for Sustainable Development (WBSCD) added to these figures by describing the SDGs as *"an effective way for companies to communicate their contribution to sustainable development"* (WBCSD, 2015:8). There is a clear business logic to these responses: contributing to the SDGs can unlock 12 trillion USD annually in business opportunities (Business & Sustainable Development Commission, 2017). Whether companies can make this material depends on their further actions, in interaction with governmental policies and strategies of non-governmental organisations (NGOs) (GRI, UN Global Compact, & WBCSD, 2015; Hajer et al., 2015; UN Global Compact, 2017).

International business (IB) research has not kept pace with the expanding role of companies in sustainable development – in particular in agenda-setting activities such as the MDGs or SDGs. Studies on the role of Multinational Enterprises (MNEs) in sustainable development have generally focused on the macro-level of analysis, primarily by offering insights on the link between FDI and (mainly economic) development (Dunning & Fortanier, 2007; Kolk & van Tulder, 2010). In addition, a rich – albeit still fragmented – literature is developing on how companies can reach the "base of the pyramid" (e.g., London & Hart, 2004) and bridge the "institutional divide" between higher and lower segments of society (Rivera-Santos, Rufín, & Kolk, 2012). Recent literature reviews show that although certain studies have discussed companies' influence over specific sustainable development challenges, for instance relating to poverty and inequality, energy and climate change, and peace (e.g., Kolk et al., 2017; Kolk, Rivera-Santos & Rufín, 2018), far fewer research efforts have examined the actual actions of individual firms in sustainable development (e.g, Kolk, 2016; Kolk et al., 2017; van Tulder,

Verbeke, & Strange, 2014), understood as meeting the environmental, social, and economic needs of current and future generations (WCED, 1987).

The limited attention paid to the role of MNEs in the sustainable development discourse is remarkable considering the mainstreaming of concepts such as corporate social responsibility (CSR), corporate citizenship, and corporate sustainability (e.g., Dahlsrud, 2008; Garriga & Melé, 2004; van Marrewijk, 2003 on terminology).[2] Scholars have used these concepts to explore corporate engagement with sustainable development using academic perspectives related to business ethics (e.g., Donaldson & Dunfee, 1999; Frederiksen, 2010; Hemingway & Maclagan, 2004), strategic management (e.g., McWilliams & Siegel, 2001; Orlitzky, Siegel, & Waldman, 2011), stakeholder management (Parmar et al., 2010), institutional theory (e.g., Campbell, 2007; Matten & Moon, 2008), and political theory (e.g., Scherer & Palazzo, 2011; Scherer, Palazzo, & Matten, 2014). However, most efforts applying a CSR-related angle have studied outcomes on the performance of the firms engaging in such behaviour, rather than the impacts on society (Kolk, 2016).

Although there is no conclusive body of research on MNEs' impacts on society and the environment, many researchers have made critical remarks about the degree to which companies contribute to sustainable development. They observe that the majority of companies develop reactive strategies towards sustainability challenges, and regularly use their CSR/sustainability strategy as window dressing or greenwashing (Banerjee, 2008; van Tulder & van der Zwart, 2006). Within three years of their adoption, allegations that companies engage in "SDG washing", i.e., the use of the SDGs as an excuse for malpractice or as a cover up for modest efforts, emerged (Eccles & Karbassi, 2018; Nieuwenkamp, 2017).

By defining the world's sustainable development priorities, the SDGs offer a unique opportunity for studying MNEs' engagement with diverse and interlinked development challenges. But the SDGs are more than a wish-list. They are an intergovernmental agreement – based on multi-stakeholder engagement processes – that urges companies to help solve developmental challenges. The effects of global goal frames, such as yesterday's MDGs and today's SDGs, on the policies of MNEs

[2] A discussion on terminology is beyond the scope of this paper. We use the term corporate sustainability liberally and inclusively to refer to any efforts MNEs may initiate to contribute to sustainable development.

is not extensively studied. This partly stems from the novelty of the SDGs, the MDGs' governmental emphasis, the lack of proper evaluation methods for contributions to such frames (e.g., Hák, Janoušková, & Moldan, 2016), and the limited attention paid to the role of MNEs in institution-building (other than through lobbying activities towards governments). However, the advent of the SDGs as a global consensus on sustainable development priorities by the private and public sectors alike fundamentally changes the discourse. The aims of this paper are to conceptualise the SDGs as a topic for international business strategies, to use this conceptualisation to obtain initial evidence on MNEs' engagement with the SDGs, and to outline a policy and research agenda for further enhancing MNEs' contributions to the SDGs.

We adopt an institutional lens in proposing how institutional pressures may influence MNEs' sustainability efforts, including those that emerge from the SDGs themselves. By being an intergovernmental agreement, an institutional approach lies at the heart of the SDGs. Moreover, political and economic institutions govern corporate behaviour, including their sustainability activities (Campbell, 2007; Matten & Moon, 2008), their ethical activities, their internationalisation strategies (Marano & Kostova, 2016), as well as the ways in which they address stakeholder concerns (Freeman, Wicks, & Parmar, 2004). For these reasons, and following Campbell (2007), we consider institutions as an important and primary – but not the sole – driver for MNEs to engage with specific SDGs.

This paper makes several contributions to the literature. We conceptualise the SDGs as a goal-based institution for international business and develop propositions that argue how MNEs' engagement is influenced by traits of SDGs and traits of MNEs. We posit that two SDG traits are important: i) the actionability of an SDG target, which can be internal or external to MNEs' (value chain) operations; and ii) the ethical duties conveyed by the SDG target, which can be positive ("doing good") or negative ("avoiding harm"). Together, these traits describe the moral behaviour of MNEs in terms of ability and type, respectively. We further argue that engagement with SDGs is influenced by two traits of MNEs: i) their home- and host-country contexts; and ii) their industrial sector. Providing detailed empirical proof of our propositions is beyond the scope of this paper. Instead, we present exploratory survey results from 81 European and North American Financial Times

(FT) Global 500 companies. These indicate that MNEs engage more with internally than externally actionable SDG targets, that SDG engagement is higher for SDG targets that seek to avoid harm rather than do good, that European MNEs engage with more SDG targets than North American MNEs, and that MNEs in industrial sectors with negative externalities engage more with SDG targets that seek to avoid harm. Building on our analysis, we discuss policies for the further and more pro-active engagement of MNEs in achieving the SDGs.

The remainder of this paper is organised as follows. Section 2 discusses literature relating to institutional theory and the role of MNEs in sustainable development to conceptualise the SDGs as a goal-based institution. Expanding on this discussion, we develop propositions that indicate MNEs' engagement with specific SDGs in section 3. Section 4 describes the survey design and sample. The findings indicate how and to what degree a selection of MNEs engage with SDG targets (section 5). In section 6, we aim to explain MNEs' engagement with specific SDG targets, characterise MNEs as agents in sustainable development, and propose how MNEs can be further involved in realising the SDGs. Section 7 offers conclusions, identifies limitations and delineates avenues for future research.

2.2 Institutions and MNEs' engagement with the SDGs

This section firstly discusses how institutions influence the role of MNEs in sustainable development (section 2.1). It subsequently argues that the SDGs can be understood as a goal-based institution (section 2.2).

2.2.1 Institutions and the role of international business in sustainable development

Companies are governed by institutions, which can be defined as the formal and informal "rules of the game" (North 1990). Institutions constrain and enable corporate activities at the macro (international, national), meso (inter-organisational), and micro (company) levels (e.g., Campbell, 2004). They can broadly be categorised into three types: i) regulative institutions, or formal rule systems enforced by the state; ii) normative institutions, which are related to professional societies that set roles and expectations for specific groups; and iii) cultural-cognitive institutions that describe the accepted beliefs and values shared

among individuals of a society (Scott, 1995). Abiding by institutions is important as it confers legitimacy on companies through coercive, mimetic, and normative isomorphic processes (DiMaggio & Powell, 1983).

Institutions are highly relevant in debates on the role of MNEs in sustainable development. Governments in developed and developing countries have increasingly enacted policies that require companies to provide environmental and social protection (e.g., Rivera, 2010; Wijen, Zoeteman, Pieters, & van Seters, 2012). International agreements as developed since the second half of the 21st century further testify to this trend. Examples include the UN and International Labour Organization (ILO) conventions on human rights and labour conditions. Moreover, norms and values in societies change over time and increasingly require MNEs to pay attention to ethical and sustainability issues (Crane & Matten, 2016; Swanson, 2018). Hence institutionalism helps explain why companies engage in socially responsible behaviour (Campbell, 2007), how corporate sustainable development is shaped (Bansal, 2005), and how such activities differ across companies from, and operating in, different countries (e.g., Matten & Moon, 2008; Marano & Kostova, 2016).

But institutions are not simply imposed on companies by regulators and cultural groups. Rather, MNEs play a role in shaping the institutions that influence their behaviour – particularly when operating in the "normative free space" (Donaldson & Dunfee, 1999) and the "institutional void" that lies beyond national regulatory regimes. The influence of institutions on MNEs and vice versa has rendered institutional distance one of the most salient factors to take into account when studying the behaviour of MNEs (Verbeke, Puck, & van Tulder, 2018). This equally applies to the role of MNEs in sustainability issues. Reflecting a broader trend of greater corporate engagement in sustainable development (Blowfield, 2012), over the past decades, MNEs have expanded their involvement in international negotiations on institutional frameworks for sustainable development, including those on the SDGs (Scheyvens, Banks, & Hughes, 2016). As such, MNEs help form institutions that can govern, but also guide, their sustainable development activities.

Aside from influencing regulations, MNEs have also increasingly developed normative institutional initiatives to make their operations more

environmentally sustainable and socially responsible by creating norms, rules, and standardised procedures for their own sustainable business conduct (Brammer, Jackson, & Matten, 2012). Four types of normative institutional initiatives that encourage companies to contribute to sustainable development have become particularly widespread in recent years (Rasche, Waddock, & McIntosh, 2013). This includes: i) *principle-based initiatives*, such as the UN Global Compact and the OECD Guidelines for Multinational Enterprises, which urge companies to commit to specific norms in their day-to-day operations; ii) *certification initiatives* that address developmental issues associated with the production of specific goods, like the Marine Stewardship Council and Social Accountability 8000; iii) *reporting initiatives* (e.g., the Global Reporting Initiative) that seek to advance the disclosure of companies' social and environmental information pertaining to companies; and iv) *process-based initiatives*, such as AccountAbility's standards, set up procedures for managing corporate responsibility (Rasche et al., 2013). Because institutional initiatives seek to govern corporate outcomes on the environment and on society, they have been understood as an institution for transnational governance (Barkemeyer, Preuss, & Lee, 2015; Rasche & Kell, 2010; Scherer & Palazzo, 2011; Waddock, 2008).

In this light, the SDGs represent the culmination of a number of internationally agreed-upon rules, guidelines, and principles for MNEs, as well as of normative institutional initiatives. Corporate engagement with sustainable development themes – such as those defined by the SDGs – will thus be influenced by existing (formal and informal) institutions (e.g., Bondy, Moon, & Matten, 2012; Campbell, 2007; Matten & Moon, 2008). Yet, the SDGs themselves can also be thought of as an institutional initiative. The next section applies an institutional lens to the SDGs to understand their potential influence on the role of MNEs in sustainable development.

2.2.2 The SDGs as a goal-based institution

The SDG framework can be considered as a combined effort of governments, businesses, knowledge institutes, and civil society in developing an institutional initiative for realising sustainable development. The SDGs signal a shift in institutional focus from the MDGs (Fukuda-Parr, 2016) which communicated a

simplified concept of development as meeting basic needs, without mentioning the need to reform institutions. Several authors warned that the "negotiations around the post-2015 development agenda should go beyond just re-writing goals and targets that adhere to "sustaining" the same old economic and social models" (Moore, 2015:801). This raises the question of how the SDGs can be understood as an institutional initiative.

As a set of internationally agreed-upon goals, the SDGs define the sustainable development aspirations of all countries and major stakeholder groups. Their voluntary nature, lack of sanctions, and the few formal mechanisms in place to ensure the achievement of the goals (Biermann, Kanie, & Kim, 2017; Bowen et al., 2017), allow for understanding the SDGs as "soft" international law (Persson, Weitz, & Nilsson, 2016). An important dimension of the SDG framework is, therefore, the liberty it offers to governments, as well as to other stakeholders, to decide which goals to act upon (Stevens & Kanie, 2016). Additionally, by starting with aspirations without defining concrete implementation methods, the SDGs are an opportunity for an institutional initiative centred on creative thinking that involves increasingly diverse actors (Stevens & Kanie, 2016). On this basis, Biermann et al. (2017) argue that the SDGs amount to a distinct type of institution – termed "global governance through goals" – that introduces a unique and new way of steering global development efforts.

As a goal-based institution, the SDGs can influence corporate policies for sustainable development. Goals are critical for orienting and socially mobilising multiple stakeholders' activities in a consistent manner towards a specific, concise, measurable, and new trajectory of sustainable development, while simultaneously putting peer pressure on agents regarding their progress made towards the goals (Sachs, 2015). The SDGs' bottom-up approach that encourages the participation of a wide variety of stakeholders (Biermann et al., 2017) also helps mobilise businesses (Hajer et al., 2015; Schönherr, Findler, & Martinuzzi, 2017). Seen this way, the SDG framework, which importantly includes five principles to guide agents' efforts - People, Planet, Prosperity, Peace, and Partnering (UN, 2015) – can be understood as applying normative institutional pressure to work towards the achievement of the SDGs. Contributing to these goals, then, can be a source of organisational legitimacy (DiMaggio & Powell, 1983), which is most likely obtained if a company

is able to show the benefits it achieves from working towards the SDGs (Donoher, 2017).

2.3 Development of propositions

Institutions, including the SDGs themselves, thus apply pressure on MNEs to engage with the SDGs. But because the SDGs are a voluntary institutional arrangement, agents have the liberty to decide which goals they want to work towards. This section aims to understand better which traits of SDGs and of MNEs are more likely to lead to MNEs' engagement. We focus on two selected SDG traits: the *actionability* of SDG targets; and the *ethical duties* conveyed by SDG targets. These two traits recognise that sustainable development is an ethical concept (cf. WCED, 1987). They were selected because they, jointly, describe the moral behaviour of companies. Actionability describes a company's ability to act on a SDG target, while ethical duties describes the type of intended behaviour. We further include MNEs' *home- and host-country* and *industry* levels (Delmas & Toffel, 2008), to assess how traits of MNEs relate to the extent to which they engage with the SDGs.

2.3.1 Actionability

The SDG agenda urges agents from all sectors in society, including governments, the private sector, and civil society, to contribute to their achievement. Each of the sectors brings complementary capabilities for contributing to sustainable development challenges (Brinkerhoff & Brinkerhoff, 2011; Selsky & Parker, 2005). Yet, not all actors are equally equipped to contribute to all types of sustainable development themes. For example, certain themes demand governmental action while others primarily need the private sector to provide solutions (van Tulder & van der Zwart, 2006). Notwithstanding a certain degree of interconnectedness among the goals (Le Blanc, 2015; Nilsson, Griggs, & Visbeck, 2016), the 17 SDGs and their underlying 169 targets define highly diverse sustainability challenges. As a result, the actionability of – and the responsibility for – their implementation varies across the targets. At the same time, some SDG targets are so complex that they can only be realised through collective action in which governments, companies, and civil society organisations work in partnership (van Tulder & Keen, 2018).

SDG targets can be characterised according to whether they are internally or externally actionable. Internally actionable SDG targets can be engaged with within MNEs or throughout their value chains. Hence, these SDG targets fall in a company's sphere of influence (cf. Ruggie, 2008). Externally actionable SDG targets cannot be meaningfully advanced within a company's internal and value chain operations. Significant contributions towards their achievement can only be made when working in partnership with other types of agents. To illustrate, SDG target 16.5, to "Substantially reduce corruption and bribery in all their forms", can be implemented throughout a company with relatively little help from the government or civil society, thus being internally actionable. In contrast, to "provide access to affordable and safe housing for all" (SDG target 11.4), is externally actionable, thereby requiring partnerships between the private sector, states, and civil society.

Externally actionable SDG targets are vulnerable to the "free rider" problem, in which agents are reluctant to act collectively towards reaching a goal unless it is likely that progress is made and others are held accountable for their contributions (Bowen et al., 2017). Cross-sector partnerships could overcome this problem by promoting collaboration among actors in a structured manner. However, even though such partnerships have become increasingly widespread, they are relatively complex for companies to create and operationalise (Babiak & Thibault, 2009; Pattberg & Widerberg, 2016; van Tulder & Pfisterer, 2014). In addition to collaboration between societal sectors, arm's length strategies, such as philanthropy and corporate volunteering, can lead to engagement with externally actionable SDGs. Yet, such policies are frequently disconnected from companies' core activities (Austin & Seitanidi, 2012).

In this light, it appears easier for MNEs to address sustainability challenges that are internally actionable. In this endeavour, MNEs are helped by existing normative institutions, which have a dominant focus on self-regulation (Brammer et al., 2012). Using such institutional arrangements, companies have increasingly regulated their own and their value chain activities with the purpose of improving their impact on sustainable development themes (Scherer et al., 2014). Illustrative of this trend is the spread of codes of conduct (e.g., Bondy et al., 2012; Kolk, van Tulder, & Welters, 1999; Painter-Morland, 2006; van Tulder, van Wijk, & Kolk,

2009), the reporting mechanisms that communicate a company's social and environmental footprints (e.g., Barkemeyer et al., 2015), as well as the introduction of the "Ruggie principles" that guide MNEs' human rights policies (Ruggie, 2007, 2008).

On this basis, we propose that internally actionable SDG targets, by helping MNEs apply ethical principles to their operations, reducing their negative environmental and social footprints, and regulating their own activities, receive greater engagement than externally actionable SDG targets that require MNEs to act in partnership with the state or civil society:

Proposition 1: Companies are more likely to engage with internally actionable SDG targets, compared to externally actionable SDG targets.

2.3.2 Ethical duties

Cultural-cognitive institutions, or simply the norms and values in societies, describe the type of behaviour that is expected of companies. Companies can act in socially responsible and in socially irresponsible ways (e.g., Giuliani, Macchi, & Fiaschi, 2014; Jones, Bowd, & Tench, 2009; Strike, Gao, & Bansal, 2006). Socially responsible behaviour is a prerequisite for contributing to sustainable development, yet can take different forms. Ethical theory distinguishes between positive and negative ethical duties (e.g., Rawls, 1972). Positive duties entail making additional contributions to the well-being of society, or "doing good", while negative duties imply pre-empting negative impacts on communities and the environment, thereby "avoiding harm". This distinction is common in business research (cf. Crilly, Ni, & Jiang, 2016; Lin-Hi & Müller, 2013), and is also prevalent in the normative practice of many professions: see for instance the widespread application of "do no harm" principles in the medical profession, or the compliance practices of large companies.

Activities that aim to avoid doing harm are expected of every good citizen; actions that seek to do good exceed social expectations (Davis, 1973; Lin-Hi & Müller, 2013). Lichtenberg explains that "No one disputes that people have duties not to harm others; these so-called negative duties are about as well established as any moral duties could be. But the very existence of "positive" duties to render aid is controversial" (Lichtenberg, 2010:557). The same applies to companies: avoiding

negative impacts occurring is a minimum behavioural standard regarding the company's relationship to its stakeholders (cf. Campbell, 2007:951). As a cultural-cognitive institution, avoiding harm can thus be considered to be a stronger norm than actively creating positive change. Emphasis on negative duties is also widespread in regulative and normative institutions that address corporate impacts on society and the environment. These overwhelmingly intend to reduce companies' negative externalities, or abuse of power and influence, while paying less attention to helping companies engage in radical or systemic change that will be necessary for achieving many of the SDGs.

The various recent corporate scandals and the public outrage that consequently ensued – from the 2018 Facebook-Cambridge Analytica data hijacking scandal, the 2015 Volkswagen diesel emissions scandal to the 2010 BP Deepwater Horizon oil spill - are clearly rooted in companies' violation of the norm and their (negative or fiduciary) duty to "avoid doing harm". In contrast, when companies abstain from actively "doing good", norms are not violated to the same extent. Moreover, companies that actively try to "do good" without mitigating their negative impacts are vulnerable to accusations of greenwashing (e.g., Banerjee, 2008).

The distinction between avoiding harm and doing good can be applied to the SDGs. SDG target 2.3, to "double the agricultural productivity and incomes of small-scale food producers by 2030", illustrates the doing good category. An example of an SDG target that seeks to avoid harm is target 6.3: to "improve water quality by reducing pollution, eliminating dumping, and minimising the release of hazardous chemicals and materials." Based on this assessment, we formulate proposition 2:

Proposition 2: Companies are more likely to engage with SDG targets that intend to avoid harm than with SDG targets that aim to do good.

2.3.3 Home-countries and host-countries

Corporate sustainability policies are influenced by institutions in MNEs' home-countries (Doh & Guay, 2006; Kolk & van Tulder, 2010; Matten & Moon, 2008). In an effort to characterise the nature of countries' institutional infrastructures, the

"varieties of capitalism" approach distinguishes between liberal and coordinated market economies (Hall & Soskice, 2001). Companies operating in liberal market economies rely heavily on hierarchies and competitive market arrangements, whereas companies operating in coordinated market economies depend on their embeddedness in broader societal networks (Hall & Soskice, 2001). Following such institutional differences, North American companies, influenced by the liability orientation of American institutions (also known as the "substantial equivalence principle"), tend to have a defensive/reactive sustainability approach (Doh & Guay, 2006). They are characterised by explicitly assuming and articulating responsibility for a relatively narrow set of societal interests (Matten & Moon, 2008). European companies are argued to apply "precautionary principles" that prevail in the European context (Doh & Guay, 2006) and they implicitly assume a role within the wider formal and informal institutions for societal interests (Matten & Moon, 2008). We therefore formulate proposition 3a as follows:

Proposition 3a: Companies headquartered in Europe will engage with more SDG targets than companies headquartered in North America.

When companies act beyond their home-countries they are likely to encounter a wider variety of relevant sustainability challenges. To illustrate, climate change mitigation by reducing deforestation is a particularly urgent issue in tropical regions, and low- and middle-income countries are challenged to eradicate absolute poverty while high-income societies grapple with relative poverty. Thus although the SDGs apply globally, the relevance of the specific challenges outlined by the goals is dependent on local contexts. The SDG Index of the Bertelsmann Stiftung and the Sustainable Development Solutions Network clearly illustrates that the world's countries are on diverse trajectories towards achieving the SDGs (Sachs, Schmidt-Traub, Kroll, Durand-Delacre, & Teksoz, 2017).

In addition to encountering more diverse sustainability challenges, internationalisation expands a firm's legitimating environment to also include host-country institutional contexts (Kostova & Zaheer, 1999). Governments around the world are increasingly requiring companies to contribute to issues related to sustainable development (Rivera, 2010; Wijen et al., 2012). This causes more

internationalised companies to face a wider variety of regulations, which may induce the company to engage with sustainability challenges it has little prior experience with. Companies in South Africa, for instance, are required to contribute to the empowerment of previously disadvantaged people via Broad-Based Black Economic Empowerment (B-BBEE) regulations, in order to help overcome the injustices of the apartheid regime (Arya & Bassi, 2011). And similar to regulative institutions, normative institutions that relate to professional or industrial societies, and the norms and values at the cultural-cognitive level, differ across countries (Husted & Allen, 2006; Jamali & Neville, 2011). Internationalisation therefore increases the number and diversity of stakeholder pressures on the firm (Brammer, Pavelin, & Porter, 2006; Sharfman, Shaft, & Tihanyi, 2004), which can be argued to both positively and negatively affect corporate responsiveness (e.g., Kolk & Fortanier, 2013).

Host-country institutional environments are important for foreign MNEs as they may suffer from a "liability of foreignness" (e.g., Zaheer, 1995). Abiding by regulations and norms, responding to stakeholder concerns, and contributing to relevant development issues in host-countries may help in obtaining local legitimacy and thereby overcoming this liability (Attig, Boubakri, El Ghoul, & Guedhami, 2016; Bhanji & Oxley, 2013; Brammer, Pavelin, & Porter, 2009; Crilly et al., 2016; Schaltegger & Hörisch, 2017; Yin & Jamali, 2016).

We therefore propose that internationalisation, by leading companies to gain exposure to a wider variety of relevant SDGs, as well as to more diverse institutional environments calling for engagement with SDGs, increases the extent to which companies engage with SDGs:

Proposition 3b: More internationalised companies will engage with more SDG targets than less internationalised companies.

2.3.4 Industrial sectors

A final factor to take into account is sectoral. Certain industrial sectors are associated with greater negative externalities than others (Brammer & Pavelin, 2006). Direct negative social and environmental impacts have been related to sectors such as agriculture, alcohol, tobacco, chemicals, mining, metal manufacturing,

paper, and pulp (e.g., Brammer & Pavelin, 2006; Cai, Jo, & Pan, 2012; Clemens, 2001; Radley & Vogel, 2015). Similarly, certain sectors are uniquely positioned to contribute to specific social or environmental challenges. For example, the pharmaceutical sector seems well-placed to contribute to health challenges, while agriculture links to issues of food security. Thus, opportunities to both reduce negative impacts (Hall & Vredenburg, 2003) and benefit from sustainability initiatives (Carroll & Shabana, 2010), differ across industries.

In many cases, institutions that influence corporate sustainability policies apply on a sectoral basis. Governmental regulations frequently address sustainability challenges arising from specific industries. For example, the globally adopted Montreal Protocol caused industrial companies to phase out chemicals that damage the Ozone layer, thereby reducing their pollution (DeSombre, 2000). Companies often also collectively implement regulations via the industrial associations they belong to, as to ensure that their members act in socially responsible ways (Campbell, 2007). An illustration is the Roundtable for Sustainable Palm Oil, which brings together companies and other societal actors that affect sustainability challenges pertaining to the palm oil sector. Finally, cultural-cognitive institutions are influenced by a company's industrial sectors. To illustrate, stakeholder expectations, and the ability to obtain their legitimacy, depend on the industry in which a company operates (Bansal, 2005; Scherer, Palazzo, & Seidl, 2013; Spar & La Mure, 2003). Companies active in sectors that are typically associated with negative externalities are evaluated worse in terms of social performance than companies in sectors with more positive externalities (Crilly et al., 2016) and more likely to experience NGO activism (Vachani, Doh, & Teegen, 2009).

This discussion points to institutions frequently being used to mitigate negative externalities. As a result, companies in sectors associated with negative externalities are more likely to implement sustainability policies to avoid doing harm (e.g., Baron, 1996). It can also be argued that such companies face more pressure to actively do good by contributing to local societal challenges as to obtain positive stakeholder evaluations (Crilly et al., 2016). Following this discussion, we formulate the following proposition:

Proposition 4: Companies from industries associated with negative externalities will engage with more SDG targets than companies from industries with more positive externalities.

2.4 Methodology

2.4.1 Identifying and characterising relevant SDG targets

We used the SDGs as a benchmark for corporate engagement with specific sustainable development themes, thereby adopting an issue-based approach to understanding the role of MNEs in sustainable development (cf. Kolk, 2016). The breadth of the 17 SDGs, including their 169 targets with more than 300 indicators, makes it challenging to study MNEs' engagement with sustainable development themes. While the full list of 169 SDG targets can be argued to be too specific to serve as an effective framework for companies, a focus on SDG targets rather than the overarching 17 goals is valuable in order to obtain a more complete picture of companies' developmental efforts. Therefore, our aim was to derive a representative listing of SDG targets that are relevant to companies, so as to facilitate their inclusion in a survey without causing validity constraints.

To this end, our starting point were the 126 substantive official SDG targets (i.e., the SDG targets that have a number rather than a letter). To condense this list, we excluded SDG targets that are primarily aimed at governmental action. This led to the elimination of 34 targets. Examples of SDG targets that were excluded are: "14.5 By 2020, conserve at least 10 percent of coastal and marine areas, consistent with national and international law and based on the best available scientific information"; "16.9 By 2030, provide legal identity for all, including birth registration"; and "17.10 Promote a universal, rules-based, open, non-discriminatory and equitable multilateral trading system under the World Trade Organization…". Most of the excluded targets relate to SDG 10 – Reduced Inequalities (5 targets), SDG 16 – Peace, Justice, and strong Institutions (5 targets), and SDG 17 – Partnerships for the Goals (12 targets).

The list of 92 remaining SDG targets was further condensed using two methods. First, various SDGs contain highly similar targets. We merged multiple targets into one target that captures the essence of all. For example, SDGs 1 (No

Poverty), 11 (Sustainable Cities and Communities), and 13 (Climate Action) call for improved disaster and emergency planning. We included this target once, but for all three SDGs. Second, we summarised similar, and often highly specific, SDG targets, to capture their main essence. For example, there are nine targets supporting SDG 3 – Good Health and Well-Being – ranging from reducing maternal mortality (target 3.1), to reducing deaths and illnesses from pollution (target 3.9). We aggregated them into three targets: i) Health-care services and medicines for all; ii) Mental health and well-being; and iii) Occupational health and safety. In doing so, we took explicit – political – linkages between the targets into account (e.g., Le Blanc, 2015). Again, targets that explicitly relate to multiple SDGs were characterised as such. An example is reducing air, water and soil pollution (which in addition to SDG 3 also relates to SDG 6 – Clean Water and Sanitation – and to SDG 12 – Responsible Consumption and Production).

In merging and summarising the SDG targets we – where possible – followed the wording of the SDG business themes that are included in the SDG Compass (GRI et al., 2015) so as to improve the extent to which the targets relate to the private sector. Along these lines, we reworded certain targets to relate better to corporate activities. An example of a target that was rephrased to link better to the private sector is target 12.7, to "Promote public procurement practices that are sustainable, in accordance with national policies and priorities". We reworded this target as "Socially responsible and environmentally sustainable sourcing".

We consequently obtained a total of 59 SDG targets that are particularly relevant to the private sector. Many of these targets relate to multiple SDGs, causing these 59 SDG targets to have 100 linkages with specific SDGs. Building on the discussion in section 3, we characterised each of these targets according to two traits: being internally or externally actionable, and intending to avoid harm or to do good as to describe ethical duties. First, SDG targets that are relevant to a company's internal and value chain operations were characterised as being internally actionable. In contrast, SDG targets that describe sustainability challenges that require the actions of all spheres of society, including the public, private, and civil society sectors, were characterised as being externally actionable. Second, we characterised the ethical duties conveyed by the SDGs' targets by differentiating between "doing good" and "avoiding harm". Targets in the former category were

defined as helping companies exceed social expectations by generating positive externalities. Targets in the latter category seek to reduce negative externalities, thus indicating outcomes that are expected of responsible companies. The samples constructed along both traits are relatively equally distributed: (1) internal-external actionability (31-28); (2) avoiding harm – doing good (27-32). An overview of the targets, how they link to the SDGs, and their categorisations along these traits is shown in Table 1.

The relevance of our shortlist of SDG targets, including their traits, was validated through (face-to-face or Skype) conversations with four CSR/corporate sustainability professionals, working for MNEs in the financial services and food and agricultural sectors, and with one corporate responsibility programme manager at the UN.

Table 2.1 - SDG targets included in the study

SDG target	Nexus of relevant SDGs						Action-ability	Ethical duties
Socially responsible and environmentally sustainable sourcing	1	2	8	12	14	15	Internal	Doing good
Fair payment to small-scale suppliers	1						Internal	Doing good
Goods and services for those on low incomes	1						Internal	Doing good
Access to financial services for all, including the most vulnerable	1	8	9	10			External	Doing good
Sustainable food production	2	13	15				Internal	Doing good
Healthy and sufficient food for those on low incomes	2	3					External	Doing good
Agricultural productivity of small-scale suppliers	1	2					External	Doing good
Small-scale producers' ownership over land and other property	1	2					External	Doing good
Actual and potential impacts on local communities	1	2					External	Avoiding harm
Occupational health and safety	3	8					Internal	Avoiding harm

Mental health and well-being	3						External	Avoiding harm
Health-care services and medicines for all	3	5					External	Doing good
Employee training and education	4	8					Internal	Doing good
Education to promote sustainable development	4	12	13				External	Doing good
Children's access to education	4						External	Doing good
Water, sanitation, and hygiene	6						External	Doing good
Water use efficiency	6						Internal	Avoiding harm
Energy efficiency	7	8					Internal	Avoiding harm
Energy infrastructure	7						External	Doing good
Renewable energy	7						External	Doing good
Access to energy for all	7						External	Doing good
Labour rights and practices in the supply chain	8						Internal	Avoiding harm
Elimination of forced labour and child labour	8						Internal	Avoiding harm
Economic growth and productivity, particularly in developing countries	8						External	Doing good
Employment for all, particularly young people and people with disabilities	8						Internal	Doing good
Resilient and sustainable infrastructure	9						External	Doing good
Sustainable technologies and sustainable industrial processes	9						External	Doing good
Responsible finance	10						External	Doing good
Investment (e.g., FDI) in developing countries	10	17					Internal	Doing good
Access to information and communication technology for all	9						External	Doing good
Access to affordable and sustainable transport for all	11						External	Doing good
Access to affordable and safe housing for all	11						External	Doing good

Cultural and natural heritage and diversity	11						External	Doing good
Greenhouse gas emission reductions	13						Internal	Avoiding harm
Funding for developing countries' climate change actions	13						Internal	Doing good
Transfer of (sustainable) technologies to developing countries	12	17					Internal	Doing good
Resilience to climate-related hazards	13						External	Avoiding harm
Disaster and emergency planning	1	11	13				Internal	Avoiding harm
Reducing air, water, and soil pollution	3	6	12				Internal	Avoiding harm
Sustainable waste management	3	6	8	11	12		Internal	Avoiding harm
Marine, coastal, and other water-related ecosystems	6	14					External	Avoiding harm
No overfishing and illegal-, unregulated- and destructive-fishing	2	14					External	Avoiding harm
Ecosystems and biodiversity on land	15						External	Avoiding harm
Halt poaching and trafficking of protected species	15						External	Avoiding harm
Halt or reverse deforestation and/or desertification	15						External	Avoiding harm
No corruption and bribery	16						Internal	Avoiding harm
Accountable and transparent governance	16						Internal	Avoiding harm
Responsive and inclusive decision-making at all levels	16						Internal	Avoiding harm
Equal pay and opportunities for men and women, at all levels	5	10					Internal	Avoiding harm
No discrimination and anti-discrimination laws and policies	5	8	16				Internal	Avoiding harm
No workplace violence and harassment	5	16					Internal	Avoiding harm
Childcare services and benefits	4	5					Internal	Doing good
Collective bargaining for wages and benefits along the supply chain	1	8					Internal	Avoiding harm

Social protection systems for all	1	10					External	Doing good
Protection of privacy	16						Internal	Avoiding harm
External reporting on sustainability	12						Internal	Avoiding harm
Data availability and public access to information	16	17					Internal	Doing good
Tools to monitor impacts on sustainable development	12	17					Internal	Avoiding harm
Partnerships with the public and civil-society sectors	17						Internal	Doing good

2.4.2 Digital survey

Our survey allowed for obtaining the viewpoints of a wide array of companies in a standardised manner. The survey consisted of two parts. The first part requested participants to identify to what extent, on a labelled five-point scale, they think their company's policies contribute to each of the identified 59 SDG targets. The second part asked respondents how they think their companies' policies contribute to each of the 17 SDGs. Participants were given five options, which partially relate to the elements the UN Global Compact (2013) considers to be critical to a comprehensive sustainability approach: embedding the SDG in the company's strategy; contributing philanthropically; engaging in partnerships with the public and/or civil society sectors; having advocacy campaigns; and/or sharing data.

Our study concentrated on large MNEs from Europe and North America because these are faced with a relatively developed institutional context regarding sustainability regulation that nevertheless portrays noticeable differences (see the discussion in section 3). Amongst globally operating companies, North American and European companies have also adopted the most prominent role in sustainable development. European companies in this subsample have thereby taken a more active role. In the 2017 Dow Jones Sustainability Index, for instance, European companies lead in 16 out of 24 sectors.

We used the 2015 FT Global 500 to identify such firms. Out of these 500 firms, a total of 350 were headquartered in Europe (122) or North America (228).

For each of these 350 companies, we approached executives whose work relates to their company's role in sustainable development challenges. This includes executives in corporate sustainability and CSR departments. This selection was made in an effort to maximise the possibility that the respondents have an understanding of their company's engagement with the SDGs. For 301 of these companies, we found either personal contact details or contact details of corporate sustainability or CSR departments (111 European and 190 North American firms).

The survey was sent to a total of 382 email addresses. Hence, multiple email addresses were retrieved for certain companies. The questionnaire was conducted anonymously to reduce sensitivity and limit the likelihood that participants offered socially desirable answers. Our control questions were relatively generic. Too detailed questions about the companies (e.g., on profitability, turnover, or exact size) were not included because in our experience this dramatically limits the willingness to participate and/or provide meaningful answers on strategic issues. 89 corporate representatives filled out the survey. Eight responses were incomplete and therefore dropped, leaving a total of 81 respondents, which also represent 81 unique companies (response rate 21 percent). Table 2.2 displays the demographic details of the respondents, including selected details of their companies. The findings were analysed using SPSS.

Table 2.2 - Details of respondents and their companies[3]

Gender respondent (N=80)	**Number of respondents**	**Percentage of respondents**
Female	45	56%
Male	35	44%
Operates in number of countries (N=79)		
<10	13	16%
10-49	19	24%
>50	47	59%
Region of company headquarters (N=81)		

[3] The respondents had the possibility to skip questions. Therefore, N does not always add up to 81.

Europe	54	67%
North America	27	33%
Sector (N=80)		
Fast moving consumer goods	9	11%
Extractive industries	6	7%
Professional services	18	23%
Manufacturing	12	15%
Transport and retail	9	11%
ICT	11	14%
Finance	15	19%

2.5 Results

This section presents a general overview of corporate involvement in the SDGs. It first shows to what extent and how the respondents believe their companies are engaging with each of the 59 SDG targets, as well as to the overarching 17 SDGs (section 5.1). The statistical analysis helps to explain these general findings on a more detailed level (section 5.2).

2.5.1 General findings

For 81 companies, we were able to assess the extent to which they engage with the 59 SDG targets.[4] Based on median scores, these targets can be grouped into those that received high, moderate, and low contributions (Table 2.3).

Table 2.3 - MNEs' engagement with different types of SDG targets (N=81)

Extent of engagement with SDG targets	Actionability (%)		Ethical duties (%)	
	Internal	External	Avoid harm	Doing good
High (median score: 4-5) (N=21)	90%	10%	71%	29%
Moderate (median score: 3) (N=21)	43%	57%	33%	67%

[4] A detailed scoring table is available upon request.

Low (median score: 1-2) (N=17)	18%	82%	21%	79%

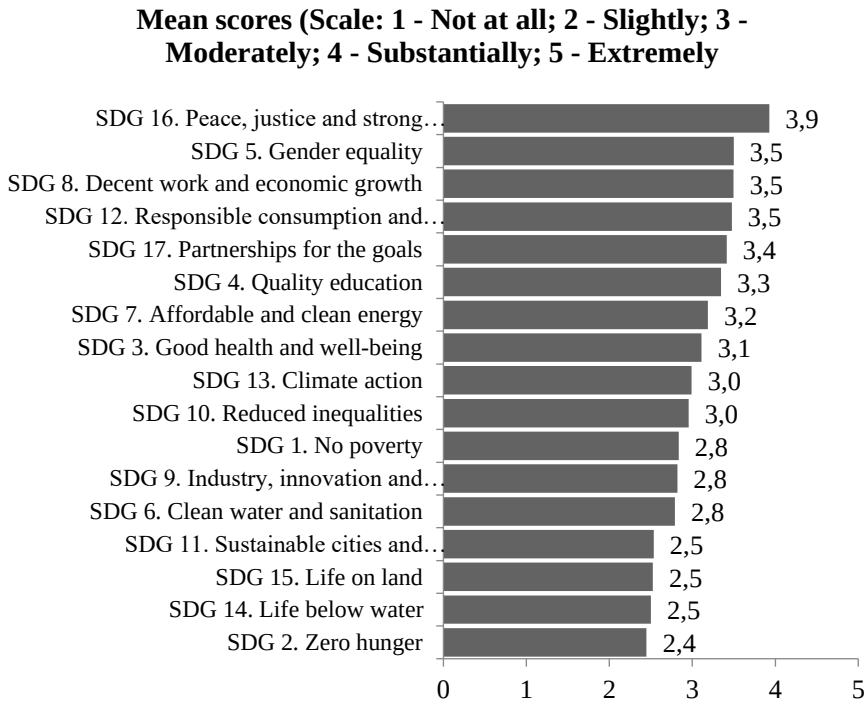
21 targets received a median score of five (indicating an extreme contribution to the target) or four (indicating a substantial contribution to the target). Companies indicate particularly high contributions to SDG 5 (Gender Equality), SDG 8 (Decent Work and Economic Growth), SDG 12 (Responsible Consumption and Production), SDG 13 (Climate Action), SDG 16 (Peace, Justice, and strong Institutions), and SDG 17 (Partnerships for the Goals).

21 targets received a median score of three, indicating that the respondents' policies moderately contribute to these targets. Many of these targets contribute to SDG 8 (Decent Work and Economic Growth). Other targets included in this segment particularly relate to SDG 1 (No Poverty), SDG 2 (Zero Hunger), SDG 3 (Good Health and Well-Being), SDG 4 (Quality Education), SDG 6 (Water and Sanitation), SDG 7 (Affordable and Clean Energy), and SDG 10 (Reduced Inequalities).

The remaining 17 targets received a median score of 2 (a slight contribution), or 1 (no contribution at all). The policies of the respondents' firms are thus relatively disconnected from these targets. Multiple targets included in this category support SDG 11 (Sustainable Cities and Communities), SDG 14 (Life below Water), and SDG 15 (Life on Land).

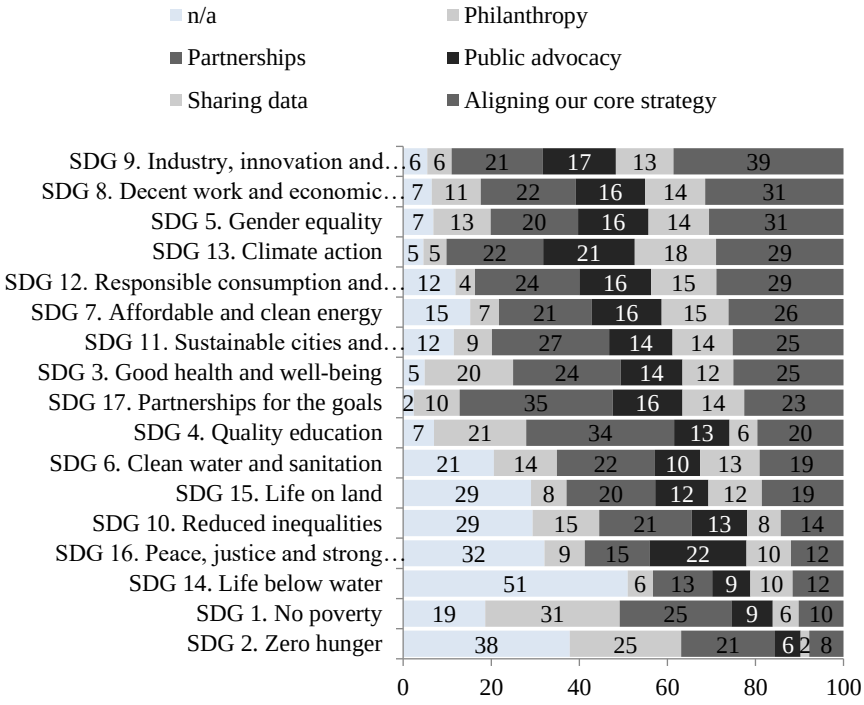
The scores on each SDG's underlying targets were summed, equally weighting the targets. As such, a composite score per SDG was created. This allowed for the calculation of a mean score of the extent to which companies' policies engage with each SDG, as displayed in Figure 2.2. It shows that there is considerable diversity among the SDGs to which the companies aim to contribute.

Figure 2.2 - Extent to which companies contribute to SDGs (N = 81)



The survey further asked how the respondent's companies contribute to each of the 17 SDGs, offering pre-defined options. Multiple options could be picked. This helped reveal the interconnections between the SDGs and understand the importance of each goal. The 'not applicable' category is thereby equally important. It reveals a lack of priority and can help in gauging the extent to which specific SDGs provide an institutional arena in which companies are inclined to actively contribute to common goals. Explicitly non-applicable SDGs ranged from a 2 percent low (SDG 17 - Partnerships) to a 51 percent high (SDG 14 – Life below water). Figure 2.3 shows the proportion of each type of contribution as a percentage of the total number of contributions that were indicated per SDG.

Figure 2.3 - Types of contributions to the SDGs (% of types per SDG)



2.5.2 Statistical analysis: Explaining MNEs' engagement with the SDGs

We analysed the survey results using non-parametric tests of differences, either paired (i.e., the Wilcoxon signed-rank test), for two (i.e., the Mann-Whitney U test), or for more samples (i.e., the Kruskal-Wallis test), to provide initial insights on the propositions. We focused on respondents' average contributions to aggregations of our SDG targets (in total as well as for subgroups of targets). Robustness tests were conducted using median scores as to reflect the ordinal nature of (non-aggregated) Likert-type data. These tests revealed the same results.

We first explored the effects associated with SDG traits, finding that engagement with internally actionable SDG targets exceeds engagement with externally actionable SDG targets. On the 1-5 scale, engagement with internally actionable SDG targets received a mean score of 3.4, compared to a mean score of 2.6 for externally actionable SDG targets. A Wilcoxon signed-rank test showed that

75 respondents indicated a higher mean score on internally actionable targets, while six respondents had a higher mean score on externally actionable SDG targets. These differences were found to be statistically significant ($Z = -7.686, p < .001$). Results on the ethical duties trait indicate similar patterns. "Avoiding harm" targets received a mean score of 3.3, compared to a mean score of 2.8 for "doing good" targets. The Wilcoxon signed-rank test showed that 69 out of 81 respondents indicated a higher mean score on "avoiding harm" than "doing good" SDG targets. These differences are statistically significant ($Z = -6.505, p < .001$).

We then studied effects related to traits of MNEs. Companies from different home-countries/regions indicate varying SDG engagement. Mann-Whitney U tests show that European companies indicate greater involvement with SDG targets ($U = 531.5, p = .048$). This also applies to SDG targets that are externally actionable ($U = 487, p = .015$). However, North American companies tend to engage more with SDG targets characterised as "doing good" ($U = 509.5, p = .028$). Engagement with internally actionable SDG targets ($U = 576, p = .125$) and SDG targets intending to "avoid harm" ($U = 591, p = .167$) does not differ significantly across North American and European firms.

The respondents were subsequently categorised according to the number of countries in which their firm operates: i) more than one but less than ten countries; ii) ten to fifty countries; and iii) more than fifty countries. A Kruskal-Wallis H test showed that, between these three different groups, there were no statistically significant differences in total engagement with SDG targets ($X^2(2), p < .480$), in engagement with internally actionable SDG targets ($X^2(2), p < .707$), externally actionable SDG targets ($X^2(2), p < .326$), in engagement with "avoiding harm" targets ($X^2(2), p < .986$), as well as with "doing good" targets ($X^2(2), p < .148$).

We finally examined differences across industrial sectors (Table 2.4). A Kruskal-Wallis H test revealed no statistically significant differences between MNEs in different sectors and total involvement with the SDG targets ($X^2(6), p < .154$), involvement with internally actionable ($X^2(6), p < .088$) or externally actionable SDG targets ($X^2(6), p < .282$), and engagement with "doing good" targets ($X^2(6), p < .309$). A statistically significant difference was found

between engagement with “avoiding harm” targets and respondents in the different industries $(X^2(6), p < .026)$. Post-hoc tests were conducted to assess between which sectors these differences occur. Seven statistically significant differences in scores on “avoiding harm” targets between sectors were found. Both the FMCG and extractive industries sectors indicate greater, and significant, engagement with “avoiding harm” targets than the professional services, ICT, and finance sectors. The transport and retail sectors indicate more, and significant, engagement with “avoiding harm” targets than financial services companies.

Table 2.4 - Summaries of Kruskal-Wallis tests on different sectors' engagement with "avoiding harm" targets

Sector A			Sector B			Explained variance	Kruskal-Wallis H	Asymp. Sig.
Sector	**N**	**Mean rank**	**Sector**	**N**	**Mean rank**			
FMCG	9	7.72	Extractive industries	6	8.42	1%	0.087	0.768
FMCG	9	19	Professional services	19	12.37	15%	3.975	0.046*
FMCG	9	12.89	Manufacturing	12	9.58	7%	1.461	0.227
FMCG	9	10.17	Transport and retail	9	8.83	2%	0.282	0.596
FMCG	9	13.39	ICT	11	8.14	21%	3.908	0.048*
FMCG	9	16.28	Finance	15	10.23	18%	4.128	0.042*
Extractive industries	6	18.86	Professional services	19	11.16	21%	4.965	0.026*
Extractive industries	6	12.33	Manufacturing	12	8.08	15%	2.543	0.111
Extractive industries	6	9.5	Transport and retail	9	7	8%	1.129	0.288
Extractive industries	6	13.58	ICT	11	6.5	48%	7.658	0.006*
Extractive industries	6	17	Finance	15	8.6	39%	7.885	0.005*
Professional services	19	14.5	Manufacturing	12	18.38	4%	1.337	0.248
Professional services	19	12.95	Transport and retail	9	17.78	8%	2.11	0.146
Professional services	19	15.55	ICT	11	15.41	0%	0.002	0.966
Professional services	19	17.08	Finance	15	18.03	0%	0.077	0.781
Manufacturing	12	10.33	Transport and retail	9	11.89	2%	0.323	0.57
Manufacturing	12	13.63	ICT	11	10.23	7%	1.444	0.23
Manufacturing	12	15.58	Finance	15	12.73	3%	0.861	0.353
Transport and retail	9	13.22	ICT	11	8.27	18%	3.467	0.063
Transport and retail	9	16.22	Finance	15	10.27	17%	4.004	0.045*
ICT	11	12.59	Finance	15	14.17	1%	0.27	0.603

** Denotes statistically significant differences at the 0.05 level.*

2.6 Discussion

This section discusses the extent to which the initial survey findings support or reject the formulated propositions and what their implications are for the role of MNEs in sustainable development (section 6.1). We then delineate policy implications for furthering MNEs' engagement with the SDGs (section 6.2).

2.6.1 An institutional approach to the role of MNEs in sustainable development

An institutional approach is important in studying the role of the SDGs in IB strategies. This is reinforced by the priority that companies themselves attached in particular to SDG 16 (Peace, Justice, and Strong Institutions). Our exploratory analysis firstly aimed to add to our understanding of the SDGs as a goal-based institution. Proposition 1 is supported: MNEs are more likely to engage with internally actionable SDG targets compared to externally actionable SDG targets. Proposition 2 also receives support: companies are more likely to engage with SDG targets that intend to avoid harm, compared to SDG targets that intend to actively do good. Thus, these two SDG traits can be considered important indicators for MNEs' engagement with the SDGs.

The extent to which MNEs engage with the SDGs was found to be influenced by their home countries/regions. European MNEs engage with more SDGs in general. They also engage more with externally actionable SDGs. Yet, North American MNEs indicate greater involvement with SDG targets that help them actively do good, which in the sample is related to the North American institutional environment placing relatively more emphasis on philanthropy (e.g., Matten & Moon, 2008). These findings are partially aligned with proposition 3a. Proposition 3b, which expected more internationalised companies to engage with more SDG targets, was neither supported nor rejected. This result might be influenced by a selection bias in favour of the world's largest firms or the relative simplicity of the measurement of internationalisation in our survey (with no distinction between the types of countries the respondents' firms engage in and the institutional distance they experience, for instance). This finding could also reflect that MNEs are at an initial stage of engaging with the SDGs, causing efforts to be

more global than local, and more generic than specific. Proposition 4, which expected MNEs from industrial sectors with greater negative externalities to engage with more SDG targets, was partially supported. Such MNEs were found to engage more with "avoiding harm" targets than companies in sectors with smaller societal footprints.

In addition to the extent of their engagement with the SDGs, we explored how MNEs say to contribute to different SDGs. Philanthropic contributions are mostly made to SDGs that tend to represent highly complex (macro) challenges (SDG 1 – No Poverty; SDG 2 – Zero Hunger; SDG 3 – Good Health and Well-Being; and SDG 4 – Quality Education). MNEs mainly share data regarding SDGs that represent collective action and/or public good challenges (SDG 6 – Clean Water and Sanitation; SDG 7 – Affordable and Clean Energy; SDG 13 – Climate Action; SDG 14 – Life below Water; SDG 15 – Life on Land). Public advocacy is geared towards many goals, but is considered the most prominent method of contributing to SDG 16 (Peace, Justice, and Strong Institutions). Partnerships with civil society organisations and the public sector concentrate on SDGs 1 (No Poverty), 2 (Zero Hunger), 4 (Quality Education), and 6 (Clean Water and Sanitation). These are general challenges in which the link between short-term and longer-term integration in future core business might be established through a combination of philanthropic and partnering activities. MNEs aim to align their core strategy to internally actionable SDGs that are most obviously in their direct interests: SDGs 5 (Gender Equality); 8 (Decent Work and Economic Growth); 9 (Industry, Innovation and Infrastructure); 12 (Responsible Consumption and Production); and 13 (Climate Action). Because the more philanthropic the nature of a contribution is, the less relevant it can be considered for the core business of the company (Austin & Seitanidi, 2012), these patterns corroborate propositions 1 and 2 that internally actionable and "avoiding harm" SDGs are placed at the core of MNEs' policies.

These findings have implications for the role of MNEs in sustainable development. MNEs have been argued to increasingly become actively engaged agents, as opposed to distant or passive tools, in sustainable development (Blowfield, 2012). In line with their institutional environments, the MNEs in our sample have adopted a relatively narrow role in sustainable development. They primarily engage with SDG targets that are internally actionable and that seek to

avoid doing harm. This is important: accountability for, and mitigation of, negative impacts on societies and the environment are critical requirements for achieving the SDGs (Kumi, Arhin, & Yeboah, 2014). Nevertheless, sustainable development also necessitates a radical diversion from current practices (Chang, 2010). There is a need to go "beyond business as usual" (Scheyvens et al., 2016) and extend a company's sphere of influence (Ruggie, 2008). Focusing only on internally actionable and "avoiding harm" centred SDG targets tends to make MNEs rather passive sustainable development agents. Greater and actively managed positive spill-over and sustainable development effects (cf. Dunning & Fortanier, 2007; Kolk and van Tulder, 2010) are externally actionable and require a positive duty approach.

Table 2.5 provides a gap analysis on the SDG targets with which the companies engage least, framed along the dimensions of the two SDG traits used in this study. Internally actionable SDG targets that receive low engagement (category [C]), require investments in developing countries and are aimed at actively creating positive externalities, for instance through technology transfer. Institutional barriers in intellectual property rights regimes, the organisation of international value chains (in particular in food), and host country regulation arguably play an important role here.

To broaden their role in sustainable development, companies should move from the narrow end to the broad end of the continuum (categories [B] and [D]). A number of specific gaps appear in the engagement of European and North American MNEs with the SDG targets. In particular, "tragedy of the commons" type problems require the joint efforts of governments, companies, and civil society to reduce negative externalities (Hardin, 1968). However, companies indicate low engagement with such SDG targets, especially those related to environmental deterioration (category [B]). Furthermore, the greatest challenge is provided by SDGs that aim to maximise positive externalities, such as providing access to affordable housing and energy (category [D]). These SDGs require involvement of all societal actors. In this complex category we see only a few companies that are willing to take up such challenges.

Table 2.5 - Gaps in MNEs as development agents: SDG targets that MNEs do not or only slightly engage with

		Actionability	
		Internal	**External**
Ethical duties	**Avoiding harm**	[A] None	[B] Many • Deforestation and/or desertification • Poaching • Marine and other water-related ecosystems • Overfishing
	Doing good	[C] Few • Transfer of technologies • Sustainable food production • Funding for climate change action in developing countries	[D] Most • Access to affordable and sustainable transport, housing, energy, financial services, ICT • Agricultural productivity of small holders • Cultural and natural heritage and diversity • Healthy and sufficient food for those on low incomes

Philips is an example of a globally operating company that is using the SDG framework to reposition itself as an innovative health company and broaden its role in sustainable development. It aligns with all SDGs in general and with three SDGs in particular: SDG 3 (Good Health and Well-Being), SDG 12 (Responsible Consumption and Production), and SDG 13 (Climate Action) (Philips, 2016b). SDGs 12 and 13 are internally actionable and predominantly seek to avoid doing harm. SDG 3 is a challenge that – to a large extent – is externally actionable and seeks to do good, thus relating to the broader, more active, developmental role. The "doing good" aspect is illustrated by Philips's official target to contribute to the health of more than 3 billion people, and have 95 percent of its revenues by 2020 linked to the SDGs (Philips, 2016a). To achieve this ambition, the company is proactively establishing partnerships with a variety of non-market players like NGOs and governments (Philips, 2017; PrC, 2011).

In an effort to broaden their engagement with sustainable development themes, certain MNEs have also actively influenced the creation of institutions. Unilever's role in the making of the SDG Agenda is an example. SDG target 6.2 promotes access to sanitation and hygiene and has as an indicator the "proportion

of the population using safely managed sanitation services, including a hand-washing facility with soap and water". This SDG target and related indicator mirror Unilever's global strategy of contributing to sustainable development by giving people access to its hygiene products. The position of Paul Polman, Unilever's Chief Executive Officer, as a leading member of the UN SDG advocacy group cannot be underestimated in the formulation of this target.

Nevertheless, as Table 2.5 illustrates, our exploratory findings presents a sizable research gap in an important area of IB: how can MNEs move beyond their relatively narrow/passive role in the SDGs and plan and implement business models that support externally actionable SDGs that seek to actively do good? Given the influence of institutions over MNEs' engagement with the SDGs, the next section explores the policy implications of our study.

2.6.2 Policy implications: The need for cross-sector partnerships

The introduction of the SDGs highlights a successful joint effort of governments and societal actors to increasingly involve MNEs in the sustainable development agenda. A first policy aim, therefore, is to increase the number of companies that support the SDGs, acknowledging that this will probably imply relatively narrow involvement aimed at not doing harm. The adoption of the SDGs by most MNEs is a clear illustration of a bandwagon effect. The exact interpretation of that effect is open to debate and the challenge to materialise the SDGs in MNEs' strategies is still substantial. This challenge lies partly with governments, concerning the creation of policies that stimulate companies to adopt broader development roles.

Regulatory policies seem to be limited in their potential to stimulate positive corporate actions. Subsidy policies have been effective but highly disputed (because of the problems associated with "selecting winners" or "backing losers"). The experience with market-based mechanisms, such as carbon pricing, proves particularly difficult to implement. Non-traditional regulatory measures have used "nudges", endorsements, and market-based mechanisms as incentive to "do good" (cf. Thaler & Sunstein, 2008) within the direct sphere of influence of companies. Additionally, it is important to realise that our exploratory results indicate that most of the gaps in the involvement of MNEs in sustainable development concern externally actionable SDGs. These involve systemic, collective action problems that

require a greater emphasis on the creation of positive externalities and a focus on "doing good" (cf. van Tulder & Keen, 2018). Notwithstanding this finding, MNEs do indicate a willingness to engage in cross-sector partnerships: just 2 percent of the MNEs in our survey indicated "not applicable" when asked how they aim to contribute to SDG 17 (Partnerships). Thus, a more complex policy challenge for governments and civil society is to reach out to MNEs and establish collaborative projects in support of specific – complementary – SDG targets that fall into categories [C] or [D] of Table 5.

Partnerships between actors from the public, private, and civil society sectors are critical for realising the 2030 Sustainable Development Agenda. This is recognised by both the fifth basic Principle of the SDGs (Partnering) and the seventeenth SDG, which is fully dedicated to promoting partnerships for realisation of the goals. Partnerships can adapt current activities to better fit with the SDGs (Pattberg & Widerberg, 2016), but are also crucial for enabling the private sector to broaden its role in sustainable development and contribute to those targets that cannot be achieved by individual societal sectors (e.g., Kolk et al, 2008; Reed & Reed, 2009; Seitanidi & Crane, 2009; 2014). Section 4.1 argued that in particular for those SDGs that companies consider "not applicable" (SDG 2 – Zero Hunger; and SDG 14 – Life below Water), governments can anticipate a relatively inactive corporate audience. Controlling for the sectoral bias in the sample, however, indicates that companies engaged in food and nutrition, are much more active in support of these SDGs. Thus, the task for governments is also to align policies to industries, and within those industries to relevant frontrunners that are willing to include these particular SDGs in their strategic planning and make them part of their core business through partnerships.

Thousands of cross-sector partnerships have materialised in the area of sustainable development (PrC, 2011). By way of illustration, governments of many previous "donor" countries (in particular from Europe and North America) have developed policies for stimulating companies to engage in public-private partnerships (PPP). Countries thereby prioritise specific SDGs in support of their own "core capabilities" as well. The Netherlands for instance has initiated PPP-initiatives around SDG 2 (Zero Hunger) and SDG 6 (Clean Water and Sanitation). Along these lines, the adoption of the SDGs has sparked the creation of SDG

platforms in which all societal sectors are represented, sometimes in general and sometimes around specific SDGs. Such platforms could provide fertile ground for involving MNEs in partnerships for the SDGs.

Our results indicate that MNEs are adopting partnerships as a way to contribute to SDGs that are complex and externally actionable (in particular to SDG 1 – No Poverty; SDG 2 – Zero Hunger; and SDG 4 – Quality Education). MNEs mitigate their lack of actionability over such themes by searching for partners that have the right sets of skills and expertise. This relationship also works the other way around. Agents in partnerships other than companies can also be characterised by having various degrees of actionability over working towards the realisation of an SDG. As a result, partnering with the private sector can cause these actors to benefit from a company's expertise, for example related to general business operations such as finance, supply chain management, and HR, or a company's skills related to its sector. On this basis, it can be proposed that partnerships for sustainable development are most effective when the combined actionability of the agents involved in the partnership over the sustainable development theme is high.

A telling example of a partnership that succeeds in increasing the combined actionability of partners over a sustainability issue is "Seeing is Believing". This partnership between Standard Chartered Bank and the International Agency for the Prevention of Blindness (IAPB) dates back to 2003 and ambitions to combat avoidable blindness and visual impairment (most of which affects low- and middle-income countries). Over the past 15 years, the partnership has raised nearly US$100 million, implemented projects in 37 countries with numerous governmental and NGO organisations, and expanded its interventions to include prevention alongside treatment. The partnership capitalises on both partners' capabilities. Standard Chartered's commercial strengths are valuable in raising financing, mobilising employees, promoting eye health at an institutional level, and governing the Seeing is Believing partnership. IAPB, as an internationally operating alliance of 148 organisations working to promote eye health, has thorough eye health expertise which helps ensure that Seeing is Believing projects work with the best-suited implementing partners, that these projects' impacts are maximised, and that best practices are facilitated throughout the sector. As such, partnering with IAPB

enabled Standard Chartered to contribute to an externally actionable sustainability challenge and helped it to "do good".

This discussion provides a clear imperative for MNEs to contribute to externally actionable SDG targets through partnerships. Companies' core capabilities can be of significant value in realising these targets when other agents use their knowledge and higher degrees of actionability over the target to ensure that provided solutions are effective. Because institutional frameworks influence corporate contributions to specific SDG targets, an opportunity for further expanding the role of companies in sustainable development lies in including partnerships in institutions. Since it is complicated for governments to require companies to formally engage in partnerships for sustainable development, and as including such demands in cultural-cognitive institutions in the foreseeable future is unlikely, this particularly applies to normative institutional initiatives. Discussions on this topic with major institutions, such as the UN Global Compact and the WBCSD, could deliver practical results while simultaneously building theoretical knowledge on the SDGs as a goal-based institution.

Nevertheless, the cross-sector partnering literature – from a policy as well as a company perspective – is still in its infancy (Kolk et al., 2017). Most of the research is hampered by the fact that partnerships are only a recent phenomenon, whilst their effectiveness is difficult to measure – certainly when they claim to have an impact on the achievement of complex goals like the SDGs. As a result, partnering gets criticised for not adequately – or measurably – addressing the manifold problems for which it is introduced. A second line of critique concerns the partnership composition, including: sub-optimal partnering configurations (Wettenhall, 2003); not addressing the actual complexity of the problem (Pattberg & Widerberg, 2016); a too dominant private sector (Dauvergne & LeBaron, 2014); too limited ambitions; non-optimal issue-partner fits (van Tulder & Pfisterer, 2014); and over-ambition that creates all sorts of "collaborative complexities" (Schneider et al., 2017). Thirdly, ill-conceived partnerships have been criticised for undermining the legitimacy of the whole partnering phenomenon (Bäckstrand, 2006), for instance owing to overly optimistic or superficial claims, subdued responsibilities, or poor governance structures (Brinkerhoff & Brinkerhoff, 2011).

In response to such criticisms, many have reiterated that partnerships cannot be considered a panacea for development problems (Kolk, 2014). Collaboration does not come easily, hence success cannot be assured (Bryson, Crosby, & Bloomberg, 2015). The effectiveness of partnering is highly context dependent and susceptible to change. A potential pitfall of such partnerships is that the distance between the company's business model (or its profit-driving activities) and its sustainable development efforts widens too far, making the company's contributions to the SDGs financially unsustainable. An illustration is the partnership between logistics company TNT and the World Food Programme (WFP) that aimed to eradicate hunger. At the inception time of the partnership, hunger did not appear as a problem of insufficient food produced, but primarily as a problem of unequal distribution. As ending hunger is externally actionable, TNT contributed to the partnership through its core capabilities in transport. WFP, on the other hand, had fewer transport capabilities compared to TNT, but a high knowledge about feeding those in need. This way, the partners' combined actionability over the sustainable development theme – i.e., ending hunger – was high. However, no clear link was established between this partnership and TNT's commercial activities, rendering it primarily a philanthropic sponsoring programme, which posed a risk to the sustainability of the partnership (van Tulder, 2008). This contrasts with Standard Chartered's Seeing is Believing partnership to some degree, as this partnership's activities take place in countries where the bank has a presence, thus offering opportunities for increasing local legitimacy. Although no formal reason was provided, in 2015 TNT terminated the partnership. Hence, contributing to complex SDGs in partnership with other actors is likely to be most efficient when links can be made with the company's business model.

Notwithstanding these concerns, the fact that so many companies, governments, as well as NGOs have embraced the SDGs makes cross-sector partnerships relevant as a study object. This not only concerns the measurement of outcomes, but also as a frame to help participants improve the effectiveness of their efforts. The interaction between the SDGs as a goal-based institution that necessitates expanding a company's actionability and "doing good" efforts, and national institutions that are often aimed at companies' internal actionability and

mitigating "avoiding harm", is critical in creating a policy mix that enhances companies' impacts on sustainable development.

2.7 Conclusions and further research

This paper intended to frame an important topic of research in international business: MNEs' adaptation to, as well their (co)creation of, institutions. The SDGs provide a central and lasting framework in which companies are not only asked to adapt to a policy agenda in the form of universal goals with specific local adaptations, but in which they are also required to create new institutions. The role of MNEs is without dispute; not least because they have actively collaborated in the formulation of the SDGs themselves. This study conceptualised the SDGs as a goal-based institution. It subsequently explored the first patterns of alignment between the strategies of an important group of often leading MNEs from two distinct institutional backgrounds – North America and Europe – and the SDGs. We found general and specific patterns and identified clear implications for the role of MNEs in contributing to sustainable development.

Our initial findings indicate that MNEs primarily engage with internally actionable SDG targets, and that they engage with SDGs to avoid negative impacts on sustainable development. Acting on externally actionable SDGs and proactively "doing good" is to a far lesser extent associated with MNEs' actions. SDGs that represent complex areas of general institution building, for instance for public goods, receive relatively little support other than through philanthropic means. By mainly engaging with SDGs that "avoid harm" and thus mitigating negative externalities, MNEs have adopted an important but fairly narrow/passive role in contributing to the SDGs. Sustainable development, however, demands that SDGs that seek to "do good" are also realised. Since many of the "doing good" SDG targets are externally actionable, we argue that partnerships for sustainable development are critical for the broader and more active involvement of MNEs in achieving the SDGs. These have to be placed at the fore of international business policy research. Our discussion in section 6.2 provides a first attempt.

Three consequences of our exploratory study should be taken into account. First, sampling issues have to be addressed. Our empirical data were obtained from companies headquartered in Europe or North America that are listed in the 2015 FT

Global 500. The survey's sample size (81 respondents) can be argued to be representative of these two groups but not of a wider group of MNEs from different regulatory regimes. Previous studies find operational and conceptual differences in sustainability policies of companies from different cultures and societies (Jamali, 2010; Matten & Moon, 2008; Muller, 2006) and of companies of different sizes (Baumann-Pauly, Wickert, Spence, & Scherer, 2013). Our study did not include the sustainable development efforts of subsidiaries (and the effect of specific country portfolios on more consolidated sustainability strategies). Countries adopt varying kinds of SDG policies based on national priorities. The interaction between company and country priorities provides an additional avenue for further research. Moreover, the sample overlooks companies that were established with an explicit social and/or environmental mission. Scarce IB research on this topic, for instance, found a positive relationship between family ownership and a higher inclination to "doing good" (Crilly et al., 2016). Future research needs to look at the effects of governance structures and corporate missions on the choice of particular SDGs.

Second, the SDGs as a goal-based institution requires further research. The SDG targets used by this study were deductively defined by examining the SDGs' official targets and the SDG business themes that are included in the SDG Compass of the GRI, WBCSD, and UN Global Compact. This method aimed to increase the validity of our survey by maximising the degree to which the respondents in our sample could relate to the targets that we included. But it also introduces a potential bias, because we excluded targets of a purely public-sector nature, or because we reworded such targets so as to align them better with the practices of the private sector. Although we aimed to use a shortlist of SDG targets that is representative of the formal list, the results presented in this study could overstate the role of companies in the SDGs. This also raises a broader question about the (potential) limitations of the SDG framework for agents other than governments. The SDG targets appear to have been operationalised with a heavy emphasis on governmental action. Efforts are needed to further conceptualise the SDG framework as an institution in IB.

Adding to that, the SDG targets used in this study were characterised as being internally or externally actionable and as aiming to avoid harm or do good. It could be that different results are obtained when sustainable development themes –

and their categorisation along these two traits – are inductively identified by asking companies about their policies, or through assessments of their sustainability/CSR reports. Moreover, our and other research shows that companies adopt a variety of SDGs, which also makes it important to understand better what the nexus of SDGs implies in general terms – for instance, as portrayed in studies on "inclusive green growth" – and in specific terms for the portfolio of SDGs that companies could use for their strategic aims.

Finally, the SDG agenda demands emphasis on a prevailing methodological challenge. Our insights describe companies' self-reported contributions to the SDGs. This allowed us to gain insights into the number of SDGs with which companies engage. A logical next step would be to measure companies' sustainable development impacts. Companies that engage with fewer SDGs might well have greater positive impacts on sustainable development than companies that are involved with a wide variety of sustainability goals. The advance of the SDG agenda offers a unique opportunity towards this end, as many organisations are now working on developing metrics for the SDGs' targets and indicators. Such a discussion would not only contribute to examinations of the actual impact of companies on sustainable development, but also provide insights into the extent to which companies engage in decoupling (e.g., Crilly, Zollo, & Hansen, 2012; Hawn, 2012).

In addition to these research avenues, this paper intends to trigger more IB related research on three topics in particular: (1) define the factors and processes that can help MNEs to be more engaged in "doing good" and to contribute to societal goals within and beyond their spheres of influence, either alone or through partnerships; (2) define the policy measures that can help companies make this transition, in particular how governments can apply complementary roles – either alone through partnerships – to produce global public goods and as such contribute to sustainable development (i.e., the SDGs); (3) expand the sample of companies under consideration, either by adding more companies from different regions, different sizes, different governance structures (state-owned and family-owned, for instance), as well as by adding more in-depth company studies that go into the antecedents of integrating the SDGs in the internal planning exercise of the company. It is beyond dispute that MNEs have vast opportunities for helping

achieve the SDGs. Research is now needed to understand, accelerate, and materialise these opportunities.

3. Towards Nexus-Based Governance: Defining interactions between Economic Activities and Sustainable Development Goals (SDGs)[5]

Abstract

The success of the Sustainable Development Goals (SDGs) depends on solving the 'nexus' challenge: how can positive interactions between SDGs be optimised, and negative interactions minimised, in order to create co-benefits and reduce trade-offs? Due to their varying impacts on the SDGs, the economic activities undertaken by organisations present a key lever for operationalising this SDG-nexus. Yet the interactions between individual economic activities and the economic, social, and environmental dimensions of sustainable development have not been systematically assessed, thus creating a vital operational bottleneck to achieving the SDGs. This paper conducts a systematic review of 876 articles published between 2005 and 2019 to study the nexus between individual economic activities, sustainable development in general, and the SDGs in specific. It finds that studies on agricultural, industrial, and manufacturing activities predominantly report negative impacts on environmental development, while literature on services activities highlight economic and social contributions. Overall, most economic activities are expected to positively impact industrialization, infrastructure, and innovation [SDG 9] and economic productivity [SDG 8], while many help meet basic needs [SDGs 2, 3, 4, 6, 7, 11]. However, negative impacts are widespread, afflicting ecosystems [SDGs 14 and 15], climate change [SDG 13] and human health [SDG 3]. We synthesise positive and negative interactions between individual economic activities and SDG targets and discuss implications for: integrated (nexus) governance approaches to the SDGs; the role of the private sector in promoting sustainable

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development; and for improving statistical classifications to monitor economic activities' SDG impacts.

The desire to engross the whole surface of the earth in the mere production of the greatest possible quantity of food and the materials of manufacture, I consider to be founded on a mischievously narrow conception of the requirements of human nature.

John Stuart Mill, 1866

3.1 Introduction

In 2015, the world's leaders adopted 17 Sustainable Development Goals (SDGs) that aim to *"free humanity from poverty, secure a healthy planet for future generations, and build peaceful, inclusive societies as a foundation for ensuring lives of dignity for all"* (UN, 2017:4). These 17 goals are supported by 169 targets with over 200 indicators. All countries, regardless of their income-levels, agreed to aim to achieve the SDGs by the year 2030. However, five years in, the outlook on the SDGs is bleak: recent assessments show that inequality is widening, hunger is on the rise, ecosystems are eroding at an alarming rate, and climate change threatens the entire SDG agenda (Sachs et al., 2019; UN, 2019).

A major challenge is the priority given to SDGs that drive economic growth compared to SDGs that promote social inclusion and ecological sustainability (Gupta & Vegelin, 2016). Economic growth is a double-edged sword for sustainable development. Growth is critical for improving living standards, and it typically is good for the poor (Dollar et al., 2013), as witnessed by the role economic growth played in helping lift more than one billion people out of poverty since 1990 (World Bank, 2018). However, economic growth may promote inequality within and between countries (Ravallion, 2001; Stiglitz, 2018). Moreover, our impacts on the planet have become so profound that we entered the Anthropocene – an epoch in which human activity is the dominant cause of environmental change, which will likely be observable for millions of years to come (Crutzen, 2006; Lewis & Maslin, 2015). These "limits to growth" (Meadows et al., 1972) also jeopardise the SDGs. The dominant focus on economic growth and consumption – organised in

vulnerable international systems (e.g. Mintzberg, 2015) - conflicts with SDGs addressing the natural environment (Kopnina, 2016; Spaiser et al., 2017). Environmental destruction may consequently harm public health, both through pollution and by encouraging the spread of diseases passed from animals to humans, which is a likely cause of the current coronavirus pandemic (UN Environment, 2020). Such inconsistencies could cause the SDG agenda to fail.

Moving forward requires integrated governance approaches (Boas, Biermann & Kanie, 2016) that treat the SDGs as they are: entwined and indivisible (UN, 2015). One such approach is the "nexus approach", which induces policymakers to act on the interactions between individual SDGs in order to reap co-benefits and reduce the risk of trade-offs (Boas et al., 2016; Liu et al., 2018; Weitz, Nilsson, & Davis, 2014). Different methods are emerging for exploring interactions between the SDGs. One method quantifies interactions between SDGs using public statistics (e.g. Allen et al., 2019; Bali Swain & Yang-Wallentin, 2020; Spaiser et al., 2017). Another method qualitatively maps and scores the strength of positive, neutral, and negative SDG interactions in different contexts (e.g. Nilsson et al., 2016). Understanding the range of positive and negative interactions between the SDGs is critical for unlocking their potential and supports creating coherent, nexus-based, policies for the SDGs (Griggs et al., 2017). This need for integrated governance for the SDGs resonates with policymakers: the 2018 UN High Level Policy Forum prioritised SDGs 6, 7, 11, 12 and 15 for governing linkages amongst the SDGs, and the 2019 Global Sustainable Development Review (GSDR) advised the UN to act on the interactions between the SDGs by targeting six 'entry points' to the SDG agenda (Independent Group of Scientists appointed by the Secretary-General, 2019).

In this context, the critical role of the economy in the broader notion of sustainable development (i.e. the integration of economic, social, and environmental development in resilient, inclusive and balanced societies) merits further exploration. To date most efforts examined the consequences of economic growth on sustainable development in general (e.g. Meadows et al., 1972; Redclift, 2005) and the SDGs more specifically (e.g. Spaiser et al., 2017). A complementary lens zooms in on the nature of economic activities. Numerous, highly heterogeneous types of economic activities may be undertaken by organisations in a society.

Economic activities can be any kind of activity that an organisation engages in that aims to make, provide, purchase, or sell goods or services. Examples include specific types of agriculture, manufacturing, or services activities, whereby international organisations such as the UN and the European Union have classified hundreds of individual economic activities. These economic activities generate diverse economic, social, and environmental impacts. A growing number of studies analyse the sustainable development impacts of individual types of economic activities, helping shed light on their positive and negative SDG impacts. Yet as far as we are aware, no studies have yet provided an overarching perspective on how the diverse economic activities that organisations engage in impact different sustainable development dimensions, and how these impacts can be governed in an integrated manner.

This paper helps to fill this gap by synthesising the literature on the interface between economic activities and sustainable development impacts. We systematically review 876 articles published between 2005 and 2019 that cover 420 economic activities (defined by the ISIC Rev. 4 classification[6]). Following a methodological explanation (section 2), we provide an overview of the key features of sustainable development characteristics reported in articles on individual economic activities. This includes whether the articles report an economic activity to have positive or negative sustainable development impacts, the sustainable development dimensions (i.e. economic, social and/or environmental) that are discussed, the geographic scope of the study, and what types of solutions are deemed necessary to improve the economic activity's impacts on sustainable development (section 3). Then, we identify the SDGs that are central to the reviewed literature, and summarise the identified positive and negative interactions between individual economic activities and SDG targets (section 4). Finally, we discuss the implications for the governance of sustainable development, for the role of the private sector in managing the sustainable development impacts of the economic activities they undertake or invest in, and for the ability of statistical classifications to monitor and evaluate economic activities' sustainable development impacts (section 5).

[6] According to the UN Statistics Division (UNSTATS), ISIC Rev. 4 is *"a basic tool for studying economic phenomena, fostering international comparability of data, providing guidance for the development of national classifications"* (UNSTATS, 2007).

3.2 Methodology

In order to yield comprehensive and reproducible findings, published literature related to the interactions between individual economic activities and sustainable development themes (i.e. economic, social and environmental) was analysed using standardised techniques (e.g. Higgins & Green, 2019; Moher et al., 2009).

Peer-reviewed scientific papers were retrieved through two online databases (Science Direct and Google Scholar) using different combinations of search terms. The Boolean operators AND and OR were used to combine these terms. The following keywords and combinations thereof were used: [economic activity (*X*)] AND ("economic impact" OR "economic growth" OR "societal impact" OR "social inclusion" OR "environmental impact" OR "pollution"). Search terms inserted for [economic activity (*X*)] were derived from the ISIC Rev. 4 classification of economic activities. ISIC Rev. 4 classifies economic activities into 21 sections (level 1); 88 divisions (level 2); 238 groups (level 3); and 420 classes (level 4). The 88 divisions of this classification (level 2) were used as search terms for individual economic activities.[7,8] Combining these terms with two keywords for each of the three main dimensions of sustainable development ensures a broad and inclusive scope. To enhance the precision of the searches, the search terms were directed at articles' titles and abstracts.

In addition, nongovernmental organisations (NGOs) and intergovernmental organisations (IGOs) publish literature on the interface between economic activities and sustainable development. Including grey literature in addition to peer-reviewed academic literature allows for gaining a more complete perspective on the relations between economic activities and the SDGs, avoiding publication bias, and comparing debates in both streams of literature. Therefore, the websites of international NGOs and leading IGOs that have a focus on the economy-

[7] In case ISIC Rev. 4's groups (level 3) and classes (level 4) strongly differed from its divisions (level 2), we included these in the search terms, with the purpose of adding specificity to the analysis.

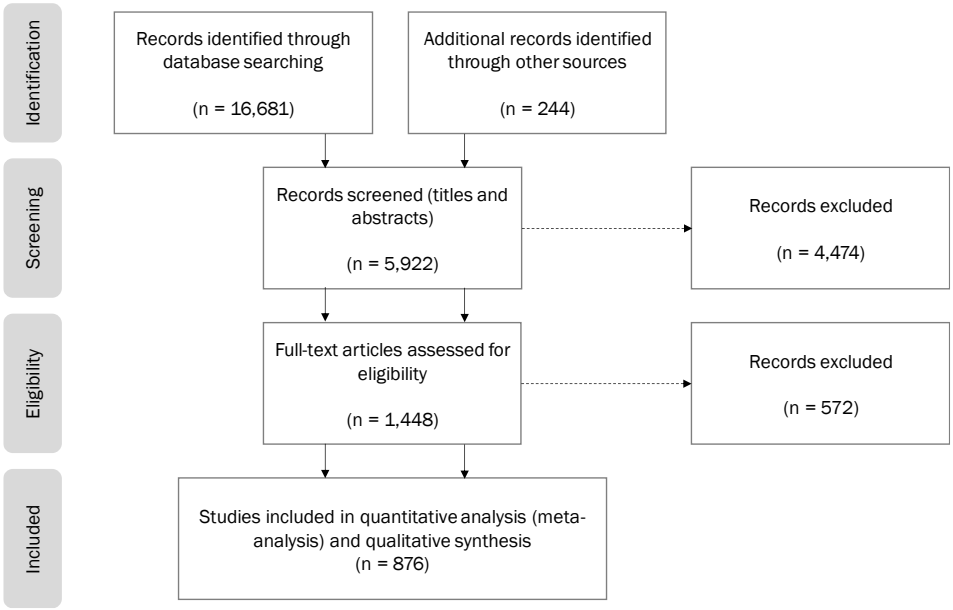
[8] Search terms related to the governance of the public sector and the activities of households were excluded. This includes the following sections (level 1): "Public administration and defense; compulsory social security"; "Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use"; and "Activities of extraterritorial organisations and bodies".

development interface were accessed to identify relevant reports. Reports were retrieved, in alphabetical order, from: Asian Development Bank (ADB); Carbon Disclosure Project (CDP); Centre for Disease Control and Prevention (CDC); European Union; Food and Agriculture Organization (FAO); International Finance Corporation (IFC); Organisation for Economic Co-operation and Development (OECD); UK Government Office for Science; UN Economic Commission for Africa; UN Development Programme (UNDP); UN Environment Programme (UNEP); World Bank; World Health Organization (WHO).

The retrieved articles were screened for their suitability for inclusion in the review and were included if they matched the following criteria: (1) the article discusses intersections between an economic activity and aspects of sustainable development; (2) the causality that is discussed runs from economic activities to aspects of sustainable development; (3) the discussed interactions are caused by the economic activity itself rather than by the managerial policies that govern the economic activity; (4) the effects of economic activities on sustainable development are discussed at the level of economies, societies, and the environment, rather than individuals and organisations. Additionally, inclusion of articles was confined to those published between 2005 and 2019. As our search terms were diverse and many, our intention was to offer a comprehensive and representative, but not exhaustive, overview of the literature on the effects of economic activities on sustainable development themes.[9] To this end, we adopted an inclusive and liberal approach in including articles in the review. In total, 876 articles were included (847 academic and 29 grey articles). Figure 3.1 reports our search and inclusion strategy.

[9] Systematic reviews use systematic and explicit methods to identify, select, and critically appraise relevant studies, and to collect and analyse secondary data from them, in order to answer a research question and synthesise the literature. Systematic reviews are often used in medicine and health care studies to provide an exhaustive summary of the current evidence. Many, particularly in these sectors, therefore advise to use the systematic review methodology for specific, narrow, and well-confined research questions (e.g. Higgins & Green, 2009). In this paper, we create a systematic-type review to synthesise a broad range of literature whereby our principle is to do so in a representative, albeit non-exhaustive manner.

Figure 3.1 - Systematic review process - flow of information*



**Adapted from Moher et al. (2009)*

Key features related to the nexus between economic activities and sustainable development were recorded for each article, including: (1) the economic activity discussed by the article, at the most detailed ISIC Rev. 4 level (minimally at the 2-digit division level); (2) the geographic scope discussed in the article; (3) which sustainable development dimensions (i.e. the economic, social, environmental, or a mix of these) the article discusses; (4) which specific sustainable development themes are discussed (e.g. poverty reduction, air pollution, climate change, health, etc.); (5) whether the economic activity is expected to have positive, negative, or mixed impacts on sustainable development; and (6) whether the article mentions solutions for improving the contributions of the economic activity to the sustainable development aspects, and if so, what types of actions are deemed necessary.

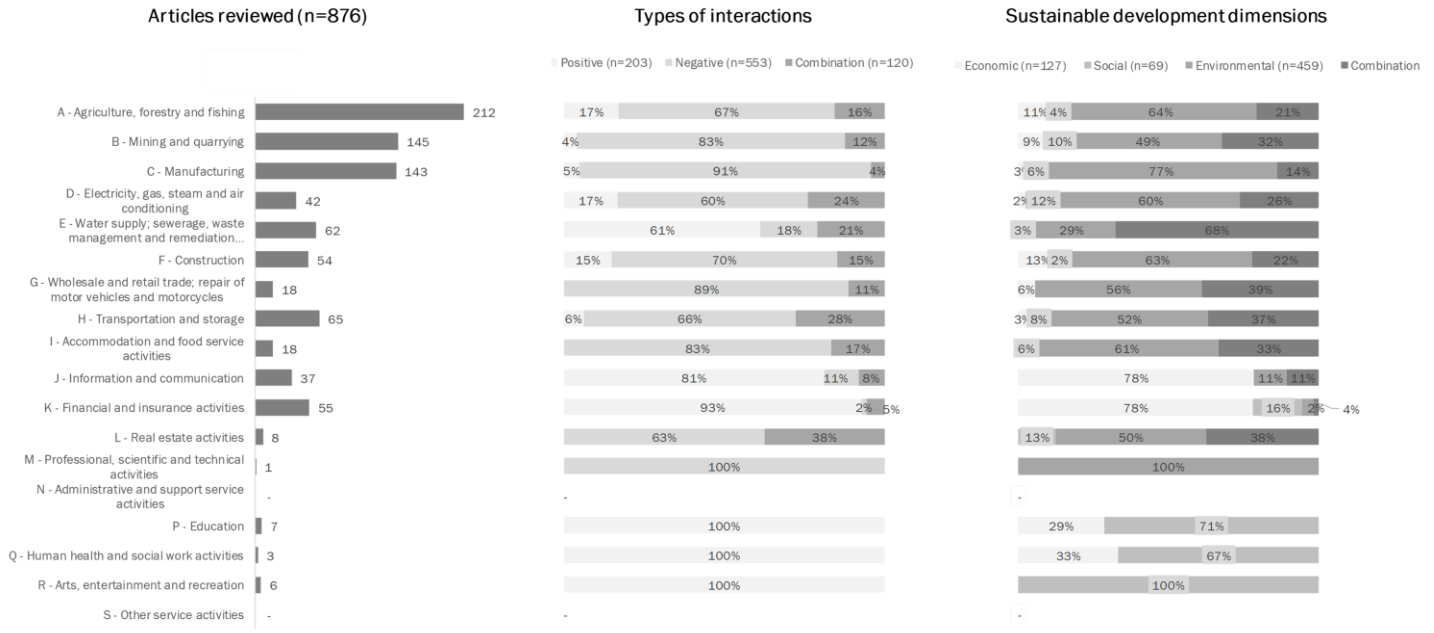
The data collected through the literature review were analysed using SPSS version 26. The analyses focused on descriptive indicators of the data to determine the significance of the relations between key features of the articles. Significances

in differences of count variables between different groups of articles were tested using Chi-Squared tests.

3.3 Key Features: Economic Activities and Sustainable Development

Figure 3.2 summarises the key features of the reviewed articles. It lists the number of reviewed articles per each of the 18 sections of the ISIC Rev. 4 classification. The majority of articles included in the review relate to agriculture, forestry and fishing (212 articles; 24% of total), mining (145 articles; 17% of total) and manufacturing (143 articles; 16% of total). No articles were retrieved for sections "N – Administrative and support services activities" and "S – Other service activities". The articles can be further aggregated into four overarching economic groups: agriculture (section A; 212 articles; 24% of total), manufacturing (section C; 143 articles; 16% of total), other industries (sections B, C - F; 303 articles; 35% of total), and services (sections G – S; 218 articles; 25% of total). This reveals that the reviewed articles are relatively evenly distributed across major economic groups.

Figure 3.2 - Number of articles, types of interactions, and sustainable development dimensions, per economic sector



Most articles (553 articles; 63% of total) centre on the negative interactions of economic activities on sustainable development. 203 articles (23% of total) discuss positive interactions and the remaining 120 articles (14% of total) refer to a combination of positive and negative interactions. As shown in Figure 2, more than 80% of the articles on "manufacturing", "wholesale and retail trade; repair of motor vehicles and motorcycles", "mining and quarrying", and "accommodation and food services", discuss these sectors' negative interactions with sustainable development. Around two-thirds of the literature on "construction", "agriculture, forestry and fishing", "transportation and storage", "real estate activities", and "electricity, gas, steam and air conditioning", also focus on negative effects of these activities on societies and the environment. Economic activities related to "finance and insurance", "information and communication", and "water supply; sewerage, waste management and remediation", are more positively focused: 93%, 81%, and 61% of articles discussing these activities talk about their contributions to sustainable development. The types of interactions discussed by the articles (i.e. positive, negative, or a combination) is significantly associated with types of (grouped) economic activities (i.e. agriculture, manufacturing, other industries, and services) ($X^2(6) = 126.14, p < .001$).

The articles vary according to the dimensions of sustainable development they discuss. Half of the articles (52%) discuss effects of economic activities on the environment, 14% discuss effects on the economy, 8% discuss social effects, and the remaining 25% discuss effects on multiple of these three dimensions. Figure 2 shows that the environment is, respectively, central to 77%, 64%, 63% and 60% of the literature on "manufacturing", "agriculture, forestry and fishing", "construction", and "electricity, gas, steam and air conditioning". Effects on the economy are mostly discussed in literature on "finance and insurance" (78% of articles), and "information and communication" (78% of articles). Social effects are primarily discussed in articles on "education" (71% of articles), and "human health and social work activities" (67% of articles). Literature on "water supply; sewerage, waste management and remediation" (68% of articles) particularly adopts an integrated perspective by discussing multiple sustainable development dimensions. The dimensions of sustainable development discussed in the articles is significantly

associated with types of (grouped) economic activities ($X^2(9) = 177.21, p < .001$).

Specific sustainable development dimensions (i.e. economic, social, environmental, or a combination) are also significantly associated with the types of interactions discussed in articles (i.e. positive, negative, or a combination) ($X^2(6) = 702.84, p < .001$). Respectively 88% and 57% of the articles talking about economic and social development emphasize the positive role of specific economic activities. Literature focused on the environment has a different focus: 93% of these articles emphasise the negative impacts of economic activities on our planet.

The literature is spread across geographies. Asia and Europe respectively host 30% and 23% of the articles, with a further 27% of studies focusing on countries in multiple regions (global). Africa, the Americas, and Oceania attract between 2% and 8% of research on interactions between economic activities and sustainable development. Figure 3.3 offers a more detailed breakdown of the geographic aspects of the literature. It shows that research with a global reach, as well as studies focusing on Europe and North America, is evenly distributed across the four (aggregated) economic sectors, focuses mainly on negative interactions between economic activities and sustainable development, and mostly assesses the environmental dimension of sustainable development. Asian and Latin American studies place more emphasis on manufacturing (42% and 59%), underscore negative sustainable development interactions (67% and 65%), while mainly focusing on the environment (54% and 52%). Manufacturing also accounts for most Africa-focused studies (43%). However, studies taking place on this continent tend to assess positive interactions between economic activities and sustainable development (53%), having a primary focus on economic development (31%) or on combinations of sustainability dimensions (30%). Statistical tests show these differences to be significant: geographical scope and (aggregated) economic sector ($X^2(18) = 64.59, p < .001$), geographical scope and types of interactions ($X^2(12) = 59.90, p < .001$), and geographical scope and types of sustainable development dimensions ($X^2(18) = 64.40, p < .001$).

75% of the reviewed articles offered suggestions for improving the impacts of economic activities on sustainable development. The proposed solutions varied and, at an aggregated level, called for public policy and regulation (54%), for business policies that influence the impacts of companies on sustainable development (26%), for technological innovation (5%) and for multiple of these potential solutions (15%). These four types of solutions are significantly associated with the grouped economic activities that the articles centre on ($X^2(9) = 59.03, p < .001$), with the types of sustainable development interactions discussed in the articles ($X^2(6) = 87.15, p < .001$), and with the sustainable development dimensions that the articles focus on ($X^2(9) = 86.14, p < .001$).

Figure 3.3 – Economic sectors, types of interactions, and sustainable development dimensions per region

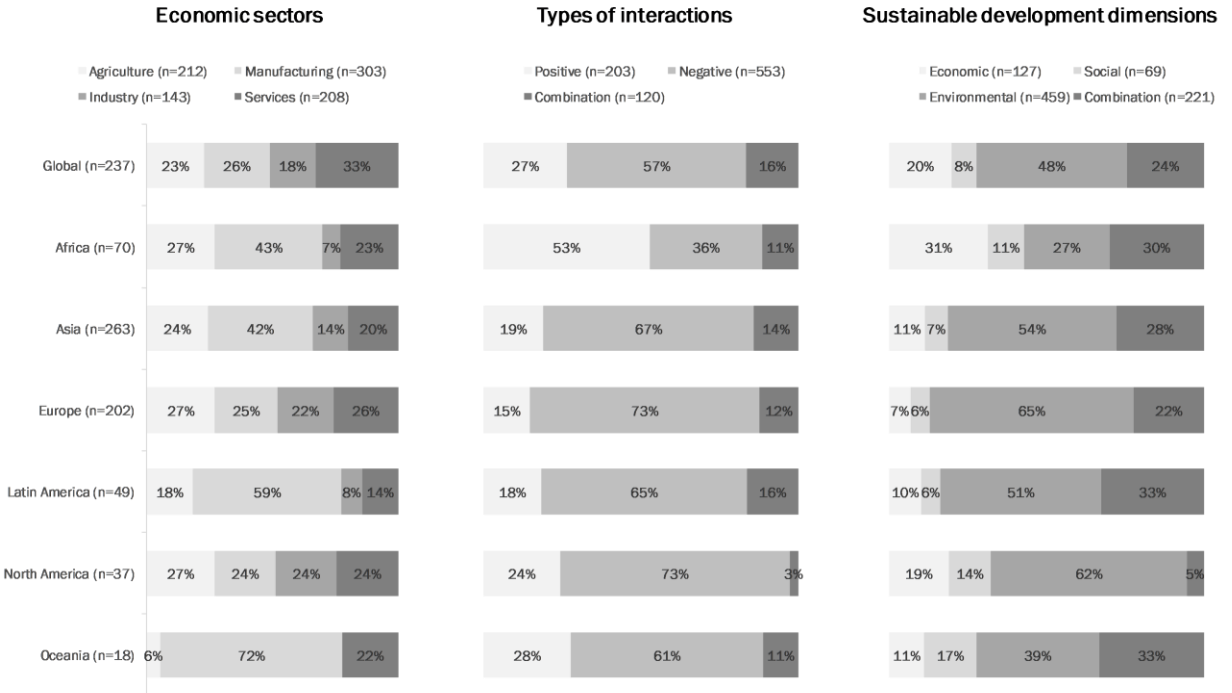


Figure 3.4– Suggested solutions, per economic sector, types of interactions, and sustainable development dimensions

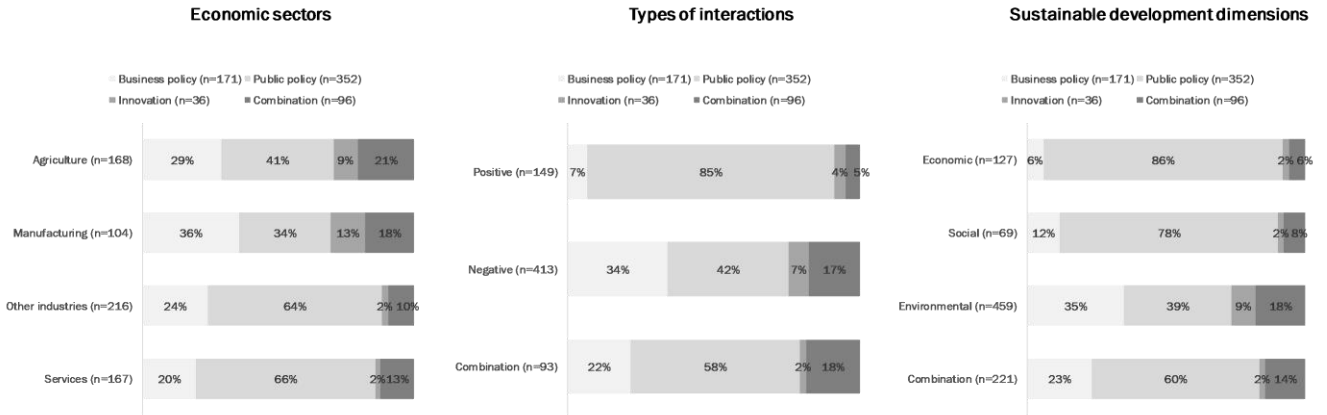


Figure 3.4 summarises the proportion of articles - per aggregated economic sector, per type of sustainable development interaction, and per type of sustainable development dimension - suggesting each category of solutions. Public policy is recommended in articles on agricultural activities (accounting for 41% of solutions offered in literature on this sector), in other industries (64%) and in services (66%). Business policy is, relatively, the most frequently offered suggestion for making manufacturing activities more sustainable (accounting for 36% of articles centred on this sector that offer solutions). At 13%, innovative technologies are also relatively frequently called upon in the literature on manufacturing activities. Articles that, respectively, centre on positive, negative, or a combination of both types of interactions between economic activities and sustainable development all mostly call for public policies (at 85%, 42%, and 58%). At 34%, a significant share of articles discussing negative interactions also call for improved business policies. A somewhat similar picture is found when looking at the sustainable development dimensions: across the four categories, public policies are deemed most desirable. Yet particularly when looking at the literature focused on the environment, many articles (35%) also call for better business policies.

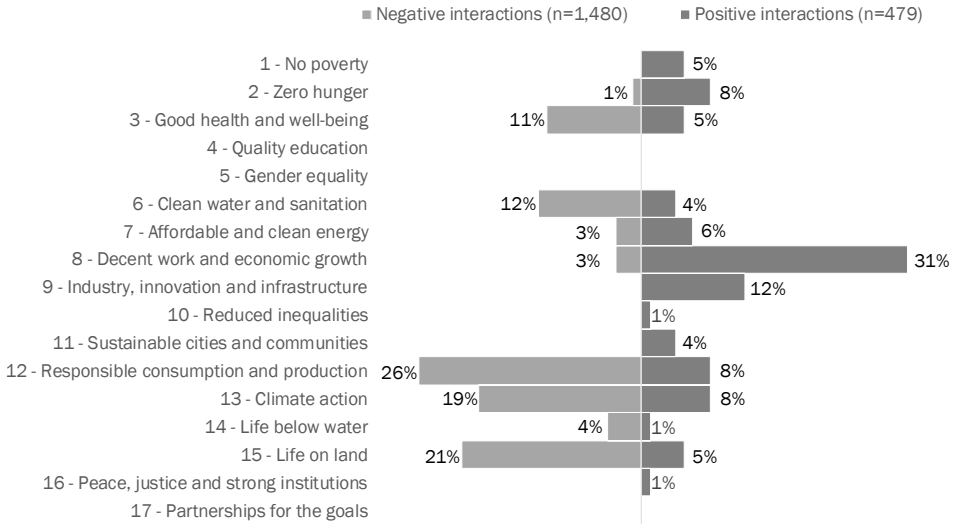
3.4 Synthesis: Interactions between Economic Activities and SDGs

3.4.1 SDG topics in literature on economic activities

In addition to sustainable development dimensions, we recorded the specific sustainable development topics each article discusses (e.g. air pollution, water use, labour productivity etc.). These themes could then be 'translated' to relevant SDGs by assessing the wording of the SDGs' 169 targets.

It is found that the 876 articles made a total of 1,959 references to the themes of the 17 SDGs. 1,480 (76%) of these references were made in the context of a negative interaction between economic activities and SDG themes. 479 (24%) references indicated positive interactions. Figure 3.5 shows the proportion of references made to the SDGs' themes, considering both negative (left) and positive (right) interactions.

Figure 3.5 – References to SDGs made in a negative (left) and positive (right) context



3.4.2 Synthesizing interactions between economic activities and SDG targets

This section summarises positive and negative interactions between economic activities and SDG targets - referred to between square brackets.[10]

Agriculture, forestry and fishing. Economic classes related to crop and animal production, and fishing and aquaculture may help end hunger by improving people's access to safe, nutritious and sufficient food [2.1], in enhancing the productivity of agriculture, particularly concerning small-scale farmers [2.3], and in ensuring sustainable food production systems [2.4] (FAO, 2017; Rasmussen et al., 2018). Additionally, economic classes focused on aquaculture can reduce overfishing and end destructive fishing practices [14.4] (FAO, 2017). And by being a renewable material, wood produced by logging and silviculture activities can help sustainably manage natural resources [12.2] (Michelsen, Solli, & Strømman, 2008). Finally, crop production and forestry deliver biomass that may support renewable energy generation [7.2], enhancing people's access to power [7.1] (Muller, 2009).

[10] For an overview of SDG targets see: https://sustainabledevelopment.un.org/

However, agricultural intensification rarely leads to positive ecosystem impacts (Davis et al., 2016; German, Thompson, & Benton, 2017). Agriculture accounts for some 70% of water withdrawals globally, raising concerns about water scarcity [6.4] (FAO, 2011). Moreover, farmers apply fertilizers and pesticides, whose (over)use causes leaching of chemicals (e.g. nitrogen, phosphorus and potassium) into the soil and groundwater [12.4] (Fischer et al., 2010), constituting water pollution [6.3], harm to freshwater ecosystems [15.1] (Evans et al., 2019) and to biodiversity [15.5] (Krief et al., 2017). Agriculture's extensive land use also drives biodiversity loss (Lanz, Dietz, & Swanson, 2018), as well as land degradation [15.3] (Nowak & Schneider, 2017). Deforestation and habitat loss are furthermore associated with forestry activities [15.2] (Michelsen et al., 2008). Fisheries, in turn, contribute to the depletion of fish stocks through overfishing [14.4] (Roberts, 2007) and, like the aquaculture sector (Islam, 2005), are a cause of marine pollution [14.1] (Good et al., 2010). At an overarching level, climate change [13.2] is worsened through agriculture and forestry's land use, their roles in deforestation, agriculture's production of livestock (IPCC, 2014; Paolotti et al., 2016), as well as through the fuel combustion of fishing fleets (Greer et al., 2019).

Mining and quarrying. Mining coal, lignite and uranium and extracting petroleum and gas contribute to current systems of energy provision [7.1]. Quarrying stone, gravel and sand contributes to developing infrastructure [9.1]. Mining of iron ores and other metals delivers inputs for industrialisation [9.2].

But mining's excavation and extraction degrades natural habitats, which frequently leads to loss of biodiversity [15.5] (Castilla-Gómez & Herrera-Herbert, 2015; UNDP, 2016). Mining activities also cause water pollution [6.3] (Martínez et al., 2019) and generate large volumes of waste (i.e. tailings), such as heavy metals [12.4] that compound effects on natural habitats [15.5] (Fashola et al., 2016). Significant air pollution, including via particulate and gas emissions, is also associated with mining and quarrying activities, posing a threat to human health [3.9] (Fugiel et al., 2017), especially to those living near mining areas (Fernández-Navarro et al., 2012; Hendryx, 2015; von der Goltz & Barnwal, 2019). GHGs are one type of air pollutant emitted by mining activities [13.2] (IPCC, 2014).

Manufacturing drives industrialisation and contributes to raising industry's share of employment and incomes [9.2]. Manufacturing classes that

produce complex goods, such as electronics, motor vehicles, and transport equipment, can be drivers of economic productivity, technological upgrading and innovation, and sources of higher value added [8.2] (H.-J. Chang, 2010; Hausmann et al., 2013). Sub-classes of the manufacturing sector may bring more unique contributions to the SDGs. Manufacturing of: food products may spread access to food [2.1]; agrochemicals and fertilizers can increase agricultural productivity [2.3]; soaps and detergent can help halt communicable diseases [3.3]; pharmaceutical products may contribute to the latter target, as well as to increasing people's access to medicines and vaccines [3.8]; coke and petroleum products could contribute to access to energy [7.1]; construction and building materials can contribute to ensuring access to adequate, safe and affordable housing [11.1]; motor vehicles, bicycles, and railway locomotives may support accessibility of safe, affordable, accessible and sustainable transport systems [11.2]; repair activities can prolong the life of machinery and equipment, thereby preventing waste [12.5]; and computers and communication equipment can spread access to information [16.10].

Being industrial activities, these manufacturing classes have negative impact potential on climate change [13.2] (IPCC, 2014). Many manufacturing classes, such as producing food products, textiles, paper products, and steel products, consume large amounts of freshwater, thereby causing concerns over water scarcity [6.4] (Saleh, 2016). Water pollution is a related issue, being associated with the textile, paper, metals and chemical manufacturing classes [6.3] due to their effluents containing chemicals and waste [12.4 and 12.5] (Pérez et al., 2017; Toczyłowska-Mamińska, 2017). For instance, China's pulp and paper industry, contributing to 25% of global production, accounts for 18% of the country's wastewater emissions (Yu et al., 2016). Similarly, the textile industry represents around 20% of global industrial water pollution (Colin et al., 2016). Such water pollution reaches rivers [15.1] (Madikizela, Tavengwa, & Chimuka, 2017) and marine ecosystems [14.1] (Čelić et al., 2019). Solid waste [12.5] is furthermore generated by the manufacturing of construction and building materials, metals, paper, plastics, and electronics ("e-waste") (Monte et al., 2009; R. Wang & Xu, 2014) which, when ending up in the environment, may pollute natural habitats and harm biodiversity [15.5]. Forests are also at risk [15.2], particularly from wood, paper, and rubber manufacturing classes (Ahrends et al., 2015; FAO, 2008). Finally,

manufacturing of alcohol and tobacco products may cause substance abuse [3.5] while manufacturing of weapons and ammunition and military fighting vehicles could be associated with violence [16.1].

Electricity, gas steam and air conditioning supply classes have the potential to help ensure access to affordable, reliable and modern energy services [7.1]. When derived from renewable sources (which is not included in ISIC Rev. 4) it helps increase the share of renewable energy in the energy mix [7.2]. Access to power is a necessary condition for promoting industrialisation [9.2] (Aliyu, Ramli, & Saleh, 2013).

However, the non-renewable energy sources that are the dominant source in most countries' electricity production (Abas, Kalair, & Khan, 2015), are the principal cause of GHG emissions [13.2] (Höök & Tang, 2013). This section's combustion of energy furthermore drives air pollution [3.9]. For instance, estimates suggest that in China 15 million and in India 11 million years of life lost can be avoided by eliminating power generation emissions (Gao et al., 2018).

Water supply. sewerage, waste management and remediation activities can advance diverse SDG targets. Water collection, treatment and supply activities can spread access to safe and affordable drinking water [6.1], for instance through water distribution (Li et al., 2016) and desalination (Al-Agha & Mortaja, 2005), and contribute to water quality by treating wastewater [6.3]. Sewerage activities may improve access to adequate and equitable sanitation and hygiene [6.2] (Tortajada & Biswas, 2018). Together, water and sewerage activities form important components of infrastructure [9.1] and promote housing with basic services [11.1]. In turn, waste collection, treatment and disposal activities, materials recovery, and remediation activities contribute to waste management [11.6 and 12.4] and may accelerate recycling [12.5] (Andreasi Bassi, Christensen, & Damgaard, 2017). By treating water and waste, and by providing sewerage, these economic classes may also reduce deaths and illnesses from hazardous chemicals and water and soil pollution and contamination [3.9] (Oyoo, Leemans, & Mol, 2014). Waste can furthermore be used as an energy source [7.1].

Trade-offs mainly concern climate change [13.2] due to the energy used in distributing water – estimated to account for some 7% of global energy consumption (Coelho & Andrade-Campos, 2014) – but also caused by economic classes focused

on dismantling wrecks (Dodds, 2007). Waste incineration causes air pollution [3.9] (D. S. Chang & Yang, 2011).

Construction of buildings may positively impact access to housing and urbanisation [11.1] (Castells-Quintana, 2017). Construction of roads, railways, motorways, bridges, but also of utility, water, and telecommunication projects, can contribute to developing quality, reliable, sustainable and resilient infrastructure [9.1] (L. Wang et al., 2018). More specific positive relations between construction of infrastructure and sustainable development targets can also be defined: water projects support access to water, access to sanitation, water quality, and water resources management [6.1, 6.2, 6.3 and 6.5], utility projects spread access to energy [7.1], and telecommunications help provide access to information [16.10].

Yet construction emits GHGs [13.2] (Arıoğlu Akan, Dhavale, & Sarkis, 2017; IPCC, 2014), particulate matter air pollutants and dust [3.9] (Ahmed & Arocho, 2019; Zuo et al., 2017). It consumes vast amounts of natural resources [12.2] (Dong & Ng, 2015) and generates waste [12.5] (Badi & Murtagh, 2019). To illustrate, construction is estimated to account for 25-30% of the European Union's solid waste (European Union, 2019). Fragmentation of natural habitats, for instance through roads that cut through ecosystems, are additional threats [15.5] (Koemle, Zinngrebe, & Yu, 2018).

Wholesale and retail trade; repair of motor vehicles and motorcycles is a broad section that delivers goods and services that can benefit specific SDG targets. Wholesale and retail trade of agricultural and food products and of agricultural machinery can support access to food [2.1] and improve farmers' productivity [2.3 and 2.4]; pharmaceutical and medical goods contribute to ending communicable and non-communicable diseases, ensuring access to sexual and reproductive health-care services, as well as to health-care services and medicines more generally [3.3; 3.4; 3.7; 3.8]; plumbing devices support sanitation [6.2]; gaseous fuels enhance access to energy [7.1]; waste can be a source of clean energy and links to recycling [7.2 and 12.5]; metals, wood, and construction materials may develop infrastructure [9.1]; industrial machinery drives industrialisation [9.2]; timber and building materials support access to housing [11.1]; sale and repair of motor vehicles support access to transport [11.2]; and information and communication equipment can spread access to information [16.10].

Wholesale and retail trade activities transport goods to customers, emitting GHGs [13.2] (Wiese, Toporowski, & Zielke, 2012). Trading motor vehicles, fuels, and chemicals spreads release of air pollutants [12.4 and 3.9]. Selling textiles and clothing produces significant waste, including of microplastics that end up in the environment [11.6; 12.5; 14.1 and 15.5] (Belzagui et al., 2019). Risks of substance abuse are linked to trading alcohol and tobacco [3.5]. And food waste is associated with distributing and selling food products [12.3] (Albizzati et al., 2019).

Transportation and storage activities may support industrialisation [9.2] through freight transport and warehousing. Passenger transport supports mobility [11.2] while public transport helps mitigate GHG emissions and air pollution [13.2 and 3.9]. To illustrate, on days during which Barcelona's metro, train, and/or bus systems are striking, inducing people to take private vehicle trips, air pollutants rise by 4.1% to 7.7% (Basagaña et al., 2018). Additionally, pipeline transport may support countries' access to energy [7.1], whereas space transport's research and development activities help upgrade countries' technological capabilities [9.5].

Yet road, water, and air transport activities are a leading cause of climate change [13.2] (IPCC, 2014; Shi, 2016), and release air pollutants [12.4] that cause health risks [3.9] (Gujba, Mulugetta, & Azapagic, 2013; Zhang et al., 2017). Furthermore, road and rail transport threaten land-based ecosystems [15.5], inland water transport afflicts rivers [15.1] and sea and coastal transport disrupt marine ecosystems through generating pollution, waste, disturbance, and introducing aquatic invasive species [14.1] (Halpern et al., 2008; O'Brien, Johnston, & Kerstetter, 2017).

Accommodation and food service activities can, via hotels and camping grounds, contribute to sustainable tourism [8.9] and, through restaurants and mobile food services, spread access to food [2.1]. However, hotels and restaurants are associated with high water consumption [6.3] (Deyà Tortella & Tirado, 2011), GHG emissions [13.2] (Chan, 2005; L.-F. Chen, 2019), food waste [12.3] (Sakaguchi, Pak, & Potts, 2018; Sandaruwani & Gnanapala, 2016; Yang, Bao, & Xie, 2019), and municipal waste [11.6 and 12.5] (Singh, Cranage, & Lee, 2014).

Information and communication activities provide access to information [16.10]. Software development, computer programming, and telecommunications activities may enhance market efficiencies and thereby promote economic

productivity [8.2], and could also diffuse technology supporting research that upgrades industrial sectors' technological capabilities [9.5] (Vu, 2011). Empirical research confirms a positive link between information and communication activities and economic development, applying among countries at different income levels (Niebel, 2018). An illustration is the African continent, where a 1% increase in access to mobile networks is estimated to lead to a 0.5% increase in real GDP per capita (Djiofack-Zebaze & Keck, 2009).

Negative externalities primarily concern GHG emissions from energy consumption [13.2] (Asongu, Le Roux, & Biekpe, 2017). This relationship is hypothesised to follow an inverted-U shape: over time, smarter cities, transportation systems, electrical grids, industrial processes and energy saving gains may be realised (Añón Higón, Gholami, & Shirazi, 2017).

Finance and insurance activities are called for by various SDG targets, most notably 8.10: to strengthen the capacity of financial institutions to expand access to banking, insurance and financial services. Monetary intermediation may help micro-, small- and medium-sized (industrial) enterprises access financing [8.3 and 9.3], and, together with insurance classes, could help people, including the poor, gain access to financial services [1.4]. Financial intermediation and insurance activities are also conducive to economic productivity [8.2], although this is a complex non-linear relationship (Benczúr, Karagiannis, & Kvedaras, 2018; Lee, Lee, & Chiou, 2017) that is mediated by countries' institutions (Law, Kutan, & Naseem, 2018) and income levels, with low- and middle-income countries displaying no short-run growth effects (Bangake & Eggoh, 2011). Furthermore, past a certain threshold financial development can hamper growth (Law & Singh, 2014) and although financial development could reduce poverty, the financial instability that typically follows is detrimental to the poor (Akhter & Daly, 2009).

Real estate activities can spread access to adequate, safe and affordable housing [11.1]. But the built environment emits GHGs through energy use [13.2], consumes large volumes of water [6.4] and generates waste [12.4] (Zheng, Wu, Kahn, & Deng, 2012). For example, out of 159,000 rental properties in 10 U.S. cities just 5.3% to 21.6% had energy efficiency features, though these drive up the rent by 6% to 14% (Im, Seo, Cetin, & Singh, 2017).

Professional, scientific and technical activities contains classes related to scientific R&D and engineering activities, which support scientific research and upgrading of technological capabilities [9.5]. This section also incorporates architectural activities, aligning with sustainable cities [11.1], and legal activities, which help protect fundamental freedoms in accordance with national and international institutions [16.10].

Administrative and support service activities comprises rental and leasing activities, including of agricultural machinery and equipment, which drive agricultural productivity [2.3 and 2.4], of construction and civil engineering equipment, which contribute to infrastructure development [9.1], and of motor vehicles, water, and air transport equipment, that contribute to access to transport [11.2]. Other services in this section include employment placement, which can match supply and demand of decent jobs [8.3], building and landscape related services, which support the quality of housing [11.1], travel agency services, which play a role in advancing sustainable tourism [8.9], and security and investigation activities, which may reduce violence [16.1].

GHG emissions [13.2], air pollutants [3.9], and negative impacts on land- and marine-based ecosystems [15.5 and 14.1] are associated with the rental and leasing of motor vehicles, water transport equipment, and agriculture and construction machinery.

Education directly supports SDG 4 – Quality Education. Pre-primary, primary, secondary, tertiary, technical and vocational, and other education are classes that enable girls and boys to complete primary and secondary education [4.1], provide access to pre-primary education [4.2], and ensure that people can access technical, vocational and tertiary education [4.3].

Human health and social work activities directly supports SDG 3 – Good Health and Wellbeing, and spreads access to health-care services [3.8]. Hospital, medical and dental activities can help end the spread of communicable diseases, promote prevention and treatment in general, and of substance abuse in specific, help reduce deaths and injuries from road traffic accidents, and ensure access to sexual and reproductive health-care services [3.3; 3.4; 3.5; 3.6; and 3.7]. Child day-care activities can help ensure that girls and boys have access to early childhood development, care, and pre-primary education [4.2].

Arts, entertainment and recreation includes performing arts, libraries, and museums, which safeguard cultural and natural heritage [11.4]. This may foster the appreciation of cultural diversity, which relates to disseminating knowledge and skills for promoting sustainable development [SDG 4.7]. Moreover, these classes may help empower the social, economic and political inclusion of all (Azmat, Ferdous, Rentschler, & Winston, 2018; Hodgetts et al., 2008).

Other service activities is an aggregation of economic classes, many of which are so broad that their interactions with SDGs are hard to define. The repair of computers and personal and household goods, however, can contribute to reducing waste generation through prevention [12.5].

3.5 Implications and Future Research

3.5.1 Towards nexus-based governance

This paper made it clear that the SDGs cannot be viewed in isolation of the economic structures in which they are to be achieved. Economic activities drive positive and negative impacts on the SDGs which are themselves entwined. Our review informs how this nexus may be governed. Whereas economic activities may contribute to diverse socio-economic topics, they are simultaneously linked to environmental degradation and negative health impacts. More specifically, economic activities can promote industrialisation, infrastructure and innovation [SDG 9], economic productivity [SDG 8], housing and transport [SDG 11], production and distribution of food [SDG 2], generation and distribution of energy [SDG 7], managing waste [SDG 12], providing access to health [SDG 3], education [SDG 4] and to information [SDG 16]. But negative externalities abound and afflict the environment as well as people's health. Nearly all types of economic activities emit GHGs [SDG 13], many use vast amounts of water and/or are related to water pollution [SDG 6], cause pollution and waste more generally [SDG 12], which erodes the natural environment [SDGs 14 and 15], and harms people's health [SDG 3], directly, due to pollution, and indirectly as degradation of habitats may spread diseases from animals to humans - which is the likely origin of the current coronavirus pandemic.

Hence, economic activities' impacts on sustainable development must be managed in an integrated - nexus-based - manner that promotes co-benefits of economic activities on SDGs, and mitigates trade-offs (c.f. Allen et al., 2019; Boas et al., 2016; Weitz et al., 2014). There are ample opportunities for furthering research on this nexus:

On the one hand, scholars studying individual economic activities may expand their notions of sustainable development. Of the reviewed articles, just 25% discuss effects on more than one sustainable development dimension and only 14% simultaneously examine positive and negative effects. Analysing an economic activity's positive as well as its negative impacts on multiple sustainable development dimensions helps inform integrated approaches for the SDGs. On the other hand, sustainable development scholars could build on this paper's analysis by: (i) defining networks between economic activities and SDGs; (ii) empirically assessing the correlation (and causality) of economic activities in specific countries, and these countries' performance on the SDGs; and (iii) exploring the conditions that enable policymakers to govern this economy-SDG nexus, including their ability to mobilise collective action, publicly, as well as by bringing companies along in the SDG agenda, for instance through cross-sector partnerships.

3.5.2 Solutions for improving economic activities' sustainable development impacts and the role of the private sector

The reviewed articles proposed diverse solutions for improving the sustainable development impacts of economic activities. These were grouped into four categories: business policy, public policy, innovation, or a combination of these types. Improving sustainable development requires polycentric approaches (Ostrom, 2010). Yet just 15% of articles propose combinations of solutions. Most articles call for *public policy*, particularly as a means to enhance potential positive impacts on social and economic development. Over a quarter of articles invite *business policies*, especially to mitigate negative impacts on the environment. Indeed, in addition to integrated governance (5.1), we note three points concerning businesses, the main agents undertaking economic activities.

First, early insights reveal that although companies supportively embraced the SDGs, there are many gaps in their engagement with SDGs that aim to "avoid

harm" but are "externally actionable", such as environmental degradation (van Zanten & van Tulder, 2018). This is concerning: this study showed that environmentally centred SDGs are among the biggest victims of the economic activities that companies undertake, whereas scholars call on companies to improve their environmental footprint. This provides an opportunity for corporate sustainability scholars to study what the conditions and antecedents are for companies to manage their impact on the SDGs in an integrated manner, both to make positive contributions and to reduce negative externalities.

Second, economic activities undertaken by firms form global value chains (GVCs): globally dispersed chains of production and consumption. By integrating different economic activities, GVCs also spread and connect SDG impacts. For instance, agricultural value chains integrate activities such as crop production, processing, packaging, transport, wholesale and retail trade, and marketing, each impacting different SDGs in different locations of the world (Kastner, Kastner, & Nonhebel, 2011). Furthermore, some firms *"undertake the functional integration and coordination of internationally dispersed activities"* (Gereffi, 1994:41), rendering them to be "lead firms" that determine what is produced, how this is produced, and by whom (Gereffi, Humphrey, Kaplinsky, & Sturgeon, 2001). Future studies can help investigate how the governance of GVCs influences SDG impacts, and how lead firms' ability to decide which countries host what types of economic activities help explain countries' performance on the SDGs.

Thirdly, financial institutions finance economic activities. Financial assets (i.e. loans, equity, credits, etc.)thus impact SDGs. The synthesised interactions between economic activities and SDG targets presented in this paper can map financial portfolios to the SDGs and deliver insights on the impacts financial institutions support. Another research avenue would survey financial services providers' opportunities for balancing their loan portfolios' SDG interactions. For instance, financing a water treatment facility may mitigate the water pollution of a textile manufacturer. A related approach can study the incentives (e.g. reduced interest rates, improved terms) that financial institutions can offer their clients for improving SDG impacts.

3.5.3 Embedding local sustainable development priorities

In assessing the interface between economic activities and sustainable development scholars appear to take local needs into account. For instance, studies on the African continent tend to examine the manufacturing sector's positive impacts on economic development, whereas European and North American focused studies are more likely to investigate the negative environmental impacts of diverse economic activities. Countries report to the UN on their progress towards the SDGs and various institutions conduct cross-country assessments (e.g. Sachs et al., 2019; UN, 2019). Correlating countries' performance on the SDGs with the economic activities undertaken within their boundaries may explain progress and deteriorations, and offer advice on which economic activities may help close the gap towards 2030. However, data availability is a next challenge.

3.5.4 Impact measurement

Measuring the impacts of economic activities on the SDGs is a step that follows logically from this study's synthesis of qualitative effects between these two topics. Three issues deserve attention.

First, concerning the independent variable, there is a need to refine and update classifications of economic activities. ISIC Rev. 4, used by this study and one of the most commonly used classification systems, was most recently updated in 2008. Statistical classifications have thereby not kept abreast with the changing nature of the economy. Various classes of economic activities were found to be either missing, or worthy of an expansion, in a sustainable development context. Alphabetically, this includes the need to add new or differentiate existing economic classes related to: biomass and biofuels; conservation of natural habitats; renewable energy generation and distribution (i.e. hydro, solar, wind); health and climate insurance; microfinance and SME lending; organic agriculture; public versus private transport; sustainable – or green – finance; waste incineration, landfills, recycling and other waste management options.

Second, concerning the dependent variable, measuring progress towards achievement of the SDGs and their targets remains a challenge (Hák, Janoušková, & Moldan, 2016). Aside from general data unavailability and incoherency at the

national level, another issue is the lack of sub-national data. Although national-level SDG indicators are increasingly available, including through the UN Statistics Division and the World Bank, this study shows that the literature frequently reports economic activities to impact SDGs at local (municipal) levels. For instance, mining pollution was found to mostly afflict the health of those living in the mining area. Such impacts may easily be obscured in macro-level statistics. Hence, collecting sub-national data for certain SDG targets is imperative, towards which creative solutions could contribute (in the above example, it might be possible to measure health impacts by surveying doctor reports).

Third, at a meta-level, our findings provide food for thought concerning the measurement and conceptualisation of 'development'. Although GDP is commonly used as an indication of a country's level of development, many commented on its deficiencies and the limited insights the metric provides into 'sustainable development' as an integration of economic, social and environmental development (e.g. Stiglitz, Fitoussi & Durand, 2018). Alternatives have been developed (e.g. UNDP's Human Development Index and the OECD's Better Life Index), yet these apply to countries at a macroeconomic level and are unable to quantify impacts at the level of companies and the economic activities they undertake. Then, the challenge arising from this paper is that although many benefits of economic activities at the company-level can be quantified in terms of GDP (i.e. the value added delivered by an economic activity), its externalities typically are not priced. And this is particularly problematic in terms of negative externalities, such as the adverse effects on climate, ecosystems, and human health that are associated with numerous economic activities. The big question is, what can replace GDP and provide quantifications of the positive and negative impacts of economic activities at the level of companies?

3.5.5 Limitations

Although the quantity, types, and geographic distribution of the articles included in this review are likely to paint a representative picture of the interactions between economic activities and the SDGs, we note four limitations.

First, with 29 grey and 847 academic articles included in the study, publication bias is a risk. We suspect this risk to be low: academic articles were found to have

a much more confined scope than grey articles. Academics inclined to provide detailed insights into the sustainable development impacts of highly specific economic activities, using life-cycle analyses, modelling, experiments, or other comprehensive methods. In contrast, grey literature tended to synthesise the effects reported in academic research. Consequently, grey articles provided overarching perspectives that had been fleshed out in detail in academia.

Second, the review only included articles written in English, which may overlook valuable insights published in other languages.

Third, our scope was confined to the sustainable development effects inherent in the nature of economic activities. Management of these economic activities is relevant too, for instance concerning human rights, gender equality, and occupational health and safety. Corporate sustainability research can contribute to understanding why and how companies manage the interactions between their economic activities and the SDGs.

Fourth, in order to systematically survey the interface between diverse types of economic activities and the wildly varied concept of sustainable development, we inevitably faced a compromise between breadth and depth. The sustainable development challenges we are facing and the numerous ways in which economic activities contribute to them, led us to choose for synthesising breadth, rather than going into depth.

3.6 Conclusion

The world is not on track to achieve the 17 SDGs by 2030. A dominant emphasis on economic development threatens achievement of social, and especially environmental SDGs. Economies are aggregations of numerous, widely diverse economic activities. These individual economic activities vary widely in terms of the SDGs that they impact, both positively and negatively. This study conducted a systematic literature review in order to map the nexus between unique economic activities and sustainable development.

In terms of key indicators, the findings show that studies on agricultural, industrial, and manufacturing activities predominantly assess their negative impacts on environmental development. In contrast, literature on services activities emphasises contributions to economic and social development. These findings vary

across geographies, taking local sustainable development abilities and constraints into account. Solutions for improving economic activities' sustainable development impacts were categorised into a number of specific governance areas: public policies, business policies, and technological innovation. Public policies are most called upon followed by business policy. Mitigating negative impacts is particularly seen to require combinations of these policies.

The review's findings allowed us to map positive and negative interactions between economic activities and SDGs. Through their inherent nature, economic activities have the potential to advance diverse SDGs, particularly those related to industrialisation and the development of infrastructure, economic productivity, urbanization and transport, and power generation and distribution. Yet trade-offs with other, primarily environment- and health-related SDGs, will inevitably arise and are not just related to economic activities that are the usual suspects. Rather, we show that virtually all types of economic activities are associated with negative externalities. The positive and negative interactions between detailed economic activities and SDG targets were summarised per activity.

We conclude that integrated, nexus-based, governance for the SDGs will benefit from accounting for economic activities. Because they impact SDGs economic activities can be a force for good, although their negative impacts must be curtailed. This invites involvement of companies. As the primary agents undertaking economic activities, companies can make valuable contributions towards ensuring that positive interactions materialise and negative interactions are mitigated.

4. Analyzing Companies' Interactions with the SDGs through Network Analysis: Four Corporate Sustainability Imperatives[11]

Abstract

The alignment between corporate strategies and the Sustainable Development Goals (SDGs) can be an indicator of long-term sustainability success. But which types of companies are most, and which are least, aligned with the SDGs? This paper scores how 67 economic activities – as a proxy for companies' operations and the goods or services they deliver – interact with 59 SDG targets. It then uses network analysis to determine to what extent these activities that companies may undertake are aligned with the SDG Agenda. The results reveal four types of corporate activities, each having a strategic sustainability imperative: (i) 'core activities' predominantly generate positive, while having few negative, impacts on the SDGs, challenging companies to *scale* their contributions to further align with the SDG Agenda; (ii) 'mixed activities' have moderate/high degrees of both negative/positive impacts, posing a *decoupling* imperative; (iii) 'opposed activities' provide few benefits yet cause significant adverse impacts, implying that companies must *transform* in order to better align with the SDGs; and (iv) 'peripheral activities' have immaterial positive and negative impacts, creating an imperative to *explore* innovative avenues for creating SDG contributions. Detailed network graphs are presented that map companies' interactions with the SDGs and guide the creation of corporate sustainability strategies. Policy implications include the potential for using companies' activities as a lever for adopting a 'nexus-approach' to the SDGs.

[11] van Zanten, J. A. & van Tulder, R. (2021a). Analyzing Companies' Interactions with the SDGs through Network Analysis: Four Corporate Sustainability Imperatives. *Business Strategy and the Environment.* DOI:10.1002/bse.2753.

4.1 Introduction

The Sustainable Development Goals (SDGs) aim to "transform our world". The 17 SDGs with 169 underlying targets were adopted by all 193 United Nations (UN) member states, forming a "blueprint for shared prosperity in a sustainable world – a world where all people can live productive, vibrant and peaceful lives on a healthy planet" (UN, 2019:2). And in addition to shaping national policies, the SDGs aim to influence corporate strategies. The UN resolution outlining the SDGs formally states: "Governments, international organizations, the business sector and other non-State actors and individuals must contribute to changing unsustainable consumption and production patterns… We call upon all businesses to apply their creativity and innovation to solving sustainable development challenges" (UN, 2015:8, 29).

Companies impact the SDGs. However, although the role of companies in the SDGs is gaining a lot of traction in academic research (e.g., Kolk, Kourula & Pisani, 2017; Mio, Panfilo & Blundo; 2020; Pizzi, Caputo, Corvinho & Venturelli, 2020; Pizzi, Rosati & Venturelli, 2020; Sinkovics, Sinkovic, and Archie-Acheampong; 2020; van Zanten & van Tulder; 2018;2020a; van Tulder; 2018; Witte & Dilyard, 2017), few studies have investigated how companies impact the goals and their underlying targets. If progress towards achieving the SDGs is to be accelerated, the private sector's impacts on sustainable development need to be better understood (cf. van Zanten & van Tulder, 2020a;b). And better understanding how companies impact the SDGs would not only be relevant for informing how these global goals might be advanced at a policy (macro) level. It also would offer relevant inputs for creating business strategies that improve corporate impacts on sustainable development (at a micro-level).

Since all countries agreed to work towards achieving the 17 SDGs by 2030, these goals now comprise the leading frame for sustainable development (e.g. Sachs, 2015), making them part of companies' institutional environments (cf. van Zanten & van Tulder, 2018). Strategic management researchers have extensively studied the relationships between companies and their environments. The consensus is that companies that are able to coevolve with their environment are expected to be more successful compared to those that fail to adapt to changes in their

environment (e.g., Brown & Eisenhardt, 1997; Lewin, Long, & Carroll, 1999; March, 1991; Raisch & Birkinshaw, 2008; Volberda, 1996; Volberda & Lewin, 2003). Transposing these insights to the level of corporate sustainability , it can be proposed that the degree of alignment between corporate strategies and the SDGs is an important indicator of sustainability success. Companies that generate positive impacts that help attain the SDGs can be considered as more sustainable than companies whose impacts impede progress towards the goals. Hence, the SDGs provide a benchmark that helps to discriminate to what extent companies are aligned with their sustainable development context.

This proposition resonates in practice where many, particularly large, companies are choosing the SDGs as a benchmark of sustainability success. Currently, some 72% of large companies report on the goals (PwC, 2019). Voluntary initiatives like the UN Global Compact, the Principles for Responsible Investment, and the World Business Council for Sustainable Development also actively encourage their members to contribute to achieving the SDGs. However, most companies adopt gradual strategies that slowly try to align with the SDGs, with far fewer companies creating transformative strategies that are more likely to secure long-term sustainability success. To illustrate, out of 1,000 companies assessed by PwC, only 25% include the SDGs in their strategy, with just 14% mentioning specific SDG targets (PwC, 2019). Moreover, most companies situate the SDGs in their CSR or corporate communications departments (PwC, 2018). And while many are happy to report positive impacts, few examine their negative impacts on the SDGs (WBCSD and DNV-GL, 2018). It is therefore not surprising that, out of 1,000 surveyed CEOs, only 21% feel that business is currently playing a critical role in contributing to the SDGs (UN Global Compact & Accenture Strategy, 2019).

A requirement for long-term sustainability success is thus for companies to align their activities with the ambitions of the SDGs. However, companies' activities are varied and assessing their impacts on sustainable development requires a nuanced approach. Sinkovics et al. (2021) disentangle this complexity by introducing a matrix that categorizes four corporate activities, each of which may be positively, neutrally, or negatively linked to particular SDGs. First, "associative" activities refer to a firm's involvement in networks related to a specific cause. Second, "peripheral" activities are the voluntary actions a company may undertake

to support a sustainability objective, beyond its core activities. Third, "operational" activities describe the firm's processes. Finally, "embedded" activities encompass the company's products and services (see Sinkovics et al., 2021 for a discussion). Although this discussion underscores that companies can impact the SDGs through various types of activities, the products and services that a company creates, and the process through which they are made and distributed, are at the core of "economic activity" and thus likely to account for the lion share of a company's impacts on the SDGs (Sinkovics et al., 2021; van Zanten & van Tulder, 2020a).

This raises a critical question: which types of companies are most, and which are least, aligned with the ambitions of the SDG Agenda? Companies undertake a myriad of "economic activities" to produce and distribute goods and services. These economic activities may positively and negatively impact the SDGs and their targets – often at the same time. The strategic alignment challenge then becomes to assess the net effects of companies' economic activities on the whole SDG Agenda. To give three simplified examples at the level of individual companies: (i) agricultural producers help feed the world yet also are large consumers of freshwater resources, they degrade natural habitats, and use fertilizers and pesticides that pollute rivers and oceans; (ii) pharmaceutical manufacturers play a key role in promoting health but their processes are chemical intensive and pollute water; and (iii) renewable energy providers promote access to energy, help mitigate climate change, and can consequently positively support ecosystems, while having few, if any, adverse impacts on the SDGs (e.g. van Zanten & van Tulder, 2020a). Only when we understand what the positive and negative impacts are of a company's operations ("operational activities") and the goods and services it delivers ("embedded activities") can we think about how the company might achieve long-term sustainability success by improving its alignment with the SDG Agenda through adaptive or more transformative strategies.

This paper studies the alignment of different types of economic activities, used as an umbrella term that includes companies' operations as well as the goods or services it creates, with the SDG Agenda. We identify 67 unique economic activities and assess to what extent they positively and/or negatively interact with 59 SDG targets. These 67 economic activities apply at the sectoral (meso-level). Since they serve as indications of companies' operations and the goods or services

that are created, these economic activities can be used as a proxy for better understanding the heterogeneous influence of the private sector on sustainable development. This recognizes that we are in need of a more fundamental approach that partly abstracts from individual corporate strategies and instead problematizes the more general impacts of economic activities (meso-level/network) on the SDGs (macro-level). To assess the interactions between these 67 economic activities and 59 SDG targets, we use a qualitative scoring framework that draws from recent studies that seek to conceptualize and establish interactions between the SDGs themselves (e.g. Nilsson et al., 2016; 2018; Weitz et al., 2018). To assess the alignment of each of these economic activities with the SDG Agenda, we then adopt mathematical techniques from network theory to study the scored interactions as a network. Network theory allows for disentangling the interactions between firms and their environments, which is a promising approach that can "invigorate the relevance of management studies in a changing world" (Casciaro, 2020:6).

The results reveal indications of centrality and similarity: (i) which economic activities are most central in terms of impacting most SDG targets; (ii) which economic activities are similar in terms of impacting the same SDG targets; (iii) which SDG targets are most central by being most frequently impacted by economic activities; and (iv) which SDG targets are most similar by virtue of being impacted by the same economic activities. Our results inform to what extent companies pursuing different activities are positively and negatively aligned with the SDG Agenda. This creates critical inputs for corporate sustainability strategies that seek to improve a company's alignment with the SDGs and to thereby attain long-term sustainability success. We distinguish between four types of economic activities, each of which is associated with a strategic imperative: (i) activities that are 'core' to the SDG Agenda generate significant positive and few negative impacts, implying that companies must seek to scale their positive impacts to further align with the SDG Agenda; (ii) 'mixed' activities generate significant positive and negative impacts on the SDGs, posing an imperative to decouple these; (iii) 'opposed' activities generate significant negative, and less significant positive, impacts on the SDGs, implying that companies must transform in order to better align with the SDGs; and (iv) peripheral activities have relatively insignificant

positive and negative effects, posing an imperative to explore ways for generating positive impacts.

These results contribute to the strategic management and sustainable business innovation literature in a number of ways. Extant literature suggests various strategies that companies can employ to improve their impacts on societies and the environment. But most of these studies have found it hard to develop appropriate metrics that can successfully lead to reaching complex sustainability goals, while acknowledging the trade-offs between corporate activities and these goals. One of the most popular strategic management approaches in this discourse has been the idea of 'creating shared value', which aims to align company success with social progress (Porter & Kramer, 2006; 2011). In this approach, companies are supposed to 'fix' capitalism by "creating economic value in a way that also creates value for society by addressing its needs and challenges" (Porter & Kramer, 2011:65). The shared value concept builds on earlier ideas like 'blended value' (Emerson, 2000), the 'triple bottom line' (Elkington, 1997) or the 'bottom of the pyramid' strategy (Prahalad, 2005). The significant traction each of these strategic approaches gained, in theory and in practice (van Tulder, 2018), underscores that it is well-recognized that strategic management is pivotal to improving the impacts of companies on sustainable development. However, this literature also faces significant gaps. One the one hand, such strategic approaches adopt a general perspective, paying little, if any, attention to the different types of economic activities that companies may undertake. In this view, companies are often treated as monolithic entities (or black boxes), that are advised to generically adopt the same type of sustainability strategy, thereby ignoring the diversity of activities different companies may undertake. On the other hand, many dominant strategic management approaches narrowly focus on improving companies' positive impacts, thus conveniently ignoring negative externalities (cf. Crane et al, 2014; Dembek, Singh, & Bhakoo, 2016), which made them susceptible to serious critique for being either too positive or even naive. This paper aims to make a fundamental contribution to this discourse by arguing that strategies that aim to (measurably) have an impact on sustainable development, as exemplified by the SDGs, need to appreciate the heterogeneity of activities that companies may pursue, as each activity can generate positive and negative impacts on various SDGs. Corporate

strategies for improving the degree of alignment between a company and the SDGs – thus creating shared value - are likely to become more effective if they depart from the actual impacts – positive and negative – of that company's activities on the entire SDG Agenda.

Although this paper is framed in the context of corporate strategic approaches to sustainable development, the results also yield insights for policymakers aiming to drive progress towards achieving the SDGs. This study's assessment of economic activities' impacts on the SDGs' targets contribute a meso-level perspective to the policy discourse – with its dominant focus on macro-level interventions. The poor experience with specific interventions (for instance through selective industrial and technology policies that tried to advance particular industries or technologies), have reinforced the search for general – often neo-liberal policies - with a top-down 'one-size-fits-all' approach. The complexity of the SDG framework has likewise precipitated policy-makers to design generic macro-economic strategies. The efficiency and effectiveness of such generic top-down policies can be seriously questioned. They are unable to steer on the complex interconnectedness of sustainable development and thus fail to take spill-over-, networking- and substitution effects of policies into account (e.g., Bennich, Weitz & Carlsen, 2020; Boas et al., 2016; Obersteiner et al., 2016; Scharlemann et al., 2020). Overly generic policy approaches are part of the explanation why progress towards achieving the SDGs is too slow (UN, 2020). These findings reiterate the urgency for developing more sophisticated policy responses, that integrate different levels of analysis (i.e. the macro-, meso- and micro-levels) and the way they interact. By assessing how corporate activities impact diverse SDGs, this paper provides inputs for policies that steer towards attaining the (macro) SDGs by leveraging economic activities (at the meso-level) and the companies that undertake them (at the micro-level).

The remainder of this paper is organized as follows: Section 2 presents our methodology for identifying and subsequently analyzing the interactions between economic activities and SDG targets using techniques from network theory. The results are presented in section 3, revealing detailed network graphs showing the extent to which economic activities align with the SDGs. In section 4 we raise implications for strategic management and for public policy. We also discuss the

study's limitations and delineate avenues for further research. Finally, section 5 offers concluding remarks.

4.2 Methodology

This section first describes how we selected 67 economic activities – as a standardized indication of the core activities that companies undertake - and 59 SDG targets. Then, we explain how we defined and subsequently analyzed the interactions between them.

4.2.1 Defining the scope: economic activities and SDG targets

First, to select economic activities for inclusion in the study, our starting point was the International Standard Industrial Classification of All Economic Activities, Rev. 4 (ISIC) published by the UN Statistics Division (UNSTATS). ISIC classifies economic activities into 21 sections (level 1); 88 divisions (level 2); 238 groups (level 3); and 420 classes (level 4), thereby offering *"a basic tool for studying economic phenomena, fostering international comparability of data, providing guidance for the development of national classifications"* (UNSTATS, 2007). This standardized list of economic activities can be argued to be a relevant proxy for companies' core activities. This is underscored by the prevalence of such classifications in extant datasets on the private sector. For instance, rankings of the world's largest companies (e.g., FT 500) and on the world's most sustainable companies (e.g., Dow Jones Sustainability Index), but also the financial data that is provided by agents such as MSCI, S&P, Bloomberg, or Sustainalytics, use standardized classifications of economic activities to shed light on what types of activities companies undertake.

Taking the ISIC classification (see UNSTATS (2007) for the entire list) as a starting point, we had to decide which particular activities to include in our study. To that end, we assessed the entire classification, aiming to derive a representative list of specific economic activities that offered the level of granularity required for mapping interactions with SDGs (as in many cases the sections were too generic), while at the same time avoiding the inclusion of numerous, highly similar activities (as the economic classes typically were too granular for our purposes).To this end, we started by taking each of ISIC's 21 sections and asked whether it is a good

representation of all divisions, groups, and classes belonging to it. If so, we took the section. If not, we moved down one level and asked whether this division was representative of its underlying groups and classes. A positive answer led us to include the division whereas a negative answer made us repeat the process at the next level down. To illustrate, we decided that the section "Education" sufficiently represented its underlying divisions. In contrast, for the section "Financial and insurance activities" we decided to include two divisions, one for financial and one for insurance activities.

Finally, we removed economic sections that were purely focused on the public sector (i.e. "Public administration and defense; compulsory social security" and "Activities of extraterritorial organizations and bodies") and economic activities whose implications for sustainable development are hard to attribute due to their generic nature, at the levels of sections (i.e. "Other service activities" and "Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use") and divisions, groups, and classes.

The obtained list of 67 economic activities is shown in Table 1. The table also lists the summarized names and sector numbers, which are referred to in some of this paper's figures.

Table 4.1 - Economic activities included in this study

Number	Economic activity	Summarized name
1	Growing of non-perennial crops	A. Crops (n-p)
2	Growing of perennial crops	A. Crops (p)
3	Animal production	A. Animals
4	Forestry and logging	A. Forestry
5	Fishing	A. Fishing
6	Aquaculture	A. Aqua
7	Mining of coal and lignite	M. Coal
8	Extraction of crude petroleum	M. Petrol
9	Extraction of natural gas	M. Gas
10	Mining of metal ores	M. Metal
11	Quarrying of stone, sand and clay	M. Quarrying

12	Manufacture of food products	Mf. Food
13	Manufacture of sugar and bakery products	Mf. Sugar
14	Manufacture of alcohol and tobacco products	Mf. Alcohol
15	Manufacture of soft drinks	Mf. Drinks
16	Manufacture of textiles, leather and wearing apparel	Mf. Textiles
17	Manufacture of wood and paper products	Mf. Wood
18	Manufacture of coke and refined petroleum products	Mf. Coke
19	Manufacture of fertilizers, pesticides and other agrochemical products	Mf. Fertilizer
20	Manufacture of soap and detergents	Mf. Soap
21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	Mf. Pharma
22	Manufacture of rubber, plastics and glass products	Mf. Plastics
23	Manufacture of cement, lime and plaster	Mf. Cement
24	Manufacture of basic metals	Mf. Metals
25	Manufacture of weapons and ammunition	Mf. Weapons
26	Manufacture of computer, electronic and optical products	Mf. Computer
27	Manufacture of agricultural and forestry machinery	Mf. A. Mach
28	Manufacture of machinery for mining, quarrying and construction	Mf. M. Mach
29	Manufacture of motor vehicles	Mf. Motor
30	Manufacture of railway locomotives and rolling stock	Mf. Rail
31	Manufacture of medical and dental instruments and supplies	Mf. Medical
32	Non-renewable electric power generation, transmission and distribution	U. Power (n-r)
33	Renewable electric power generation, transmission and distribution	U. Power (r)
34	Water collection, treatment and supply	U. Water
35	Sewerage	U. Sewerage
36	Waste collection, treatment and disposal activities; materials recovery	U. Waste
37	Construction of buildings	C. Buildings
38	Construction of roads and railways	C. Roads
39	Construction of utility projects	C. Utility
40	Wholesale trade	W. Wholesale
41	Retail sale of food products	R. Food
42	Retail sale of beverages and tobacco products	R. Beverages

43	Retail sale of automotive fuel	R. Fuel
44	Retail sale of information and communications equipment	R. ICT
45	Retail sale of clothing, footwear and leather articles	R. Clothing
46	Retail sale of pharmaceutical and medical goods	R. Pharma
47	Passenger rail transport	T. Rail (p)
48	Freight rail transport	T. Rail (f)
49	Transport via roads	T. Road
50	Water transport	T. Water
51	Air transport	T. Air
52	Accommodation	S. Accommodation
53	Food and beverage service activities	S. F&B
54	Information and communication	S. IT
55	Financial service activities	S. Financial
56	Insurance	S. Insurance
57	Real estate activities	S. Real estate
58	Legal activities	S. Legal
59	Architectural and engineering activities	S. Architecture
60	Scientific research and development	S. Science
61	Activities of employment placement agencies	S. Employment
62	Travel agency, tour operator, reservation service and related activities	S. Travel
63	Security and investigation activities	S. Security
64	Education	S. Education
65	Human health and social work activities	S. Health
66	Arts, entertainment and recreation	S. Arts
67	Repair of computers and personal and household goods	S. Repair

Second, we aimed to derive a representative list of SDG targets that may be influenced by these economic activities. Because the SDGs' targets are much more detailed than the overarching goals, a target-based analysis enhances the richness of insights (van Zanten & van Tulder, 2018) and allows interactions in a network to be more easily discerned (Weitz et al., 2018). Because there are 169 SDG targets, Weitz et al. (2018) advise to work with a sub-selection in order to avoid feasibility constraints. Following the method of van Zanten & van Tulder (2018), we reduced

this list to 59 SDG targets by: (1) removing SDG 17, since it is an overarching goal dedicated to strengthening the means of implementation; (2) working with the 107 substantive targets (those that are numbered) of SDGs 1 - 16, thereby removing "means of implementation" targets (those that are lettered); and (3) excluding targets which could not significantly be foreseen to be impacted by economic activities. We adopted an inclusive approach and intended to ensure good coverage across the SDGs. These 59 targets cover 55% of all substantive targets belonging to these 16 SDGs and, for 11 of the 16 SDGs, the selected targets cover over 55% of their official substantial targets (Table 4.2).

Table 4.2 – SDG targets included in this study

SDG	Substantive targets included	% of the SDG's substantive targets included
1. No poverty	1.4 By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance	40%
	1.5 By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters	
2. Zero hunger	2.1 By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round	60%
	2.3 By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment	
	2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality	

3. Good health and well-being	3.3 By 2030, end the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, water-borne diseases and other communicable diseases	56%
	3.4 By 2030, reduce by one third premature mortality from non-communicable diseases through prevention and treatment and promote mental health and well-being	
	3.5 Strengthen the prevention and treatment of substance abuse, including narcotic drug abuse and harmful use of alcohol	
	3.7 By 2030, ensure universal access to sexual and reproductive health-care services, including for family planning, information and education, and the integration of reproductive health into national strategies and programmes	
	3.8 Achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all	
	3.9 By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination	
4. Quality education	4.1 By 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes	57%
	4.2 By 2030, ensure that all girls and boys have access to quality early childhood development, care and pre-primary education so that they are ready for primary education	
	4.3 By 2030, ensure equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university	
	4.7 By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development	
5. Gender equality	5.1 End all forms of discrimination against all women and girls everywhere	33%
	5.2 Eliminate all forms of violence against all women and girls in the public and private spheres, including trafficking and sexual and other types of exploitation	
6. Water and sanitation	6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all	67%

	6.2 By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations	
	6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally	
	6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity	
7. Affordable and clean energy	7.1 By 2030, ensure universal access to affordable, reliable and modern energy services	67%
	7.2 By 2030, increase substantially the share of renewable energy in the global energy mix	
8. Decent work and economic growth	8.2 Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and labour-intensive sectors	70%
	8.3 Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services	
	8.4 Improve progressively, through 2030, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation, in accordance with the 10-year framework of programmes on sustainable consumption and production, with developed countries taking the lead	
	8.5 By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value	
	8.8 Protect labour rights and promote safe and secure working environments for all workers, including migrant workers, in particular women migrants, and those in precarious employment	
	8.9 By 2030, devise and implement policies to promote sustainable tourism that creates jobs and promotes local culture and products	
	8.10 Strengthen the capacity of domestic financial institutions to encourage and expand access to banking, insurance and financial services for all	
9. Industry, innovation	9.1 Develop quality, reliable, sustainable and resilient infrastructure, including regional and trans-border infrastructure, to support	80%

and infrastructure	economic development and human well-being, with a focus on affordable and equitable access for all	
	9.2 Promote inclusive and sustainable industrialization and, by 2030, significantly raise industry's share of employment and gross domestic product, in line with national circumstances, and double its share in least developed countries	
	9.3 Increase the access of small-scale industrial and other enterprises, in particular in developing countries, to financial services, including affordable credit, and their integration into value chains and markets	
	9.5 Enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, in particular developing countries, including, by 2030, encouraging innovation and substantially increasing the number of research and development workers per 1 million people and public and private research and development spending	
10. Reduced inequalities	10.2 By 2030, empower and promote the social, economic and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status	29%
	10.3 Ensure equal opportunity and reduce inequalities of outcome, including by eliminating discriminatory laws, policies and practices and promoting appropriate legislation, policies and action in this regard	
11. Sustainable cities and communities	11.1 By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums	57%
	11.2 By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons	
	11.4 Strengthen efforts to protect and safeguard the world's cultural and natural heritage	
	11.6 By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management	
12. Responsible production and consumption	12.2 By 2030, achieve the sustainable management and efficient use of natural resources	63%
	12.3 By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses	
	12.4 By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance	

	with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment	
	12.5 By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse	
	12.8 By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature	
13. Climate action	13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries	100%
	13.2 Integrate climate change measures into national policies, strategies and planning[12]	
	13.3 Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning	
14. Life below water	14.1 By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution	29%
	14.4 By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics	
15. Life on land	15.1 By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements	56%
	15.2 By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally	
	15.3 By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world	
	15.5 Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species	

[12] SDG 13 aims to advance "Climate Action" and refers to the Paris Agreement, which was agreed in December 2015, three months after the world agreed on the SDGs. Having been agreed before the Paris Agreement, the SDGs contain no concrete targets for climate change mitigation. In this study, we view SDG target 13.2 as relating to climate change mitigation efforts.

	15.7 Take urgent action to end poaching and trafficking of protected species of flora and fauna and address both demand and supply of illegal wildlife products	
16. Peace, justice and strong institutions	16.1 Significantly reduce all forms of violence and related death rates everywhere	40%
	16.3 Promote the rule of law at the national and international levels and ensure equal access to justice for all	
	16.4 By 2030, significantly reduce illicit financial and arms flows, strengthen the recovery and return of stolen assets and combat all forms of organized crime	
	16.10 Ensure public access to information and protect fundamental freedoms, in accordance with national legislation and international agreements	

4.2.2 Defining interactions between economic activities and SDG targets

We assessed each of the interactions between economic activities and SDG targets. The selection of economic activities and SDG targets renders a total of 3,953 interactions to be analyzed (67 x 59). Economic activities can have diverse interactions with SDG targets and there is a need to go beyond a simple dichotomy of positive and negative effects (cf. Weitz et al., 2018).

To account for the multiplicity of interactions, we used the SDG interactions framework created by Nilsson et al. (2016). This framework provides a typology and scoring of the interactions between SDG targets on a seven-point scale, indicating expected effects of progress of one SDG target on another. The framework distinguishes between three types of positive interactions (i.e., enabling (+1), reinforcing (+2), or indivisible (+3)), neutral interactions (0), and three types of negative interactions (i.e., constraining (-1), counteracting (-2), or cancelling (-3)) (cf. Nilsson et al., 2016). This framework has been applied in empirical studies, for instance by ICSU (2017) to qualitatively map interactions between SDGs, and by Weitz et al. (2017) to map interconnections between 34 SDG targets in the context of Sweden. We adapted the framework (Table 3) in order to assess the uni-directional interconnections between economic activities and SDG targets.[13]

[13] In principle, interconnections between economic activities are bi-directional (i.e. an economic activity influences, and is influenced by, an SDG target). In this study, we only assess the uni-directional interactions between economic activities and SDG targets (i.e. the influence of an economic activity on an SDG target, but not vice-versa).

Table 4.3 – Seven point typology of interactions between economic activities and SDGs*

Type	Interaction	Name	Explanation	Example
Positive	3	Indivisible	An economic activity is inextricably linked to the achievement of an SDG	Renewable energy generation is indivisible from the objective of increasing the share of renewable energy in the global energy mix (SDG target 7.2)
	2	Reinforcing	An economic activity aids the achievement of an SDG	Manufacture of soap and detergents reinforces ending the spread of communicable diseases (SDG target 3.3)
	1	Enabling	An economic activity creates conditions that enable achievement of an SDG	Construction of buildings enables improving people's access to adequate and safe housing (SDG target 11.1)
Neutral	0	Consistent	An economic activity does not significantly - positively or negatively - interact with an SDG	Legal services do not significantly interact with the provision of quality education (SDG 4)
Negative	-1	Constraining	An economic activity limits options to achieve an SDG	Real estate activities constrain the objective of improving water use efficiency (SDG target 6.4)
	-2	Counteracting	An economic activity clashes with an SDG	Water transport releases air pollutants, counteracting health objectives (SDG target 3.9)
	-3	Cancelling	An economic activity makes it impossible to achieve an SDG	Mining coal and lignite cancel the ability to achieve the climate change mitigation goals outlined in the Paris Agreement (SDG target 13.2)

**Adapted from Nilsson et al. (2016)*

Using this scoring framework, we created an incidence matrix that scores interconnections between the 67 economic activities (rows) and the 59 SDG targets (columns). Because identification of interconnections depends on context variables and assumptions about them (Nilsson et al., 2016), we created particular assumptions to guide the scoring exercise and to reduce the risk of subjectivity. As Nilsson et al. (2018) note, in scoring interactions in the context of the SDGs there is a need for transparency about assumptions.

To score the interactions of companies' economic activities on SDG targets, we ask the question: *"If a company engages in this particular economic activity x (rows), how does this influence progress on SDG target y (columns)?"*, whereby we abide by the following assumptions:

1. *Intrinsic:* we only record interconnections caused by the intrinsic nature of the economic activity, not those that might arise from management. For instance, "mining activities" are *intrinsically* expected to negatively interact with the preservation of land-based ecosystems and biodiversity (SDG target 15.5). Such activities may be *managed* in ways that minimize these negative environmental impacts and rehabilitate the ecosystem after the mine's life cycle (and they could be *managed* in ways that promote other SDGs, like gender equality (SDG 5)). This study only looks at the expected intrinsic impacts of economic activities, regardless of how they are potentially managed;
2. *Universal:* we assign interactions if they are expected to arise across different countries. The above example of the interactions between "mining activities" and SDG target 15.5 is expected regardless of whether the activity is executed in Switzerland or Swaziland. While we acknowledge the influence of national factors such as countries' institutional environments, their income-levels, and their resource endowments, on interactions between economic activities and SDG targets, we intend to shed a first light on the universal effects of economic activities on the SDG agenda.

Guided by these assumptions, we scored the interconnections in the incidence matrix through three related methods:

First, we assessed the wording of the 59 SDG targets included in the study to identify which types of economic activities are called for by the targets. For example, SDG 3.8 seeks to improve people's access to health care services and

medicines, which is a direct call for the involvement of the health services (including hospitals) and pharmaceutical sectors. In such cases we defined positive interactions between economic activities and SDG targets, in line with similar endeavors that mapped interactions among the SDG targets based on their wording (e.g. Le Blanc, 2015).

Second, we followed the systematic-type literature review conducted by van Zanten & van Tulder (2020a). This study synthesized interactions between economic activities (also using the ISIC classification) and SDG targets, as reported in 876 academic and grey articles published between 2005 and 2019. We scored the interactions defined by this literature review. By building on extant literature we gained access to a wide-variety of well-founded insights. This was critical for reducing the subjectivity involved in the scoring exercise and for enhancing the replicability of this study.

Third, we liaised with external experts to create a degree of interrater reliability by validating the strength of linkages defined. In total, we consulted 18 experts. Two groups of experts (consisting of 8 and 7 individuals employed as sector and sustainability experts in the financial sector) offered feedback on the defined interactions during half day workshops. The remaining three experts provided feedback on a continuous basis. The feedback of the experts primarily informed which strength to assign to an interaction, rather than whether the interaction should be drawn or not (which was established based on the two methods above).

Following Weitz et al. (2018), we cross-checked the scores, provided explanations for scores that were not straightforward, and in some cases adjusted scores during this iterative process. Although the scores remained qualitative transcriptions of expert judgments, basing them on an assessment of the SDGs' targets, extant literature, and external expert opinions mitigated the extent of the subjectivity inherent to this study.

4.2.3 Analyzing interactions using network theory

We quantitatively analyzed the identified interactions using techniques and methods from *network theory*. A network (G) - or graph in the mathematical literature - is a collection of nodes (N) (or vertices) joined by edges (M) (also called links or interactions), so that $G(N, M)$ (Newman, 2018).

The 67 x 59 incidence matrix that we developed shows the identified and scored interactions between economic activities (67) and SDG targets (59). This incidence matrix can be represented as a bipartite network (also called a two-mode network), since it incorporates two kinds of nodes with edges that only connect nodes of different kinds (i.e. economic activities and SDG targets). Moreover, the network is directed and weighted, meaning that the interconnections flow *from* economic activities *to* SDG targets (direction), whereby the interconnections have different strengths (weight). By employing tools from network theory, we gained also more quantitative insights into the degree of (positive and negative) alignment of individual economic activities with the SDG Agenda.

The data were analyzed using Microsoft Excel. We use Gephi software[14] to visualize the estimated networks of interactions between economic activities and SDG targets.

4.3 Results

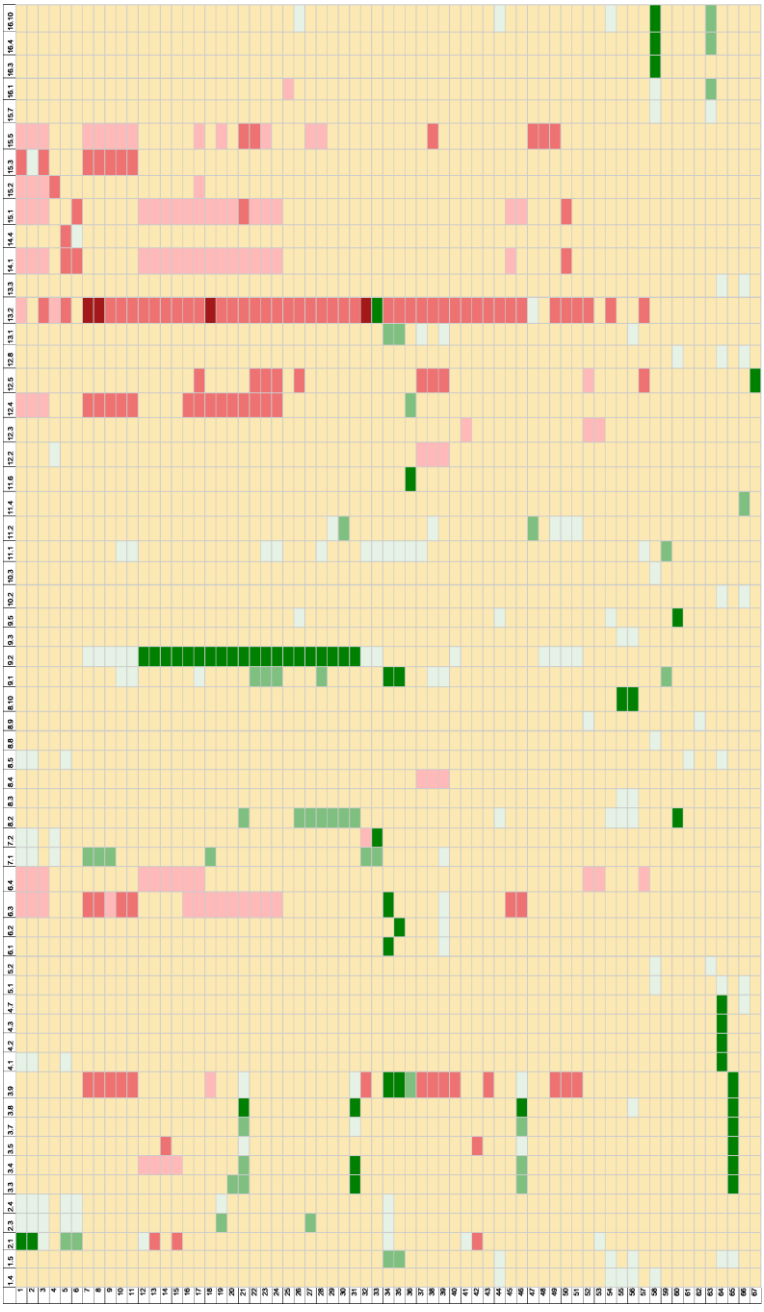
How is progress on SDG targets influenced by the economic activities companies undertake? Our method results in an 'impact matrix' which creates the backbone of this study (section 3.1). The matrix enables in-depth network analysis of the net alignment between economic activities and SDG targets (section 3.2).

4.3.1 Impact matrix

Our analysis departs from the impact incidence matrix that scores interactions between 67 economic activities and 59 SDG targets. The scoring reveals how progress on SDG targets (columns) is expected to be influenced by the particular economic activities (rows) companies engage in. Figure 4.1 is the resulting incidence matrix showing the 3,953 interactions that were analyzed. In the matrix, colors correspond to the scores that were used, ranging from dark red (-3 - cancelling) to dark green (+3 – indivisible).

[14] Gephi is "the leading visualization and exploration software for all kinds of graphs and networks". See: https://gephi.org/

Figure 4.1 – Incidence matrix



Slightly more positive (225) than negative (214) interactions were identified. The remaining and predominant share of interactions (3,514; 89% of total) are neutral. Of the positive interactions, 57% are characterized as 'enabling' (+1), 19% as 'reinforcing' (+2), and 24% as 'indivisible' (+3). Conversely, 46% of negative interactions are 'constraining' (-1), 52% 'counteracting' (-2) and 2% 'cancelling' (-3).

The matrix in Figure 1 sums the rows as an indication of the net influence an economic activity exerts on all SDG targets. It similarly sums the columns, indicating the net influence a SDG target receives from all economic activities. We find that economic activities with the most positive influence on SDG targets are "Human health and social work activities" and "Education". In contrast, "mining of coal, lignite and extraction of natural gas" and "quarrying of sand, stone, and clay" exert the most negative net influence on the SDGs. And whereas SDG target 9.2 (promotion of industrialization) benefits the most from economic activities, target 13.2 (mitigation of climate change) receives the most net negative influence from economic activities.

As Weitz et al. (2018) note, such net influence scores provide an impression of the identified interactions, though offer limited insights into the dimensions of the underlying interactions. An economic activity can have a high score by having few but important, or many but less significant, interactions with SDG targets. Similarly, an economic activity may simultaneously have many positive and negative interactions, indicating it has an important role in the SDG agenda, yet still have a net influence score of around zero as pluses and minuses balance one another. This logic holds equally for the net influence scores of SDG targets (columns). Hence there is a need to further analyze these interactions.

4.3.2 Assessing interactions through network analysis

The incidence matrix contains diverse types of information. It shows that economic activities generate positive, neutral, and negative influences on multiple SDG targets. There are big differences between economic activities in their influence on the SDGs. The same variations apply to SDG targets: some are supported by many economic activities, some are degraded by many, and others

receive few influences. To obtain a better understanding of these interactions we apply network analysis.

As a first step, Figure 4.2 visualizes the interactions identified in the incidence matrix as a bipartite network of two groups of nodes: economic activities shown as grey nodes; and SDG targets shown in colored nodes, with their color corresponding to the SDG logos. The color of the interactions (edges) between the nodes denotes positive (green) or negative (red) impacts. The interactions' strength is indicated by the width of the interactions (ranging from 1 to 3). In total, it visualizes 439 interactions between 126 nodes (67 economic activities and 59 SDG targets).

This first visualization of the matrix conveys that: (i) the interrelations between economic activities and SDG targets are many and complex; and (ii) deeper analysis is needed to understand to what extent specific economic activities are positively and negatively aligned with the entire SDG Agenda.

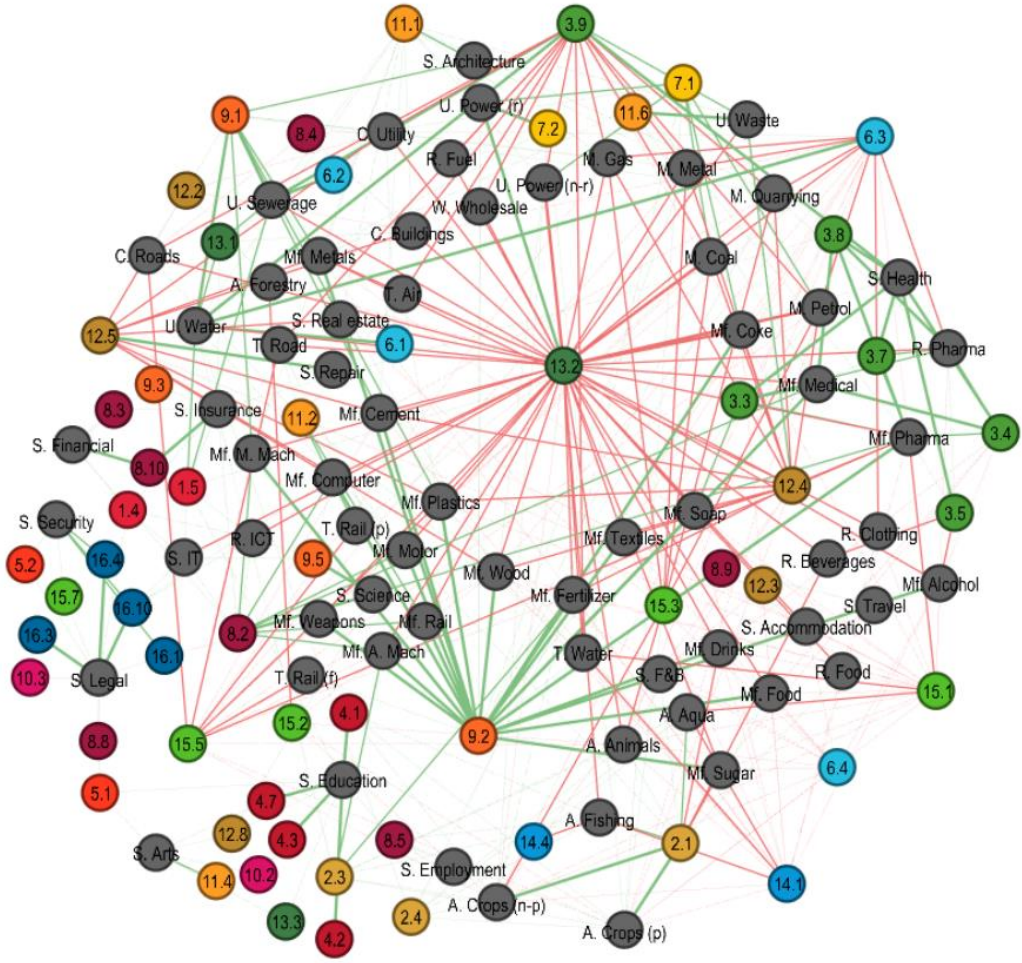
Centrality. Figure 4.2 shows that economic activities differ in terms of the number of SDG targets that they impact, and conversely that SDGs vary in terms of the number of sectors that they are influenced by. The concept of *degree centrality* sheds light on which nodes in a network are most important, by virtue of their influencing (or being influenced by) many other nodes. We calculated the out-degree centrality of economic activities and the in-degree centrality of SDG targets by summing each economic activity's out-going interactions (edges) and each SDG target's ingoing interactions.

We transformed our incidence matrix in order to only look at whether there is an interaction between an economic activity and an SDG target. Hence, this changed our weighted interactions to binary - yes/no – interactions. With this transformed incidence matrix (*A)*, we calculated the degree centrality for given nodes i and j as follows, distinguishing between the out- and in-degree:

$$k_i^{out} = \sum_{j=1}^{59} a_{ij} \qquad and \qquad k_j^{in} = \sum_{i=1}^{67} a_{ij}$$

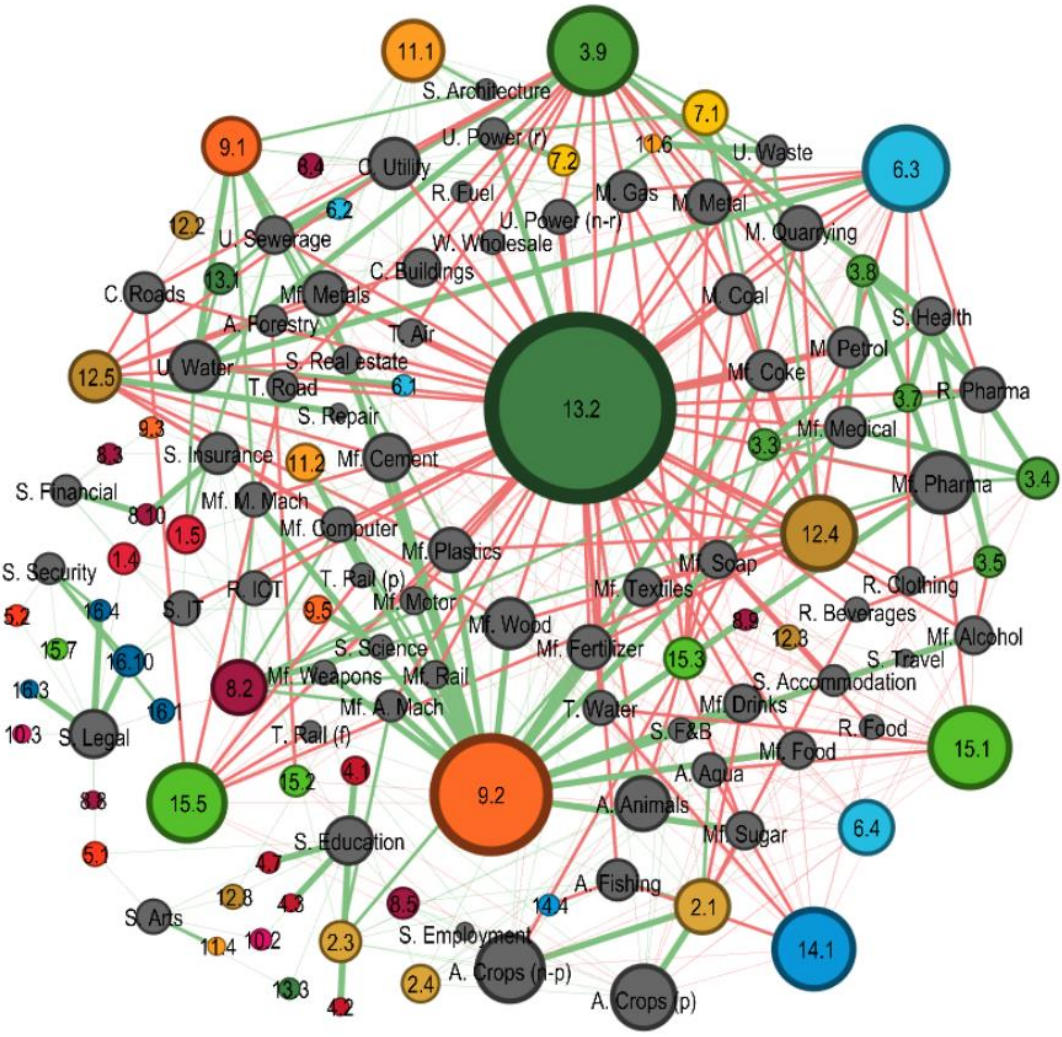
where element a_{ij} of incidence matrix *A* indicates a 1 if there is an interconnection from economic activity i to SDG target j.

Figure 4.2 - Full network of economic activities' (grey nodes) interactions with SDG targets (colored nodes)



We used the obtained measures of out-degree centrality (of economic activities) and in-degree centrality (of SDG targets) to update the visualization of the network. In Figure 4.3, the size of the nodes correlates with the extent to which economic activities influence SDG targets and vice versa.

Figure 4.3 - Centrality-adjusted network of interactions between economic activities and SDG targets



So, which economic activities exert most influence on the SDG Agenda? We find that "Growing of non-perennial crops" has the highest out-degree centrality as it interacts with 16 SDG targets. This is followed by "growing of perennial crops" ($k^{out} = 15$), and "manufacturing of basic pharmaceuticals" ($k^{out} = 14$). Figure 4.3 also clarifies which SDG targets are most central by receiving most influence

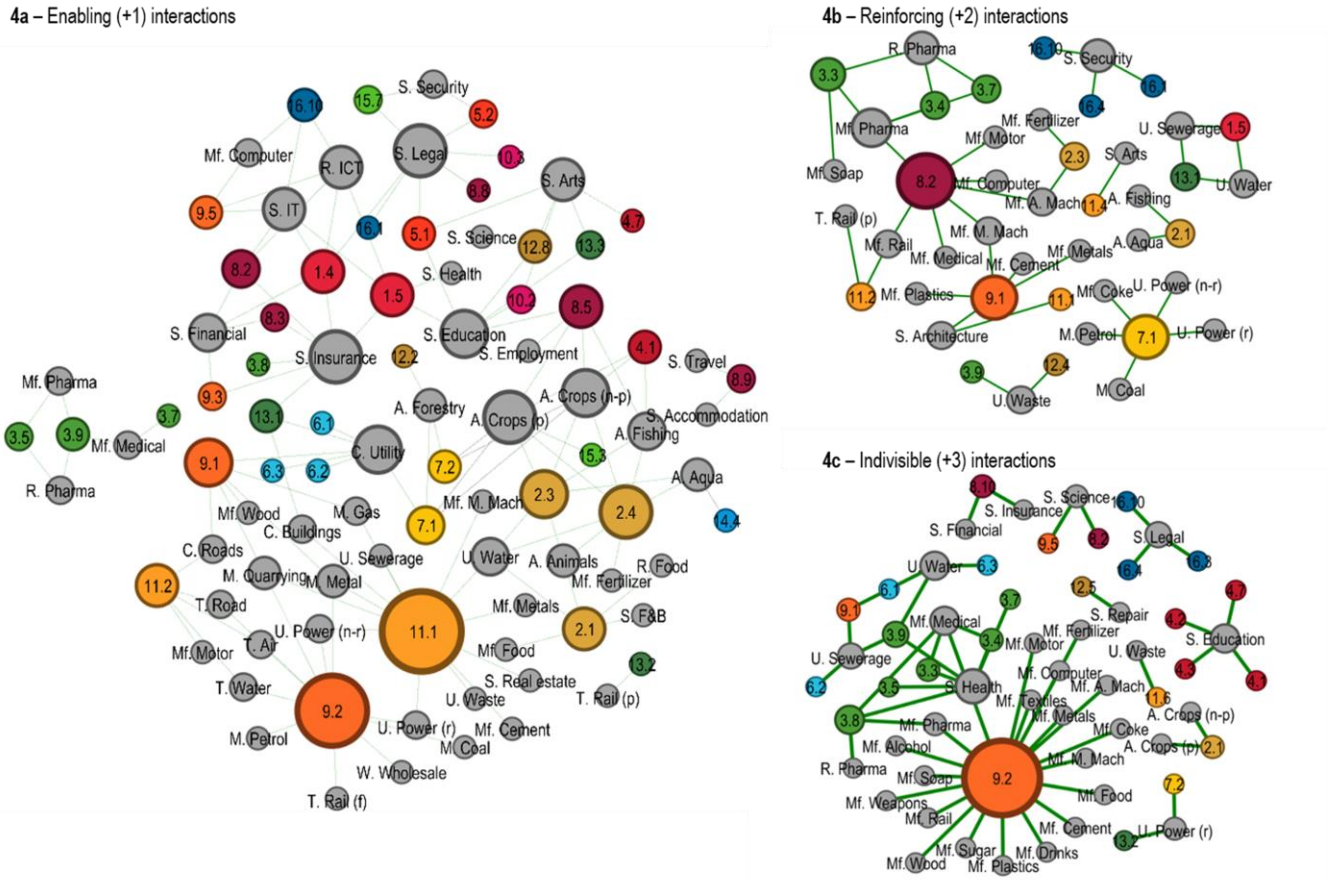
from economic activities. The results indicate that target 13.2 (climate change mitigation) has the highest in-degree centrality, being influenced by 51 economic activities. Other SDG targets that have high in-degree centrality are: 9.2 (promotion of industrialization; $k_{9.2}^{in} = 32$), 3.9 (reducing diseases from pollution; $k_{3.9}^{in} = 22$); 6.3 (reducing water pollution; $k_{6.3}^{in} = 21$), 15.1 (freshwater ecosystems; $k_{15.1}^{in} = 20$); and 14.1 (marine pollution; $k_{14.1}^{in} = 20$).

The centrality measures above give an indication of economic activities' overall influence on the SDGs. However, they do not distinguish between positive and negative interactions. To better understand how companies' economic activities influence the SDG Agenda, it is relevant to separately assess their positive and negative degree-centralities.

We find that "Education", "Legal activities", and "Water collection, treatment and supply" have the highest positive (denoted by "+") out-degree centrality ($k^{out(+)} = 10$). In terms of negative out-degree centrality (denoted by "-"), "Growing of non-perennial crops", "Animal production", and "Manufacture of wood and paper products" negatively interact with most SDG targets ($k^{out(-)} = 9$). We also look at SDG targets' positive in-degree centrality. We find 9.2 (industrialization; $k_{9.2}^{in(+)} = 32$) to rank top, followed by 11.1 (urbanization and housing; $k_{11.1}^{in(+)} = 13$), 9.1 (infrastructure; $k_{9.1}^{in(+)} = 12$), and 8.2 (economic productivity; $k_{8.2}^{in(+)} = 12$), indicating these targets to be impacted by most economic activities. Negative in-degree centrality is highest for 13.2 (climate change mitigation; $k_{13.2}^{in(-)} = 49$), 15.1 (freshwater ecosystems; $k_{15.1}^{in(-)} = 20$), and 14.1 (marine pollution; $k_{14.1}^{in(-)} = 20$).

Whereas these results indicate which economic activities generate most positive/negative interactions with particular SDG targets (and vice versa), they do not speak to the strength of the interactions that were assigned. We therefore go one step further and also consider the scores that indicate the strength of the positive/negative interactions. We do so by creating sub-networks for the economic activities' positive interactions (Figures 4.4a,b,c) and negative interactions (Figures 4.5a,b,c) with SDG targets. Each figure consists of three sub-networks: one for each score that was assigned. We next explain the findings presented in each figure.

Figure 4.4 - Positive interactions of economic activities on SDG targets



First, as displayed in Figure 4.4a, "growing of perennial crops" ($k^{out(+1)} = 7$), "legal activities" $\left(k^{out(+1)} = 7\right)$ and "insurance" $\left(k^{out(+1)} = 7\right)$ generate most *enabling (+1)* effects on SDG targets. In turn, SDG targets 9.2 (industrialization; $k_{9.2}^{in(+1)} = 12$) and 11.1 (urbanization; $k_{11.1}^{in(+1)} = 12$) receive most *enabling (+1)* effects. As shown in Figure 4.4a, these inward enabling effects arise in particular from transport, utilities, and mining activities. To briefly explain some of these interactions:

- Crop production can enable SDG targets related to agricultural productivity [2.3; 2.4], performance in schools [4.1] and in employment [8.5], and access to (renewable/biomass) energy [7.1; 7.2].
- Legal activities can enable the institutional requirements for sustainable development, especially in the context of poverty eradication [1.4], gender equality [5.1; 5.2], labor rights [8.8], discrimination [10.3], trafficking of species [15.7], and violence [16.1].
- Insurance can enable the poor to access financial services [1.4] and reduce people's vulnerability [1.5], for instance to climate-related hazards [13.1], it can enable access to health-care [3.8], and may promote entrepreneurship [8.3] and growth more broadly [8.2].

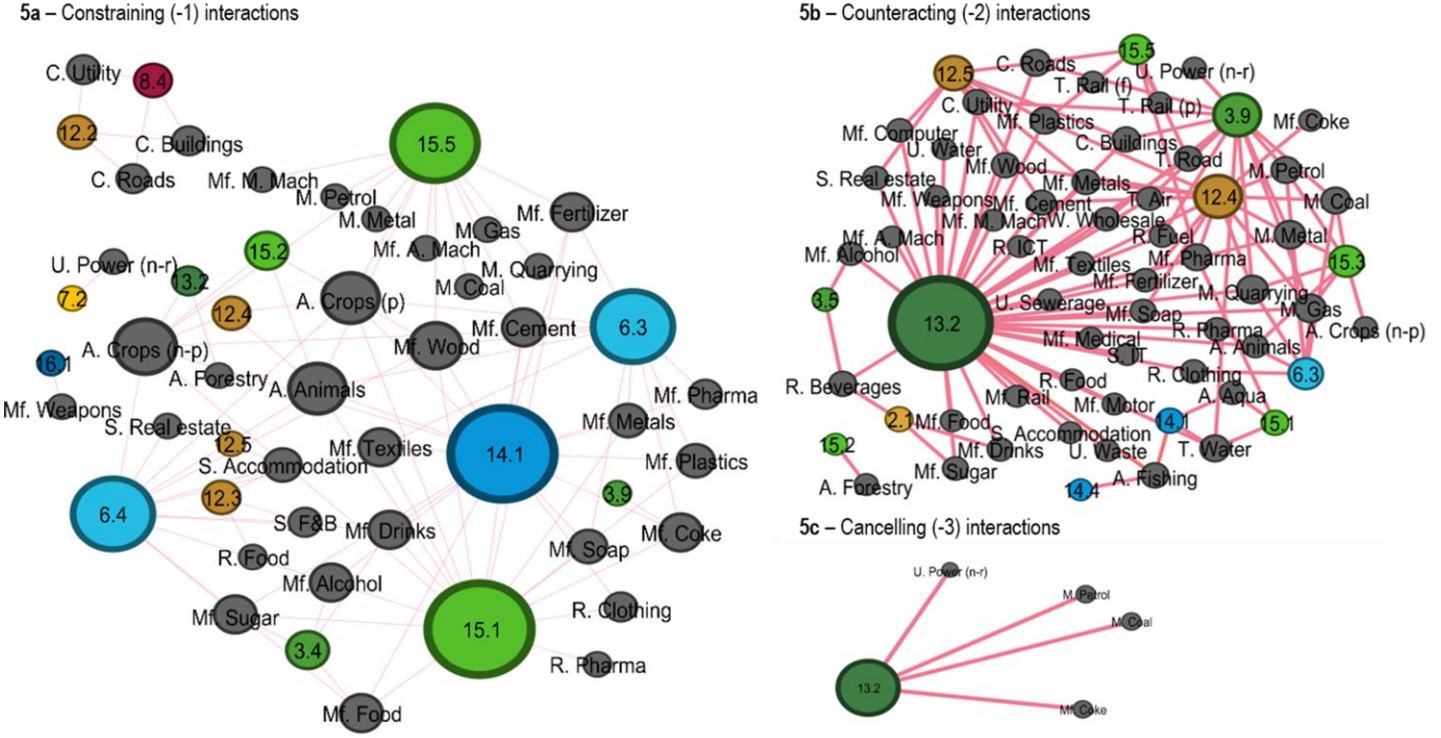
Second, Figure 4.4b shows that "manufacturing of basic pharmaceuticals" $\left(k^{out(+2)} = 4\right)$, "the retail sale of pharmaceutical and medical goods" $\left(k^{out(+2)} = 3\right)$, and "security and investigation activities" $\left(k^{out(+2)} = 3\right)$ generate most *reinforcing (+2)* effects, the former two on targets related to good health and well-being [3.3; 3.4; 3.7], the latter on targets related to peace, justice and strong institutions [16.1; 16.4; 16.10]. SDG target 8.2, relating to economic growth, receives most reinforcing effects $\left(k_{8.2}^{in(+2)} = 7\right)$, in particular from relatively sophisticated manufacturing activities. Target 7.1 (access to energy; $k_{7.1}^{in(+2)} = 6$) is reinforced by utilities, mining, and coke manufacturing activities. And target 9.1 (infrastructure; $k_{9.1}^{in(+2)} = 5$) is reinforced by cement, metals, plastics, and machinery manufacturing sectors, as well as by architecture services.

Third, *indivisible (+3)* interactions particularly arise when SDG targets explicitly call for the involvement of economic activities. As shown in Figure 4.4c, the many types of manufacturing activities in this study's scope are industrial activities and therefore, by their nature, indivisible from the promotion of industrialization [9.2] ($k_{9.2}^{in(+3)} = 20$). Economic activities causing most indivisible interactions with SDG targets include "human health and social work activities" ($k^{out(+3)} = 6$) and "manufacture of medical and dental instruments and supplies" ($k^{out(+3)} = 4$), being entwined with good health and well-being (SDG 3). Moreover, "water collection, treatment and supply" ($k^{out(+3)} = 4$) is indivisible from water and sanitation (SDG 6), and "education activities" ($k^{out(+3)} = 4$) are inseparable from quality education (SDG 4).

We similarly investigated the negative interactions between economic activities and SDG targets. Again, we explain the findings for each of the three types of negative interactions between economic activities and SDG targets.

First, Figure 4.5a reveals that SDG targets 15.1 (freshwater ecosystems; $k_{15.1}^{in(-1)} = 20$),14.1 (marine pollution; $k_{14.1}^{in(-1)} = 20$), 6.3 (water quality; $k_{6.3}^{in(-1)} = 19$), 15.5 (biodiversity; $k_{15.5}^{in(-1)} = 19$), and 6.4 (water scarcity; $k_{6.4}^{in(-1)} = 12$) receive most *constraining (-1)* interactions from an array of agriculture, mining and manufacturing activities. "Growing of non-perennial crops" ($k^{out(-1)} = 8$), "growing of perennial crops" ($k^{out(-1)} = 7$), and "animal production" ($k^{out(-1)} = 7$) generate most constraining interactions, followed by various manufacturing activities.

Figure 4.5 - Negative interactions of economic activities on SDG targets



Second, Figure 4.5b reveals that SDG targets 13.2 (climate change mitigation; $k_{13.2}^{in(-2)} = 49$), 3.9 (deaths and illnesses from pollution; $k_{3.9}^{in(-2)} = 14$) and 12.4 (chemicals and waste; $k_{12.4}^{in(-2)} = 14$) receive most *counteracting (-2)* effects. 52 of the 67 economic activities included in this study generate counteracting effects on at least one SDG target. Economic activities creating most counteracting effects are "mining of metal ores" ($k^{out(-2)} = 5$) and quarrying of stone, sand and clay ($k^{out(-2)} = 5$).

Third, SDG target 13.2 centers on climate change measures and refers to the 2015 Paris Agreement that aims to limit global warming to 1.5 degrees Celsius relative to pre-industrial times. Four economic activities in this study, "mining of coal and lignite", "extraction of crude petroleum", "manufacture of coke and refined petroleum products", and "non-renewable electric power generation", are so intensive in terms of their greenhouse gas emissions that they are not aligned with the intentions of the Paris Agreement, and therefore *cancel (-3)* SDG 13.2 (Figure 5c).

Similarity. In addition to estimating how central economic activities and SDG targets are in this network, we can assess how similar they are. Similarity is useful because it allows us to identify allies: pairs of economic activities may be similar in terms of impacting the same SDG targets, whereas pairs of SDG targets may be similar due to their being impacted by the same economic activities. If similarity between economic activities or among SDG targets is high, it implies that they share the same challenges in terms of improving positive and/or mitigating negative interactions. This may provide relevant insights for creating partnerships for the SDGs.

We took the following steps to ascertain which economic activities impact the same SDG targets, and which SDG targets are impacted by the same economic activities. First, we created one-mode projections of the bipartite (two-mode) network used in the foregoing analysis ((i.e. the network showing interactions between two groups of nodes: economic activities and SDG targets). These one-mode projections help study the similarity of nodes in each group by showing whether pairs of economic activities interact with an SDG target (and vice versa).

Hence, we created a one-mode projection that counts the number of SDG targets that two economic activities both interact with by multiplying incidence matrix A with the transpose of incidence matrix A^T(so that $P = AA^T$). Similarly, we made a one-mode projection that counts the number of economic activities that two SDG targets are commonly impacted by, through calculating the matrix $Q = A^T A$. Whereas the result P is an 67 x 67 matrix - similar to an adjacency matrix - that shows the number of SDG targets that two economic activities both interact with, Q is a 59 x 59 matrix that shows the number of economic activities that two SDGs are both impacted by.

Second, we calculate a cosine similarity metric to investigate the relative similarity of pairs of economic activities and pairs of SDG targets. To explain, the created projections measure the similarity between the nodes in each of the two groups (i.e. economic activities and SDG targets) by simply counting total number of interconnections they share. This is a rough measure that is heavily influenced by the economic activities' and SDG targets' outdegree centrality: if they have more interactions, they have a higher likelihood of sharing similarities with other nodes. We therefore analyzed the similarity of economic activities and SDG targets by calculating their cosine similarity. The cosine similarity quantifies similarity between two nodes relative to the degrees (i.e. number of interconnections) of each node. The resulting metric ranges from 0 (two nodes have no interconnections in common) to 1 (two nodes interact with exactly the same nodes), thereby providing a normalized scale for measuring similarity. We calculated the cosine similarity for all pairs of economic activities and all pairs of SDG targets.

For a pair of economic activity nodes *i* and *j*, we calculated their cosine similarity:

$$\sigma_{ij} = \frac{\sum k \; P_{ik} \, P_{kj}}{\sqrt{k_i}\sqrt{k_j}},$$

and for each pair of SDG targets nodes *i* and *j*:

$$\sigma_{ij} = \frac{\sum k \; Q_{ik} \, Q_{kj}}{\sqrt{k_i}\sqrt{k_j}},$$

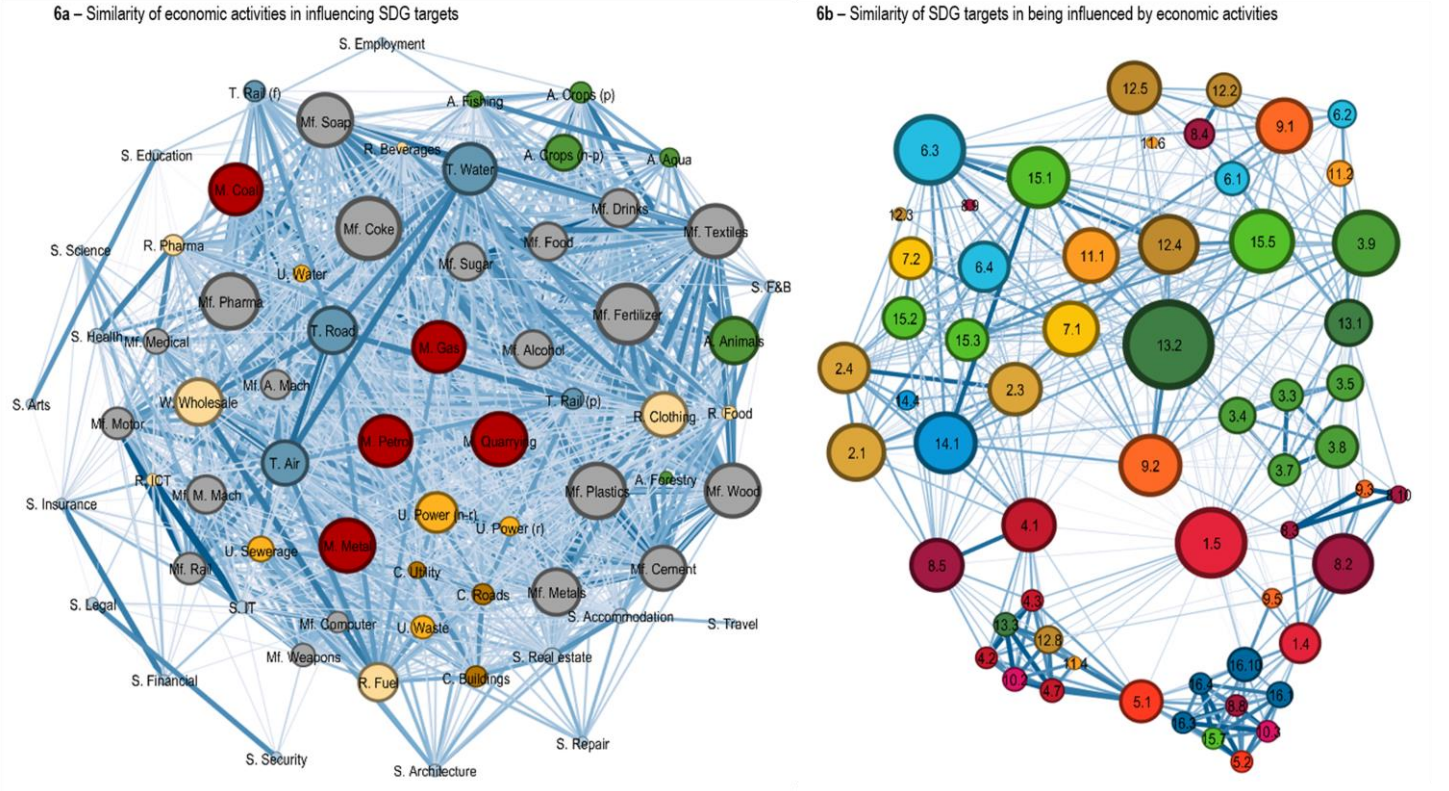
where *P* and *Q* respectively are the adjacency matrices that count the number of nodes economic activities (*P*) and SDG targets (*Q*) have in common.

The results indicate 1,511 instances in which two economic activities both impact the same SDG target. Figure 4.6a visualizes the similarity of economic activities as a network, whereby an interaction (edge) between two economic activities (nodes) signals that they both impact at least one SDG target (hence, the figure visualizes 1,511 edges). The width of the edges indicate the cosine similarity between two activities: the wider the edge, the more similar two economic activities are in their impacts on the SDGs. The size of the nodes signals economic activities' out-degree centrality. Their color relates to the overarching economic sector they are a part of. Similarly, figure 4.6b shows 500 interactions between the 59 SDG targets in this study, indicating that two targets are both impacted by the same economic activity. The edges' widths indicate their cosine similarity; the nodes' sizes indicate their in-degree centrality.

On average, an economic activity has 45 other economic activities that interact with at least one similar SDG target. This ranges from a low of 1 ("travel agency services" and "accommodation" share one SDG target [8.9]) to a high of 57 ("manufacture of basic pharmaceuticals" interacts with SDG targets that 57 economic activities also interact with). The economic activities in the center of Figure 4.a6, such as mining, construction, manufacturing and transport activities, interact with many SDG targets, leading them to share many similarities. The outer range contains economic activities, mostly in the services sector, that have fewer SDG interactions. Consequently, these economic activities have fewer instances in which they interact with the same SDG targets as other economic activities.

In contrast, an SDG target has an average of 17 other SDG targets that are influenced by at least one shared economic activity. SDG targets 8.9 (promoting sustainable tourism) and 11.6 (reducing the per capita environmental footprint of cities) both only have 4 SDG targets that are impacted by the same economic activities. In contrast, SDG target 13.2 (mitigating climate change) has 41 SDG targets that are impacted by at least one of the same economic activities. SDG targets 1.5 (building the resilience of the poor) and 6.3 (improving water quality by reducing pollution) both have 32 SDG targets that are impacted by at least one shared economic activity.

Figure 4.6 - Similarity of economic activities (left) and of SDG targets (right)



Adding to this, Figure 4.7 shows the adjacency matrix that reports the cosine similarity of two sectors (row and column). Likewise, Figure 4.8 shows the adjacency matrix that reports SDG targets' cosine similarities. In these matrixes, the colors correspond to the cosine similarity between two economic activities (Figure 4.7) or SDG targets (Figure 4.8). The following colors are used to signal similarity: dark green (high similarity; $\sigma_{ij} > 0.8$); light green (substantial similarity; $\sigma_{ij} > 0.6 < 0.8$); yellow (moderate similarity; $\sigma_{ij} > 0.4 < 0.6$); orange (slight similarity; $\sigma_{ij} > 0.2 < 0.4$); light grey (low similarity; $\sigma_{ij} > 0.01 < 0.2$); dark grey (no similarity; $\sigma_{ij} = 0$).

Unsurprisingly, we find greater degrees of similarity along the diagonals in both figures, indicating that economic activities and SDG targets, that are more similar in type, also are more similar in terms of SDG impacts. For instance, in Figure 4.7, we find high similarity among crop and animal production activities (sectors 1-3), mining activities (activities 7-11), manufacturing of different food types (activities 12-16) and so forth. By the same logic, in Figure 4.8, we find that the targets under SDGs 2, 3, 4, 5, 7, 15 and 16 are relatively similar, and thus impacted by more of the same economic activities.

More surprising similarities were found away from the diagonals. For example, the manufacturing of pharmaceuticals (21) is seen to have similar SDG impacts to other manufacturing activities, including of alcohol and tobacco (14), of textiles (16), of fertilizers, pesticides and other agrochemicals (19), of medical and dental instruments and supplies (41), and to human health and social work activities (65). Hence, these similarities can be driven by shared positive effects (e.g. pharmaceutical manufacturing and human health activities both help advance targets related to good health and wellbeing – SDG 3), by mixed effects (e.g. pharmaceuticals advance SDG targets 3.4 and 3.5, whereas manufacturing alcohol and tobacco negatively interacts with these targets), or by negative effects (e.g. pharmaceutical manufacturing and textile manufacturing both face challenges in terms of SDG target 6.3 – water pollution – and SDG target 12.4 – chemicals and waste, among others). Looking at the similarity between SDG targets, it is found for instance that ending poaching and trafficking of biodiversity (15.7) is similar to eliminating violence against women and girls (5.2), protecting labor rights (8.8),

ensuring equal opportunity (10.3), reducing violence (16.1), promoting the rule of law (16.3), reducing illicit financial and arms flows (16.4), and ensuring public access to information (16.10). The similarity across these SDG targets is driven primarily by ‘legal activities’, which plays an enabling role in the achievement of these targets.

Figure 4.7 – Cosine similarity of pairs of economic activities

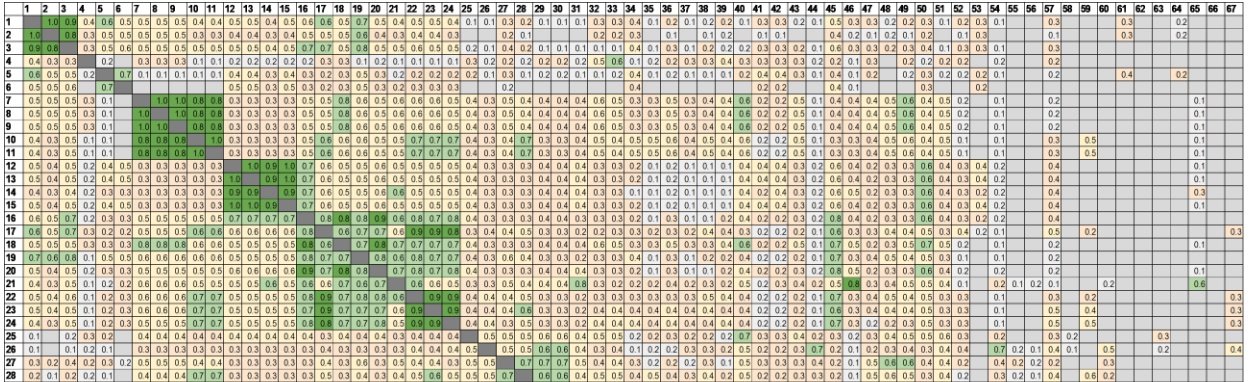
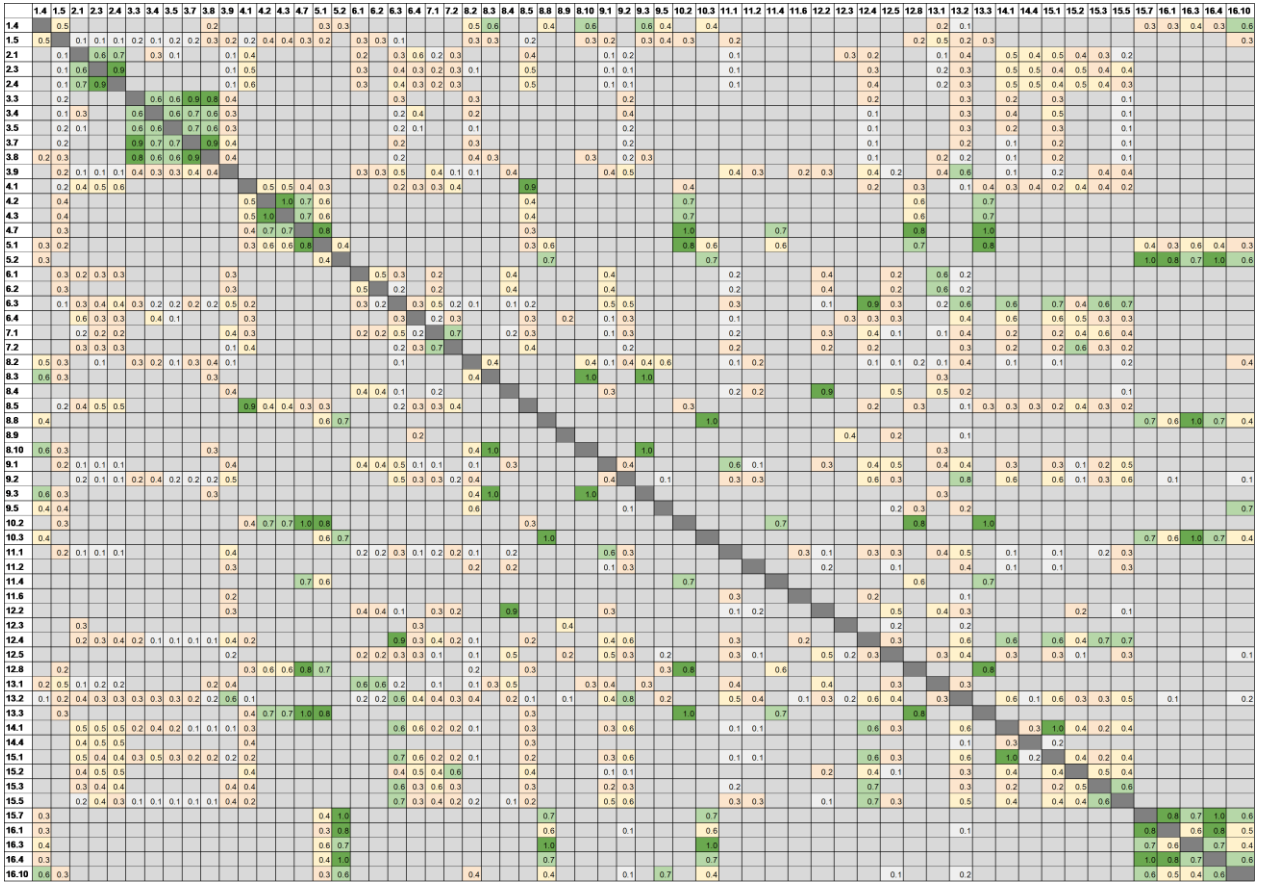


Figure 4.8 – Cosine similarity of pairs of SDG targets



4.4 Implications

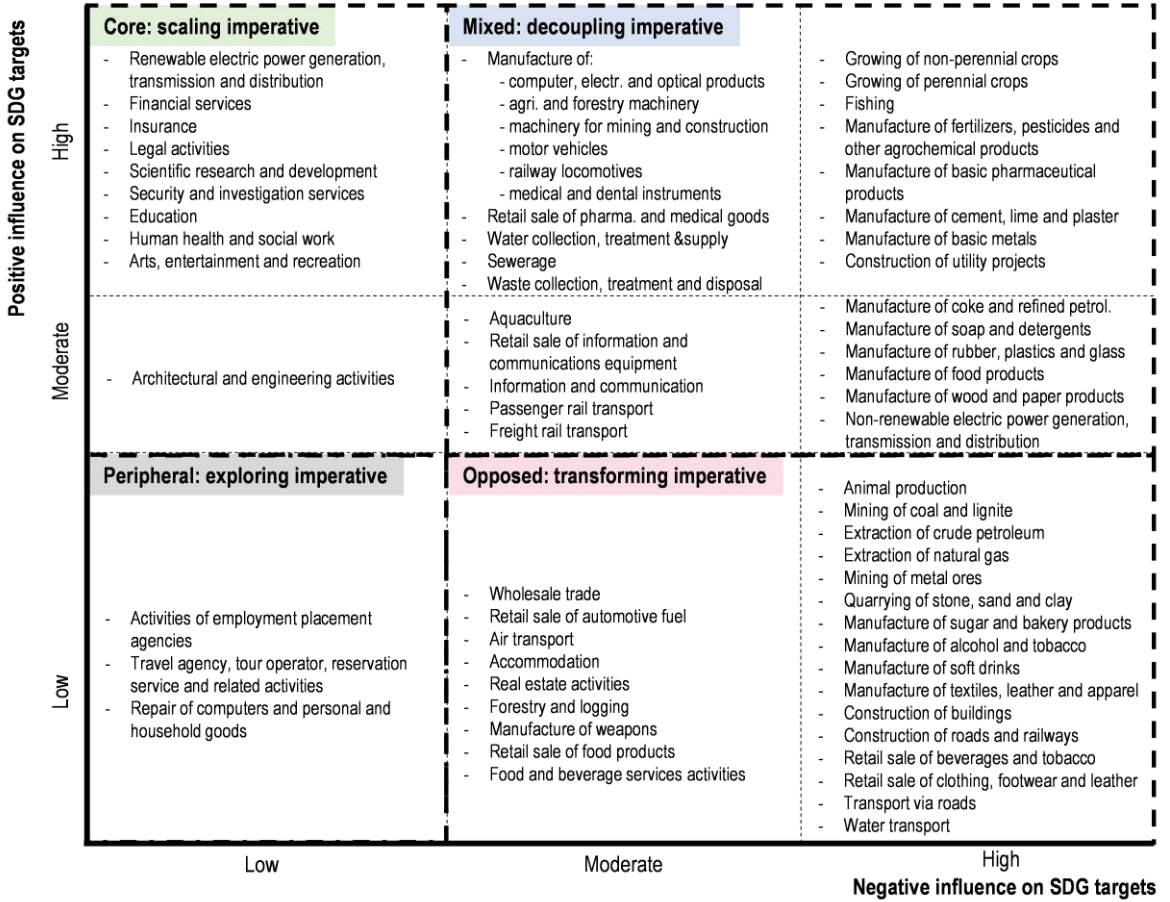
4.4.1 Strategic implications: four groups of economic activities, four sustainability imperatives

This study assessed to what extent individual economic activities are - positively and negatively - aligned with the SDG Agenda. Figure 4.9 summarizes the key findings. It organizes economic activities according to their positive (vertical axis) and negative (horizontal axis) influence on the SDG Agenda. The extent of these influences is determined by summing each economic activity's positive, as well as their negative, interactions with SDG targets. An economic activity's positive influence on the SDG Agenda is either low (score <4), moderate (score >3<6) or high (score >5). Negative influence is low (score <2), moderate (score >1<6) or high (score >5).[15] Hence, an economic activity can have a high (positive or negative) alignment with the entire SDG Agenda by having a few strong, or many less strong, interactions with the SDG targets.

Using this overview, we can categorize and strategize economic activities based on their alignment with the entire SDG agenda into four groups: core; mixed; opposed; and peripheral. We raise strategic sustainability imperatives for each of these groups.

[15] We set lower, more stringent, thresholds for negative impacts, in line with the precautionary principle in sustainability.

Figure 4.9 – Strategic sustainability imperatives based on the alignment of companies' economic activities with the SDGs



Core Activities: The imperative to scale

These are economic activities that have a high (or moderate) degree of positive and a low degree of negative interactions with the SDG targets. Many of these activities provide public goods: "education", "human health and social work", "arts, entertainment and recreation", "legal activities", "security and investigation services", and "scientific research and development" contribute to quality education (SDG 4), good health and well-being (SDG 3), reduced inequalities (SDG 10), and peace, justice and strong institutions (SDG 16). They help deliver critical components of wellbeing. Moreover, "renewable electric power generation, transmission and distribution", helps people gain access to clean energy (SDG 7) and enables societies to mitigate climate change (SDG 13). In turn, activities like "financial services", and "insurance" contribute to spreading access to financial services (SDG 1), including for (small-to-medium-sized) enterprises (SDGs 8 and 9).

Hence, these activities are core to the SDG Agenda: they deliver key components of sustainable development while having few negative externalities. For companies undertaking such activities, the strategic imperative is to expand and scale, thereby exploiting their present business models.

Mixed Activities: The imperative to decouple

These economic activities have a moderate/high degree of both negative and positive interactions with the SDG targets. These activities play a particularly important role for achieving SDGs focused on health (SDG 3), water and sanitation (SDG 6), decent jobs and economic growth (SDG 8), infrastructure, industrialization and innovation (SDG 9), and sustainable cities (SDG 11). Yet they cause significant negative externalities that predominantly cause environmental pollution (SDGs 6; 12; 13; 14; 15) which poses risks to human health (SDG 3). For instance, growing of crops provide staple foods that are key to nutritious diets (SDG 2) but also have a high degree of negative interactions, including on water use (SDG 6), chemical use (SDG 12), and land degradation (SDG 15).

Due to their moderate/high positive interactions with the SDG targets most of the economic activities in this category cannot be missed in a sustainable future. This brings the challenge of 'decoupling' their negative impacts. Exploring ways of managerial and technological innovation for decoupling adverse impacts from their positive contributions should thus rank high on the agenda of companies undertaking these activities.

Opposed Activities: The imperative to transform

These economic activities have a low degree of positive, and a moderate/high degree of negative interactions with the SDG targets. The few positive but significant negative interactions with the SDGs leads these economic activities to have a potentially strong influence on holding back – or even reversing – progress on the SDGs. Examples include the high negative impacts of "mining of coal and lignite", "extraction of crude petroleum", "mining of metal ores" and "quarrying of stone, sand and clay" on the natural environment (SDGs 6; 12; 13; 14; 15). Another example is the adverse impacts on human health (SDG 3) of "manufacture of alcohol and tobacco" or "manufacture of soft drinks", which additionally use significant volumes of water (SDG 6).

The strategic imperative for companies whose economic activities are *opposed* to the SDG Agenda is to 'transform' in order to abandon economic activities negatively aligned with the SDGs, and shift towards activities with positive alignment. An example is Danish oil and gas company DONG, which transformed itself into a renewable energy company, changing its name to Ørsted. Hence, Ørsted transformed from an 'opposed' into a 'core' company for the SDGs. Similar transformations may be used to avoid the negative SDG impacts of "animal production", simply by switching production to deliver plant-based alternatives. However, in various cases such alternatives may not be feasible, while the positive effects might still be deemed desirable. In such cases, options must be created that provide positive effects but mitigate negatives (e.g. "construction of buildings" is important for creating sustainable cities (SDG 11) yet it is imperative to do so in a sustainable manner that uses resources efficiently (8.4), avoids waste (SDG 12) and reduces GHG emissions (SDG 13)). Another example concerns mining activities,

where the attention is moving from the life cycle of the mine to the life cycle of the mineral, thus incorporating principles of circularity that enable long term sustainability (e.g. Gorman & Dzombak, 2018).

Peripheral Activities: The imperative to explore

These economic activities have a low degree of positive as well as negative interactions with the SDG targets. These *peripheral* economic activities are relatively less relevant for achieving the SDG Agenda: they contribute little, yet are also not expected to cost a lot. The strategic imperative is to 'explore' and actively seek innovative opportunities for generating positive impacts.

4.4.2 Policy implications: towards a nexus approach for the SDGs

Amidst slow progress (UN; 2020) and a fast approaching deadline, policymakers face an urgent need to accelerate action on the SDGs. Scholars are helping by conducting research that provides evidence-based tactics that (more) effectively advance the SDGs.

One approach that is gaining ground is the "nexus approach". The nexus approach recognizes that the SDGs are interconnected: positive interactions signal that one SDG improves progress on another, while negative interactions indicate that progress on one goal deteriorates progress on another. The nexus approach then stimulates policymakers to direct their efforts to the interconnections between the SDGs rather than on the goals themselves. It thereby offers opportunities for advancing multiple goals simultaneously (i.e. generating co-benefits) and reducing the risk that SDG policies undermine each other (i.e. avoiding trade-offs) (see e.g., Allen, Metternicht, & Wiedmann, 2019; Boas et al., 2016; Liu et al., 2018; Waage et al., 2015; Weitz, Nilsson, & Davis, 2014). A consequence is that the nexus approach can identify possibilities for reducing costs, generating bigger impacts across wider scales, and restraining vicious interactions that generate undesirable outcomes, which can evaporate investments. Additionally, a nexus approach can help identify which stakeholders are 'winners' and 'losers' of particular policies, and which can help accelerate – as opposed to impair - the proposed sustainable development pathways (Nilsson et al., 2018). Although there are concerns that the

"nexus" is at risk of becoming a buzzword (Nature, 2016), its traction in both policy and research circles holds potential for accelerating progress towards achieving the SDGs (Bleischwitz et al., 2018). While the interactions between themselves are increasingly being studied (for a review, see e.g., Bennich et al., 2020), we think it is also critical to improve our understanding of how different types of human activities set these SDG interactions in motion in the first place.

In this context, we propose that policymakers can use the economic activities that companies undertake as a lever for operationalizing a nexus approach to the SDGs. To date, the nexus approach has been primarily discussed concerning its potential for increasing efficiency, not in terms of its implementation. Our network analyses offer insights into the expected positive and negative impacts of economic activities which allows policymakers to promote economic activities that advance particular priority-SDGs and regulate or restrain economic activities that hamper progress on SDGs. For instance, to combat pollution (SDG 12) policymakers may want to promote activities like "water collection, treatment and supply", "sewerage" and "waste collection, treatment, and disposal activities". The detailed network diagrams that we presented offers guidance for using economic activities to create positive impacts and reduce negative impacts. This aligns with a key conclusion of the 2019 Global Sustainable Development Report, an independent scientific assessment that informs the UN General Assembly on the implementation of the SDGs: "Economic activity should be seen not as an end in itself, but rather as a means for sustainably advancing human capabilities. Decoupling the benefits of economic activity from its costs at all levels is essential in itself and can also support the systemic transformations [that] help to put people, societies and nature on the path to sustainable development" (Independent Group of Scientists appointed by the Secretary-General, 2019:24). Relatedly, now that there are strong national policy responses to the COVID-19 pandemic, there is an excellent opportunity for advancing those economic activities (meso-level) and companies (micro-level) that advance sustainable development, and avoid investing in those that hold back progress (e.g., van Zanten & van Tulder, 2020b). Amidst this pandemic, UNCTAD (2020:14) for instance is calling for managing "the multiple and changing nexuses between trade and development". The network analysis presented in this paper can provide inputs to this objective.

In using companies' economic activities as a way to promote SDG targets, opportunities for creating bigger impacts across wider scales are found in similarity. We identified which economic activities are most similar in terms of their impacts on the SDG Agenda. We also identified which SDG targets share the greatest similarities in terms of being impacted by the same economic activities. The matrixes in Figures 7 and 8 provide 'heat maps' that reveal these degrees of similarity. From a corporate, bottom-up perspective, there is a clear rationale for companies undertaking similar economic activities to partner together on sustainability: they face the same opportunities, or challenges, in terms of their SDG impacts, which stand to be improved, or mitigated, by working together. From a policy, top-down, perspective, the similarity of indicators across SDG targets prove relevant. More similar SDG targets can be advanced together, by improving/reducing the positive/negative impacts of the economic activities that are influencing them (and thus causing their similarity).

4.4.3 Limitations

Our study faces limitations yet opens avenues for future research. First, our approach is similar to the methods used by Weitz et al. (2018) in their assessment of interactions between 34 SDG targets in the context of Sweden. Whereas our scope is different and broader, our study also confronts a same subjectivity-related limitation. A degree of subjectivity is inherent to defining and scoring interactions between economic activities and SDG targets. We intended to mitigate this risk by grounding our establishment of interactions between economic activities and SDG targets in a systematic-type review of extant literature (van Zanten & van Tulder, 2020a), and by verifying the defined interactions with multiple experts. Yet differences in defining and scoring interactions might be obtained by other researchers

A second limitation concerns the lack of granularity contained in our independent variable. We investigated the interactions between a set of economic activities, as listed in international classifications (with certain modifications), and the SDGs' underlying targets. The benefit of this approach, which we pursued, is that these economic activities are used and documented by data provided (as mentioned earlier) and by international organizations. For instance, the EU

Sustainable Finance Action Plan, one of the most significant regulatory developments in sustainable finance (e.g., EU Technical Expert Group on Sustainable Finance, 2020), is fully focused on the degree of sustainability of the economic activities that companies undertake, using a very similar list of economic activities as the one included in this paper. Despite this linkage with international statistical systems, and although we intended to retain as much detail in the economic activities that we used as possible, this approach lacks granularity in that it does not capture the performance of the companies that undertake them. Yet management matters: different companies undertaking the same economic activity, while their expected positive and negative impact areas are similar, may vary widely in terms of the extent of their impacts.

Future research avenues lie in the adaptation of companies to their environment. There is consensus that companies that are successful in meeting today's demands while being simultaneously able to explore and adapt to changes in their environment are likely to be more successful in the future. Sustainable development presents unprecedented changes in companies' environments. We attempted to make a step towards understanding the degree of alignment between companies and their sustainable development environment – as conceptualized by the SDGs. More specifically, future research can build on this study by: (i) investigating how the management of economic activities by individual companies can transform the many neutral interactions (89% of all 3,514 interactions assessed in this study) into positive ones (i.e. many SDGs, such as Gender Equality or Peace, Justice, and Strong Institutions, can be advanced through management, yet were considered outside of the scope for this study); (ii) assessing how the impacts of companies on the topics of the SDGs is influencing survival (i.e. are companies that are more aligned with the SDG Agenda also financially more successful?); (iii) quantifying the environmental and social impacts of companies (i.e. to what extent do companies help attain the SDGs?); and (iv) defining strategies for improving the alignment between companies and the SDGs (i.e. how can companies improve their positive – and reduce their negative – impacts on the SDGs?). In answering such questions, theoretically embedded and practically relevant frameworks, such as the 'business responsibility matrix' of Sinkovics et al. (2021), and the 'nexus approach' to the SDGs (e.g. Bleischwitz et al., 2018), hold potential for delivering robust

insights that resonate in the scholarly domain while being actionable in the public and private sectors.

4.5 Conclusion

Successful companies are able to adapt to changes in their environment. The global adoption of the SDGs in 2015 presents a major change in the institutional environment in which companies operate. All countries now aim to achieve 17 SDGs with 169 targets by 2030. And they call upon companies to help achieve these goals. This makes aligning with the SDGs, by improving positive and reducing negative impacts, a key strategic sustainability challenge for companies. However, companies are not homogenous nor are their activities. Different companies engage in different activities, like farming, mining, marketing, or financing. Since these different activities vary in their impacts on the SDGs, tackling this strategic challenge depends on the nature of the activities a company is engaged in.

In this paper, we explored how the numerous economic activities that companies may undertake – often at the same time - have different degrees of alignment with the SDGs. Building on an extensive literature review, an assessment of the SDGs' targets, and interviews with experts, we identified and scored the extent to which 67 economic activities – which includes companies' operations and the goods and services they produce - are expected to positively and negatively interact with 59 SDG targets. These interactions were analyzed using network analysis. The findings revealed detailed measures of centrality and similarity: (i) which economic activities are most central in terms of impacting most SDG targets; (ii) which economic activities are similar in terms of impacting the same SDG targets; (iii) which SDG targets are most central by being most frequently impacted by economic activities; and (iv) which SDG targets are most similar by virtue of being impacted by the same economic activities.

Overall, we categorized economic activities into four types, each facing a strategic sustainability imperative. First, activities that are core to the SDG Agenda have many positive and few negative interactions with SDG targets. For such activities, the strategic imperative is to exploit their present business models to 'scale' positive impacts. Second, activities that play a mixed role have a moderate/high degree of both negative/positive interactions with SDG targets. The

strategic imperative is to improve alignment by 'decoupling' positive from negative impacts. Third, activities that are opposed to the SDG Agenda provide few benefits yet cause significant adverse impacts. The strategic imperative for such companies is to 'transform' in order to abandon economic activities negatively aligned with the SDGs, and shift towards activities with positive alignment. Fourth, peripheral activities have few positive as well as negative impacts on the SDG Agenda, causing the strategic imperative to be to 'explore' options for creating positive impact.

We presented detailed network diagrams that show which SDG targets stand to receive further positive impacts, and which SDG targets face negative impacts that must be reduced. These network diagrams thus can serve as guideposts for improving companies' alignment with the SDG Agenda. We also identified which economic activities are similar in terms of impacting SDG targets (and vice versa). Similar economic activities can partner to tackle the sustainability challenges they both face.

If firms manage to improve their alignment with the whole SDG Agenda – rather than with individual SDGs only - their sustainability strategies will be more successful and their ambition to create 'shared value' embedded in a more sophisticated measurement approach. This not only helps them achieve their sustainability objectives, it also contributes to creating a more stable and inclusive world in which companies can grow along sustainable pathways. And while policymakers still primarily adopt a top-down, macro-level, perspective towards the SDGs, they too stand to benefit from acknowledging the diverse impacts companies' economic activities have on sustainable development. These activities can be used as a lever for advancing particular groups of SDGs. Integrating and strategizing multiple levels of analysis makes policies for the SDGs somewhat more complex, but also holds serious potential for accelerating progress. With just ten years left to achieve the goals, further research on the role of companies in implementing the SDG Agenda is a logical next step for progress.

5. Improving Companies' Impacts on Sustainable Development: A Nexus Approach to the SDGs[16]

Abstract

Companies play a decisive role in achieving the Sustainable Development Goals (SDGs). However, as most of the world's sustainability challenges are interconnected and systemic in their nature, how can companies ensure that their strategies effectively contribute to sustainable development? This interdisciplinary paper draws from the social-ecological systems, corporate sustainability, and sustainability sciences literatures, in order to introduce a nexus approach to corporate sustainability. A nexus approach induces companies to assess and manage their positive and negative interactions with the SDGs – which may arise directly and indirectly - in an integrated manner. Instead of treating SDGs as isolated silos, a nexus approach aims to advance multiple SDGs simultaneously (creating 'co-benefits') while reducing the risk that contributions to one SDG undermine progress on another (avoiding 'trade-offs'). Through managing the interactions between the SDGs, a nexus approach to corporate sustainability enables companies to improve their societal and environmental impacts. This nexus approach is a step towards developing a theory of sustainability management that helps companies improve their impacts on sustainable development. Such systemic corporate sustainability strategies are sorely needed to drive progress towards achieving the SDGs, and to safeguard companies from 'SDG-washing'.

5.1 Introduction

Companies play a decisive role in reaching the Sustainable Development Goals (SDGs). They have unique capabilities that can advance sustainability objectives (Hajer et al., 2015; Lucci, 2012; Oetzel & Doh, 2009; Porter & Kramer,

[16] van Zanten, J. A. & van Tulder, R. (2021b). Improving Companies' Impacts on Sustainable Development: A Nexus Approach to the SDGs. *Business Strategy and the Environment.*

2011; UN Global Compact, 2017), yet companies often also negatively impact sustainable development (Frynas, 2005; Kourula, Pisani, & Kolk, 2017). This makes achieving the SDGs contingent on increasing the private sector's positive and mitigating its negative impacts (e.g., Kolk, Kourula, & Pisani, 2017; Kourula et al., 2017; Mio, Panfilo, & Blundo, 2020; van Tulder, 2018; van Zanten & van Tulder, 2018; 2020a;b; 2021; Witte & Dilyard, 2017). This critical role of companies in the SDGs is recognized by the United Nations (UN). The 2030 Agenda of Sustainable Development, the intergovernmental agreement outlining the SDGs, explicitly states: "We acknowledge the diversity of the private sector, ranging from micro-enterprises to cooperatives to multinationals. We call upon all businesses to apply their creativity and innovation to solving sustainable development challenges" (UN, 2015:29).

The good news is that corporate sustainability is becoming a mainstream ambition. Today, over 15,000 companies around the world signed up to the United Nations (UN) Global Compact, the "voluntary initiative based on CEO commitments to implement universal sustainability principles" (UN Global Compact, 2020). This is not surprising: increasing evidence indicates that corporate sustainability makes business sense. Corporate sustainability can support financial performance (e.g., Alshehhi, Nobanee, & Khare, 2018), enhance legitimacy (e.g., Brønn & Vidaver-Cohen, 2009; Schaltegger, & Hörisch, 2017), reduce reputational risks (e.g., Bebbington, Larrinaga, & Moneva, 2008), improve relationships with diverse stakeholders (e.g., Freeman, Wicks, & Parmar, 2004), and help identify future business opportunities (e.g., Hajer et al., 2015; Porter & Kramer, 2006; 2011). For instance, the SDGs are estimated to signal US$12 trillion in annual business opportunities (Business & Sustainable Development Commission, 2017).

But, next to serving companies' bottom lines, do corporate sustainability strategies effectively advance sustainable development objectives? And what strategies might companies employ to improve their impacts on the SDGs?

These questions received much less attention to date. Indeed, eminent theories of corporate sustainability management appear primarily aimed at helping companies extract value from their sustainability activities. This is obviously important. Already in 1991 A. B. Carroll noted that generating profits is among the most important responsibilities of a company because all its other responsibilities

depend on it (Carroll, 1991). However, it can be debated whether prominent corporate sustainability management theories effectively help companies improve their impacts on sustainable development. For example, the hugely popular 'shared value' strategy induces firms to generate profits from tackling environmental or social challenges (e.g., Porter & Kramer, 2011) but has been criticized for ignoring the complex interactions between economic and social-environmental value creation (e.g., Crane, Palazzo, Spence, & Matten, 2014). Stakeholder theory, in turn, calls on companies to meet the needs of a broader range of stakeholders than just their shareholders (e.g., Freeman et al., 2004), yet the theory lacks conceptual clarity as to who (and what, e.g., in the case of the natural environment) counts as a stakeholder (e.g., Gibson, 2012), and how stakeholders' interests can be balanced in a way that optimizes impacts on sustainable development (e.g., Mainardes, Alves, & Raposto, 2011).

Against this background, it is no surprise that not all sustainability strategies effectively create societal and environmental impacts (Dyllick & Muff, 2016). Prior studies paint a worrying picture. Many companies find it challenging to understand how their actions impact specific sustainable development themes (Bansal, Kim, & Wood, 2018; Sharma, 2000), how they can become an agent for change in the social-ecological systems in which they are embedded (Valente, 2010; Whiteman, Walker, & Perego, 2013; Williams, Kennedy, Philipp, & Whiteman, 2017), and how they can develop strategies that contribute to different and interlinked dimensions of sustainable development (Hahn et al., 2017; Starik & Kanashiro, 2013; Wijen, 2014). Such findings indicate that companies struggle to increase their positive societal and environmental impacts. Scholars have consequently been called upon to help advance new theories of corporate sustainability that can tackle this complexity and enable companies to better impact sustainable development (e.g., Starik & Kanashiro, 2013; Winn & Pogutz, 2013; van Tulder, Rodrigues, Mirza & Sexsmith, 2021).

Concerns over whether corporate sustainability is effective in contributing to sustainable development are reflected in companies' current engagement with the SDGs. Recent surveys suggest that most large companies supportively embraced the SDGs (e.g., PwC, 2018; UN Global Compact, 2020; WBCSD and DNV-GL, 2018). However, companies were found to primarily engage with SDGs that aim to

'avoid harm' and are based in negative duties, rather than with SDGs that seek to 'do good' and represent positive duties (van Zanten & van Tulder, 2018). Although avoiding harm – or limiting 'negative externalities' - is necessary for sustainable development, it is insufficient for achieving the objectives that the SDGs represent. Moreover, few companies have been found to integrate the goals into their core strategy. Rather, the SDGs are primarily - and superficially – adopted by CSR or communication departments (e.g., PwC, 2018). And most companies 'cherry-pick' relatively easy and isolated SDGs to report on (e.g., Pizzi, Rosati and Venturelli, 2020), which might legitimize their contributions to society (cf., Pizzi, Venturelli & Caputo, 2020; Rosati & Faria, 2019) yet does little to improve companies' future impacts (e.g., van der Waal & Thijssens, 2020). While such findings hint at 'SDG-washing' this is not necessarily comparable to 'greenwashing'. Whereas the latter often is interpreted as normatively flawed motivations for real action, the former may signal a more strategic problem whereby managers may simply find hard to operationalize corporate strategies for the SDGs. This is called the 'intention-realization' gap (Mintzberg, Lampel & Ahlstrand, 2009) and links closely to the 'promise-performance' gap in the CSR discourse – i.e. a mismatch between what is said and achieved (e.g., van de Ven, 2008). Closing this gap requires more sophisticated management models that appreciate the complexity of sustainable development, and that push for collective action and partnerships in which all societal sectors – i.e. the public, private, and civil society – work together to limit negative and optimize positive impacts (van Tulder, 2018). Hence, the key question is no longer 'why' companies should adopt sustainability strategies, but 'how' they can make them effective in advancing SDGs (cf. van Tulder et al., 2021).

This paper aims to contribute to developing a theory of sustainability management that enables companies to improve their impacts on sustainable development, as conceptualized by the SDGs. We do so by introducing a nexus approach to corporate sustainability. A nexus approach gained prominence in the sustainable development literature for its potential to (more) efficiently generate sustainable development impacts (e.g., Bleischwitz et al., 2018; Boas, Biermann & Kanie, 2016; Liu et al., 2018; Weitz, Nilsson & Davis, 2014). A nexus approach fulfills this potential by examining and managing the interlinkages between sustainable development dimensions, rather than treating different sustainability

topics like the SDGs as isolated silos. Managing the linkages between the SDGs allows for driving multiple SDGs at the same time ('co-benefits') while reducing the risk that contributions to one SDG undermine progress on another ('trade-offs'). Since most of the world's sustainable development challenges are interconnected and therefore systemic in their nature (Chapin, Kofinas & Folke, 2009; Folke, Biggs, Norström, Reyers, & Rockström, 2016), we ground our theorizing in the social-ecological systems literature. This literature suggests that it is complex to pave desirable sustainable development pathways. Sustainable development impacts follow unpredictable, nonlinear, processes. Nevertheless, actors within social-ecological systems can contribute to sustainable development by managing the interactions between the system's components in ways that improve the system's resilience: its ability to adapt to, and transform with, change in order to improve human well-being and environmental sustainability (Folke et al., 2016; Reyers, Folke, Moore, Biggs, & Galaz, 2018). Nexus-based corporate sustainability strategies help manage the systemic interconnectedness of sustainable development challenges and thereby improve the resilience of the systems in which companies operate.

Our theoretical and practical contributions lie in elucidating how companies influence the sustainable development pathways of social-ecological systems. Consequently, we contribute actionable insights, rooted in interdisciplinary literatures, that companies can use to chart and improve their impacts on sustainable development. These contributions are particularly timely in light of the slow progress countries are making towards achieving the SDGs (Sachs, Schmidt-Traub, Kroll, Lafortune & Fuller, 2019; UN, 2019; 2020a). The trends are bleak: inequality is widening, the pace of poverty reduction is slowing, hunger is on the rise, our natural environment is deteriorating at an alarming rate, climate change threatens achievement of all SDGs (UN, 2019), and the Covid-19 pandemic that has been rampaging the world since late 2019 not only is one of the worst health crises in recent history, its consequences also have devastating economic and social costs (e.g., van Zanten & van Tulder, 2020a). Despite these trends, the SDGs have gained a lot of traction, also in the private sector. We intend this paper to help translate this momentum into positive impact.

This paper first clarifies the notions of corporate sustainability and sustainable development (section 2). It argues that sustainable development is the objective of corporate sustainability. This raises an important question: how do sustainable development outcomes materialize? In section 3 we introduce a social-ecological systems perspective. Because sustainable development challenges share complex interactions, strategies that effectively advance sustainable development must be based in systems thinking. In section 4 we therefore investigate how companies interact with the SDGs. Corporate interactions with these goals influences the resilience of the social-ecological systems in which companies operate. Consequently, to improve their impacts on sustainable development companies need to devise systemic corporate sustainability strategies that manage these interactions in an integrated manner. To help achieve this objective, section 5 introduces a nexus approach to corporate sustainability. Management implications are discussed in section 6 while section 7 offers concluding remarks.

This paper integrates concepts and terminology from different disciplines. Table 5.1 provides a glossary of key terminology.

Table 5.1 – Key terms

Adaptive capacity: capacity of human actors, both individuals and groups, to respond to, create, and shape variability and change in the state of the [social-ecological] system (Chapin et al., 2009:341).
Adaptive cycles: cycles of [social-ecological] system disruption and renewal (Chapin et al., 2009:341).
Corporate sustainability: a bundle of activities fully integrated into a firm's overall strategy that contribute effectively to the welfare of current and future generations through protecting and enhancing the resilience of the biosphere, social equity and cohesion, and economic prosperity (Meuer et al., 2019:15).
Nexus approach: examination and management of interlinkages across sustainable development areas, particularly synergies and trade-offs, in an integrated manner to focus on system efficiency, rather than improvements in isolated areas (e.g. Bleischwitz et al., 2018; Hoff, 2011).
Resilience: persistence, adaptability, and transformability of social-ecological systems (Folke, 2016), thus indicating the capacity of a social-ecological system to sustain human well-being in the face of change, both by buffering shocks but also through adapting or transforming in response to change (Biggs et al. 2015).
Social-ecological systems: complex systems that include social (e.g. culture and institutions), economic (e.g. technologies and preferences) and environmental and ecological (e.g. climate and habitat) components that interact

in multiple ways, including with both positive and negative feedbacks (Grafton et al., 2019:909).
Sustainable Development Goals (SDGs): 17 goals with 169 underlying targets adopted by the United Nations in 2015 that are to be achieved by 2030. Understood in this paper as a set of politically-negotiated thresholds outlining the desirable and meaningful life support zone of social-ecological systems (Leach et al., 2018).
Sustainable development: development that meets the needs of the present without compromising the ability of future generations to meet their own needs (WCED, 1987).

5.2 Sustainable Development: The Objective of Corporate Sustainability

Corporate sustainability is an ambiguous concept. Many have tried to create an overarching, one-size-fits-all definition. Yet such a universal conceptualization of corporate sustainability is argued to be unreasonable, as an understanding of corporate sustainability should be matched to companies' contexts and their strategies (van Marrewijk, 2003). A recent review of 33 definitions of corporate sustainability confirms that scholars interpret the concept in various ways, which may range from lenient - "a firm's attempt to respond to environmental and social issues" - to stringent - "a bundle of activities fully integrated into a firm's overall strategy that contributes effectively to the welfare of current and future generations through protecting and enhancing the resilience of the biosphere, social equity and cohesion, and economic prosperity" (Meuer et al., 2019:15). The common denominator in these discussions is that corporate sustainability addresses they ways in which companies engage with, and contribute to, sustainable development (e.g., Landrum, 2017; Meuer et al., 2019; Starik & Kanashiro, 2013). In this sense, in this paper we inclusively understand sustainable development to be the objective of corporate sustainability.

Sustainable development, in turn, is commonly understood as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987). The concept integrates economic, social, environmental, and intergenerational dimensions (WCED, 1987). Sustainable development is not an end state that can be achieved, but a 'moving target' that is continuously changing (Gaziulusoy, Boyle, & McDowall, 2013).

Hence, the concept of sustainable development emphasizes that human well-being and environmental sustainability are influenced by one another, while being integrated across space and time (WCED, 1987). Yet similar to corporate sustainability, sustainable development is a contested topic. Different people have different interpretations of what sustainable development entails and what this 'moving target' ought to be.

The SDGs help elucidate the objectives of sustainable development. The SDGs specify 17 distinct goals with 169 detailed underlying targets that are the dominant part of the world's sustainable development agenda (Pahl-Wostl, 2017; Pattberg & Widerberg, 2016; Sachs, 2015; UN, 2015). Having been unanimously adopted by all UN member states as voluntary objectives to be achieved by 2030 (Bowen et al., 2017; Stevens & Kanie, 2016), the SDGs are "soft" international law (Persson, Weitz, & Nilsson, 2016) that comprises a novel form of global "hybrid" governance through goal setting and stakeholder engagement (Biermann, Kanie, & Kim, 2017). These characteristics allow the SDGs to be understood as the leading global frame of sustainable development (e.g., Sachs, 2015), which also applies to the context of companies (Sachs & Sachs, 2021; van Zanten & van Tulder, 2018).
But advancing sustainable development is challenging. Most sustainable development challenges are pervasive and lack silver bullets. The complex, cross-scale, and intertemporal interconnections between the economic, social and environmental dimensions of sustainable development cause most sustainable development challenges to be systemic (Chapin et al., 2009; Folke et al., 2016; Reyers et al., 2018). This complexity challenge plagues the SDGs. Lacking quick fixes, reaching the SDGs requires fixing systems instead of fighting symptoms (Sachs et al., 2019; Waddock, 2020; Waddock, Meszoely, Waddell, & Dentoni, 2015).

However, although companies widely claim to have embraced the SDGs, their contributions may not deliver the systemic solutions that sustainable development requires. A major shortcoming is that companies appear to treat the SDGs as isolated silos instead of as an interconnected whole. For instance, to date, companies have been prioritizing SDGs focused on economic growth and industrialization, while they least prioritize SDGs focused on ecosystems, both on land and below water (PwC, 2018; WBCSD and DNV-GL, 2018). Whereas the

economic activities that companies undertake indeed frequently positively contribute to growth and industrialization, these positive effects also typically coincide with negative impacts on SDGs that are focused on the natural environment or by causing pollution that harms human health (van Zanten & van Tulder, 2020b; 2021). If companies fail to account for these interactions, there is a clear risk that their corporate sustainability strategies fall short of advancing the SDGs.

Thus, in order for corporate sustainability to (more) effectively contribute to sustainable development, there is a need to better understand how sustainable development outcomes are shaped. In the next section, we argue that a social-ecological systems (SES) perspective helps create this understanding.

5.3 A Social-Ecological Systems Perspective on Sustainable Development and Corporate Sustainability

5.3.1 Advancing sustainable development is complex: A systems perspective

An SES perspective helps understand how sustainable development outcomes are achieved. An SES is an "integrated system of ecosystems and human society with reciprocal feedbacks and interdependence" (Folke et al., 2010:20). As Ostrom (2009) explains, the delineation of an SES's boundaries depends on the type of research question that is addressed. For instance, forests, farms and factories, but also cities, countries and our planet's climate can be examples of SESs with different types of boundaries.

Any SES consists of different interconnected components. Whereas environmental components include resource systems (such as a specified territory with forested areas, biodiversity and water systems) and resource units (e.g., the trees, animals, plants and water resources in the resource system), the SESs' social components include groups of users (e.g., individuals, companies, public organizations) and the governance systems that they create (e.g., formal and informal rules and regulations applying to the SES) (Ostrom, 2009). An SES perspective thereby not only emphasizes that people, communities, economies, societies, and cultures are embedded in, dependent on, and shaped by, resources and services provided by ecosystems, but also that social activities shape ecosystems (Chapin et al., 2009; Folke et al., 2016, 2011).

This implies that SESs evolve over time. The ways in which SESs change may be conducive to, but could also deteriorate, sustainable development objectives. An SES perspective on sustainable development assesses the interconnections between human activities and the environment in light of the sustainability of biophysical life support systems (Leach et al., 2018). These interconnections thereby provide a systems lens that helps understand the processes that lead to improvements in, or deterioration of, sustainable development outcomes (Chapin et al., 2009; Ostrom, 2009). So, how do SESs change and what does that imply for sustainable development?

Generally, SESs change along adaptive cycles. Adaptive cycles generally cover four phases: growth; conservation; release; and renewal (Gunderson & Holling, 2002). An SES's initial growth phase is marked by the exploitation of resources, followed by a stable conservation period in which capital is accumulated. This may make the system more rigid, leading to collapse and release of the system's energies. The release phase is followed by reorganization, in which the SES's components reassemble, which may lead to a reset to an earlier state of the system, but could also result in a shift towards a new regime. A return to the old, or a transformation to the new, could be desirable, but may also be undesirable, for sustainable development. Yet this outcome is not solely determined by the adaptive cycle of one individual SES. Feedbacks between SES across space and time must also be accounted for.

Indeed, SES's adaptive cycles are nested across geospatial and temporal scales.[17] SESs tend to consist of mosaics of subsystems that are at different phases of their adaptive cycles (Chapin et al., 2009). Larger scale systems, like the climate or the financial system, change slowly, whereas smaller scale systems, like a coral reef or an individual factory, do so more quickly (cf. Chapin et al., 2009; Gunderson & Holling, 2002). Interactions between the adaptive cycles of different SESs' can be top-down, when processes at larger scales influence SES at lower scales, but also bottom-up, as smaller-scale processes impact SESs at larger scales (Allen et al., 2014). This implies that an SES's ability to meet sustainable development outcomes

[17] This is captured by the concept of panarchy (Gunderson & Holling, 2002).

is influenced by interactions and feedbacks among the adaptive cycles of the SES's various subsystems at different spatial and temporal scales (Chapin et al., 2009).

However, adaptive cycles' cross-scale and intertemporal interactions and feedbacks, their phases of stability and instability, and therefore their influence on the SESs' ability to meet sustainable development objectives, are not always predictable. Not all systems always progress sequentially through all four phases of the adaptive cycle (e.g., Walker, Holling, Carpenter, & Kinzig, 2004). This unpredictability renders most SESs to be complex adaptive systems (Levin et al., 2013). A system's components respond to larger emerging patterns that influence the system, triggering changes in the properties of the whole complex adaptive system (Lansing, 2003; Levin et al., 2013). So, the system adjusts in response to changes in its components' interactions (Chapin et al., 2009). Thresholds and tipping points, once passed, may suddenly spark rapid, large-scale and undesired changes to the entire SES (Folke et al., 2011; Reyers et al., 2018). For example, the reduction of natural carbon sinks, like rainforests, at a smaller geospatial scale may destabilize the climate system at a larger scale, and drive it closer to other thresholds, such as the loss of Greenland's ice cover (e.g., Steffen et al., 2015). This nonlinear nature of SES makes it hard to plan for improvements in sustainable development outcomes (Folke et al., 2016). The concept of resilience helps tackle this complexity.

5.3.2 Resilience: Advancing sustainable development in complex systems

Resilience thinking helps manage sustainable development outcomes in an uncertain, nonlinear, and unpredictable world. Resilience influences whether an SES's changes to alternate pathways are desirable or undesirable for sustainable development (Folke, 2016). If an SES is resilient, it can cope with potential uncertainties and adapt or transform if needed, so as to maintain on a desirable sustainable development pathway (Folke et al., 2010). Resilient SES thereby have the capacity to sustain the fulfilment of human well-being while safeguarding ecological sustainability in the face of change, by persisting and adapting or transforming in response to change (Biggs et al., 2015).

Resilience comprises three central elements that interact across scales: resilience, adaptability and transformability (Folke, Carpenter, Walker, Scheffer, Chapin & Rockström, 2010). Through these three elements, resilience indicates the

capacity to absorb or adapt to change, but also the ability to transform with change by creating a completely new system (Chapin et al., 2009; Folke, 2016; Folke et al., 2010; Reyers et al., 2018; Walker et al., 2004). Resilience thinking is therefore not about maintaining the status quo, recovery, or resisting change. Instead, resilience thinking is dynamic, proactive and forward-looking (Folke, 2016). Resilience emphasizes the ability to support sustainable futures through evolving or transforming with change (Reyers et al., 2018).

The actors within an SES can support or even increase the system's resilience. Their ability to do so is indicated by the concept of 'adaptive capacity'. Adaptive capacity influences the resilience of an SES and can be understood as actors' capacity to learn from experience, gather knowledge and respond to changing conditions (Folke et al., 2010) in order to shape change in the state of the system (Chapin et al., 2009). Hence, actors can use their adaptive capacity to both help the system adapt and transform. In this sense, whereas adaptation comprises the actions of agents within SES that sustain, innovate and improve development on current pathways, transformation involves shifting development into other emergent, or even new, pathways (Folke, 2016; Folke et al., 2016; Walker et al., 2004).

Promoting sustainable development through resilience, i.e. adapting and transforming with change, can be achieved by managing the interactions within and between SESs (Chapin et al., 2009; Fischer et al., 2015; Folke et al., 2016; Ostrom, 2009; Reyers et al., 2018). In changing the system's dynamics – by reconfiguring SESs' social-ecological interactions that create sustainable development problems – actors can enhance SESs' resilience and thereby advance desirable sustainable development pathways (Reyers et al., 2018). Thus, resilience thinking frames sustainable development in the context of understanding and governing SESs' complex social-ecological dynamics that influence human well-being as part of a dynamic biosphere (Folke, 2016).

However, determining if the resilience of an SES is on a desirable or undesirable sustainable development pathway is inherently value-laden (Folke, 2016). Determining whether the resilience of an SES is desirable or undesirable for sustainable development – in particular when we apply this to the strategies of individual actors - thus involves a degree of subjectivity (e.g., Folke, 2016; Leach

et al., 2018). This is where the SDGs come in. As the leading intergovernmental frame of sustainable development, the SDGs help reduce this subjectivity. The globally relevant, politically-negotiated, delineation of thresholds, specified in a collection of 17 goals and 169 targets, lead the SDGs to help specify whether systems' sustainable development pathways are desirable (e.g., Leach et al., 2018). The SDGs aim to simultaneously promote ecological sustainability, social inclusion and equality, and sustainable economic development. They thereby help reduce the likelihood of natural and manmade hazards, while simultaneously improving the ability of actors within SES to cope with, adapt to, or transform to more sustainable development pathways. From an SES perspective, contributing to the SDGs promotes resilience, thus paving desirable sustainable development pathways.

5.3.3 Systemic corporate sustainability strategies

The macro-level perspective on better understanding how sustainable development outcomes materialize (section 3.1 and 3.2) is also relevant for assessing the impact of corporate sustainability strategies at the micro-level of analysis.

Companies are agents in SESs. One company can be embedded in multiple SES, at varying geospatial scales, at the same time. By interacting with systems' social-ecological components, like the SDGs, companies influence the resilience of systems and thus their sustainable development pathways. While it is acknowledged that it is very difficult for individual companies to change entire systems by themselves (Loorbach, van Bakel, Whiteman, & Rotmans, 2009; Waddock, 2020), companies do have adaptive capacity. This means that companies can manage their interactions with an SES's components to influence the system's adaptive cycle, and thereby its resilience (e.g., Williams et al., 2019). In fact, the management actions of agents – like companies - are a crucial part of improving SESs resilience (Grafton et al., 2019). To illustrate, research has shown that only a few companies control major proportions of marine biodiversity (Blasiak, Jouffray, Wabnitz, Sundström, & Österblom, 2018), a handful of firms dominate global agricultural production (Renwick, Islam, & Thomson, 2012), and only 100 companies have been the source of over 70 percent of global greenhouse gas emissions since 1988 (CDP, 2017). Hence, major companies exert major influences on the resilience of SESs. The way

such companies are managed matters for sustainable development (e.g., Keys, Galaz, Dyer, Mattews, Folke, Nystrom, & Cornell, 2019).

The relevance of a systems perspective on corporate sustainability has long been noted. Already since the mid-1990s scholars argued that, in order to positively impact sustainable development, corporate sustainability strategies must be based on systems thinking (e.g., Gladwin, Kennelly, & Krause, 1995; King, 1995; Korhonen & Seager, 2008; Shrivastava, 1994; Starik & Rands, 1995). These insights have more recently found resonance among (some) business leaders. In 2014, former Unilever CEO Paul Polman proclaimed: *"I truly believe that future leaders will be systems thinkers. It is inconceivable that anyone will successfully steer companies, or countries, through our volatile world without understanding the interdependencies between the systems on which we depend"* (Polman, 2014). In a June 2020 podcast on the Covid-19 pandemic Polman pondered: *"Will this crisis help us accelerate? The pressures are increasingly apparent to businesses. We need to start to re-ignite the global economy, but we need to do that in a different way than we came from. The reason why we are in this situation is not forgotten by many. The big lesson here are the links here between biodiversity, health and climate change. We should listen more to science and the importance of fact based decisions."* (Polman, 2020).

But, with the notable exceptions of Valente (2010), Williams et al. (2019) and Whiteman et al. (2013), few studies have examined how companies can ground their corporate sustainability strategies in systems thinking, and how companies influence SESs' resilience (Linnenluecke, 2017; Williams et al., 2017). And although some corporate leaders have clearly understood the importance of systems thinking to corporate sustainability, the adoption of systemic corporate sustainability strategies in practice remains elusive (e.g., Bansal et al., 2018; Haffar & Searcy, 2018; Schad & Bansal, 2018; Whiteman et al., 2013; Williams et al., 2017).

How can companies create systemic corporate sustainability strategies that effectively contribute to sustainable development, by improving the resilience of the SES in which they operate? In the next section, we argue that a company's interactions with the social-ecological components of the systems in which they

operate can serve as a starting point. We view these interactions through the lens of the SDGs.

5.4 Companies' Interactions with SDGs: A Starting Point for Systemic Corporate Sustainability Strategies

5.4.1 Sustainable development requires understanding how the SDGs interact

Because it would promote the resilience of the SES in which they operate, companies can contribute to sustainable development by advancing the SDGs. Yet this is not as simple as just advancing each of the individual SDGs. An SES perspective suggests that "sustainability outcomes are more than the sum of the ecological, economic, and the social "parts" of a system and are in fact also the result of complex interactions, feedbacks, and dynamics within and between systems" (Selomane, Reyers, Biggs & Hamann, 2019:2). These complex interactions indicate that the SDGs are not just 17 distinct goals and 169 sub-targets. Rather, they are deeply entwined, which causes them to signal systemic sustainable development challenges (cf. Chapin et al., 2009; Folke, Biggs, Norström, Reyers, & Rockström, 2016; Reyers et al., 2018).

The 2030 Agenda for Sustainable Development acknowledges the existence of interactions among the SDGs. It notes: "the SDGs are integrated and indivisible and balance the three dimensions of sustainable development" (UN, 2015:2). This indivisibility is important as it may help ensure that "the short-term achievement of improved human well-being does not occur at the cost of undermining well-being in the long term by damaging the underpinning social and environmental capital on which our global life support system depends" (Stafford-Smith et al., 2017:912). The interactions between the SDGs thus cause feedback loops that cross space and time. Effectively contributing to the SDGs consequently requires actors to manage the complex interconnections between the SDGs and their sub-targets (e.g., Leach et al., 2018; Nilsson, Griggs, & Visbeck, 2016; 2018).

But the SDGs face a major drawback: limited attention is paid to operationalizing their interdependencies (Nilsson et al., 2016; Stafford-Smith et al., 2017). The various cross-references between the SDGs' targets in the 2030 Agenda

(e.g., Le Blanc, 2015) are argued to be weak and rarely structural or transparent, causing many SDGs to remain primarily sectoral in their basic formulation (Boas, Biermann, & Kanie, 2016). Consequently, the politically defined interactions in the SDG Agenda do not adequately reflect the SDGs' natural and socio-economic relations (ICSU and ISSC, 2015). This causes agents – including companies - to have incomplete guidance in addressing the SDGs' complex interdependencies (Costanza et al., 2016; Le Blanc, 2015). To guide actions towards achieving the SDGs, the natural and social interactions between the goals need to be better understood (Lu, Nakicenovic, Visbeck, & Stevance, 2015).

Emerging efforts to assess interactions among the SDGs can be classified into two groups. One method is quantitative and uses public statistics. Most such studies depart from a single SDG to explore linkages with other SDGs. Few research projects have assessed interactions across all goals (Weitz, Carlsen, Nilsson, & Skånberg, 2018) but those that do help reveal which SDGs form synergies, and which are trade-offs in specific geographic locations (e.g., Allen et al., 2019; El-Maghrabi et al., 2018).

Another method is qualitative and maps which SDG interactions are positive (co-benefits) and which interactions are negative (trade-offs). An influential framework was created by Nilsson et al. (2016). They propose a seven-point scale to rate SDG interactions and thereby highlight priorities for policy-making. Positive interactions occur when SDGs are enabling (+1), when they are reinforcing (+2), or when they are indivisible (+3). Neutral, or consistent, interactions describe a situation in which contributions towards one goal do not yield significant positive or negative interactions with another goal (0). Finally, negative interactions arise when SDGs are constraining (-1), counteracting (-2), or cancelling (-3) (Nilsson et al., 2016). To illustrate the argumentation that can be based on this framework: eliminating discriminatory laws (SDG 10) is indivisible from promoting gender equality (SDG 5); eradicating hunger (SDG 2) reinforces good health and well-being (SDG 3) and it enables pupils to perform well in schools (SDG 4), although food production can constrain water sustainability (SDG 6) and counteracts climate action (SDG 13); and although full transparency (SDG target 16.6) is consistent with access to affordable and clean energy (SDG 7), it cancels national security goals (SDG target 16.1) (see also Nilsson et al., (2016)). The model

can lead to testable hypotheses in particular at the macro-economic level. The process of mapping interactions can be informed by scientific literature and expert opinions. Assumptions and the inclusion of context variables are a necessary feature of using this framework, which calls for a critical review of the assessment process and transparent communications (Nilsson et al., 2018). Weitz et al. (2017) for instance use the framework to assess interactions among 34 SDG targets in the context of Sweden, explaining in detail how they assigned scores, while van Zanten and van Tulder (2021) recently used the framework to analyze the interactions between 67 types of activities that companies may undertake and 59 SDG targets.

Such science-informed analyses of interactions across SDG domains supports more coherent and effective decision-making and facilitates monitoring of progress (Griggs, Nilsson, Stevance & McCollum, 2017:7). More broadly, these cross SDG interactions underscore the critical notion that because it is hardly possible to achieve individual SDGs independently of others (Bhaduri et al., 2016), the *"true transformative potential of the 2030 Agenda can be realized only through a systemic approach that helps identify and manage trade-offs while maximizing co-benefits"* (Independent Group of Scientists appointed by the Secretary-General, 2019:20).

5.4.2 Interactions between companies and the SDGs

Whereas an understanding of the interactions between the SDGs is critical for advancing sustainable development in general, an understanding of companies' interactions with the SDGs helps to create systemic corporate sustainability strategies as well as provide insights in the way companies can adopt strategies to optimize their systemic contribution to the SDGs.

Companies interact with the SDGs through: (i) the processes that companies engage in; and (ii) the goods and/or services that they subsequently create. We adapt Nilsson et al.'s (2016) operational framework to conceptualize these interactions (table 5.2). This builds on the discussion and empirical insights on the interactions between companies and SDG targets as reported in van Zanten & van Tulder (2020b; 2021).

In addition to these types of interactions, we distinguish between two degrees of interactions between companies and the SDGs. First, interactions arising

from a company's processes and the resulting goods/services that it creates are direct SDG interactions. Second, these direct SDG interactions cause indirect SDG interactions because the SDGs themselves are interconnected (section 5.4.1). When a company positively/negatively interacts with an SDG, this SDG can then advance or hamper progress on another SDG. Such indirect SDG interactions indicate 'feedback loops' since they denote secondary effects that follow direct effects between two variables (Williams et al., 2017).

Table 5.2 - Seven types of interactions between companies and the SDGs*

Type	Interaction	Definition	Explanation	Example
Positive	+3	Indivisible	Processes or goods/services are inextricably linked to the achievement of an SDG	Health care services are indivisible from the objective of achieving universal health coverage (SDG 3.8)
	+2	Reinforcing	Processes or goods/services aid the achievement of an SDG	Solar panels reinforce the share of renewable energy in the global energy mix (SDG 7.2)
	+1	Enabling	Processes or goods/services create conditions that enable achievement of an SDG	Insurance services enable the resilience of the poor to natural and manmade shocks (SDG 1.5)
Neutral	0	Consistent	Processes or goods/services do not significantly - positively or negatively - interact with an SDG	Crop production is consistent with reducing violence (SDG 16.1)
Negative	-1	Constraining	Processes or goods/services limit options to achieve an SDG	Housing construction limits options for improving people's access to green spaces (SDG 11.7)
	-2	Counteracting	Processes or goods/services clash with an SDG	Conventional, non-electric, cars counteract with reducing deaths and illnesses from air pollution (SDG 3.9)
	-3	Cancelling	Processes or goods/services make it impossible to achieve an SDG	Coal production cancels the objective of climate change mitigation in line with the Paris Agreement (SDG 13.2)

**Adapted from Nilsson et al. (2016)*

Companies are likely to have multiple interactions with the SDGs that may present complex dilemmas. For instance, a tobacco company may contribute to gender equality (SDG 5) through its processes, while its products harm health and well-being (SDG 3). Or consider Unilever. While the nutritious food products that it sells may contribute to fighting hunger (SDG 2), the company reports that around 44% of its portfolio has relatively lower nutritional value (Unilever, 2020), thus reducing, or even harming, that same goal. Furthermore, because SESs are nested across space and time, companies' interactions with the SDGs – in particular multinational enterprises (van Tulder, 2018) - can cross spatial and temporal scales. Companies may interact with SDGs in one SES, which could consequently impact other SESs in different locations, as well as generate future impacts. For example, a logging company may chop down a forest in order to produce timber products. A consequence of this deforestation may be a reduction in biodiversity (counteracting SDG 15.5), which could reduce the pollination services provided by insects, thereby constraining the food that is produced by farmers in nearby, related SESs, today and in the future (SDGs 2.3, 2.4).

This particular conceptualization of companies' interactions with the SDGs can be used as a starting point for developing systemic corporate sustainability strategies (cf. King, 1995; Shrivastava, 1994). A company's positive (+1 to +3) interactions support the resilience of SES and thereby promote sustainable development. A company's negative interactions (-1 to -3) cause it to exert a negative impact on the resilience of SES and may consequently erode sustainable development pathways (cf. Leach et al., 2018). Neutral (0) interactions would not significantly influence SES resilience. It is important to remember that although assessing these interactions may be challenging, it merely exposes already existing effects that are typically overlooked (Weitz et al., 2014).

5.4.3 A framework for linking corporate SDG interactions with systems' resilience

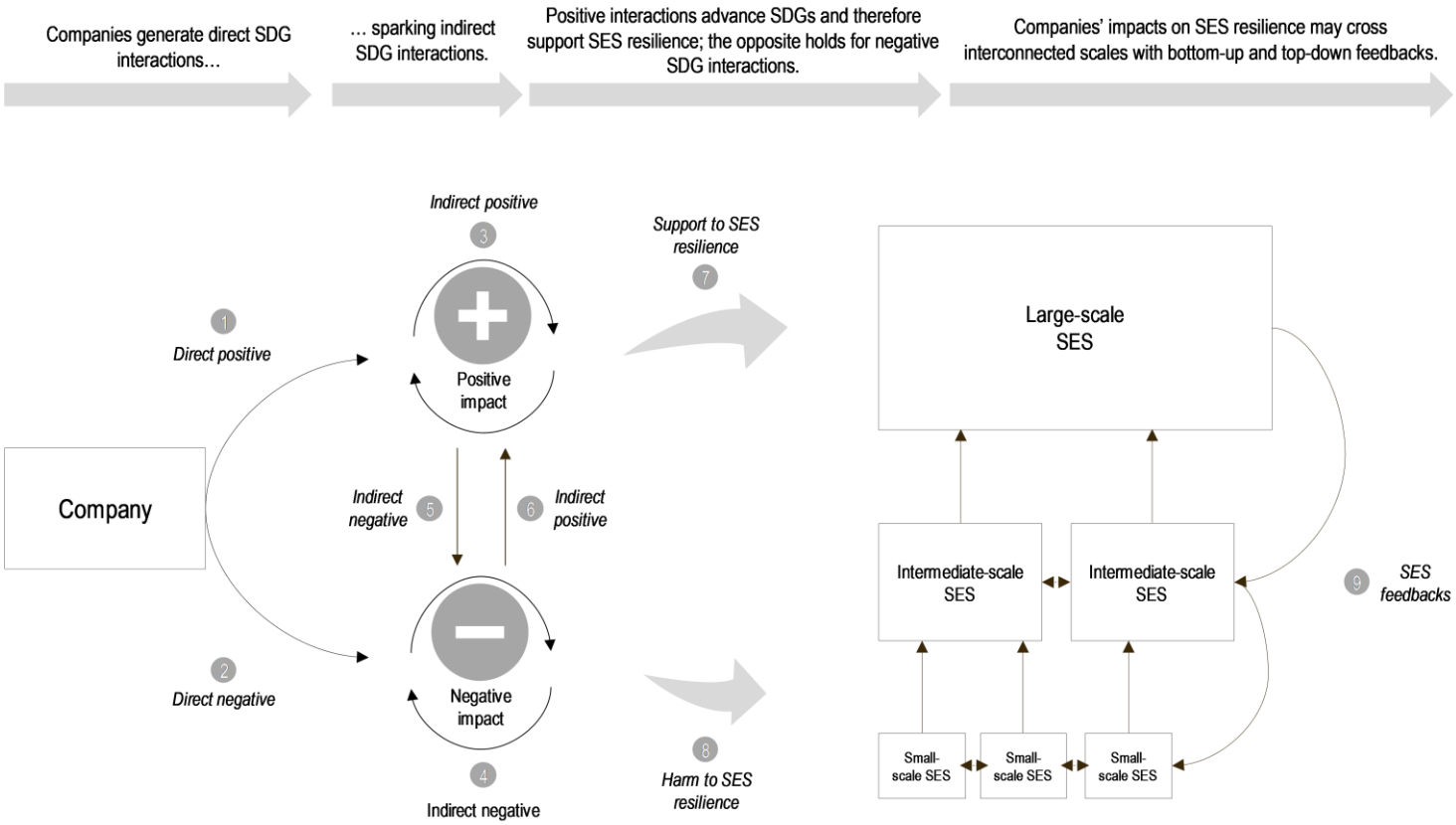
Building on this conceptualization of how companies interact with the SDGs, Figure 5.1 introduces a framework that analyzes how a company's positive and negative, and direct and indirect, interactions with the SDGs (Table 5.2) influence the

resilience of the SES that they are embedded in, which themselves are interconnected across space and time.

In the framework, a company's direct SDG interactions cause indirect SDG interactions. A company's positive interactions promote the resilience of SES, and thus help advance sustainable development. In contrast, negative SDG interactions may erode SES's resilience and thus counteract sustainable development. And these interactions may affect SESs of different scales, ranging from small to large, which may be linked to one another, and whose adaptive cycles are nested across space.

We will explain the framework and illustrate each segment using Royal Dutch Shell plc. as an example. This Anglo-Dutch energy company is responsible for providing 1.5% of the world's oil and 3% of natural gas (Shell, 2019). In line with our illustrative purposes, we only focus on Shell's most obvious SDG interactions. In this example, we mapped Shell's interactions with the SDGs using our own judgment, with both authors cross-checking the assigned scores. Relevant literature is cited to justify some of the linkages made.

Figure 5.1 - Framework: the influence of a company's SDG interactions on SES resilience



Direct SDG interactions (arrows 1 - 2). Any company assessed using this framework can positively interact with the SDGs and their targets (arrow 1). Yet the company may also have negative interactions that adversely impact the SDGs (arrow 2).

For example, Shell pumps up oil and gas and distributes the related energy to clients. This reinforces (+2) the objective of helping "ensure universal access to affordable, reliable, and modern energy services" (SDG 7.1). These activities similarly reinforce (+2) the creation of decent and formal work (SDG 8.3 and 8.5). But the company also has negative SDG interactions. Its activities constrain (-1) the sustainable use of natural resources (SDG 12.2) as well as the environmentally sustainable management of chemicals and waste (SDG 12.4) during the extraction process (e.g. van Zanten & van Tulder, 2020). Moreover, Shell's current and planned petroleum and gas extraction is incompatible with the Paris Agreement on climate change (Carbon Tracker, 2019), which seeks to limit global warming to 1.5 degrees above pre-industrial levels, thereby cancelling (-3) SDG target 13.2. Finally, oil and gas reclamation uses land and generates pollution that counteracts (-2) the conservation of water- and land-based ecosystems (SDGs 14 and 15 - various targets).

Indirect SDG interactions (arrows 3 - 6). Because the SDGs are interconnected, SDG improvements that follow from a company's direct positive SDG interactions may spark indirect positive SDG interactions (arrow 3). So too can its direct negative SDG interactions lead to indirect negative SDG interactions (arrow 4). Indirect negative SDG interactions may furthermore follow from direct and/or indirect positive SDG interactions (arrow 5), whereas cases can be thought of in which a direct and/or indirect negative SDG interaction leads to indirect positive SDG interactions (arrow 6).

In our example of Shell, the company's energy provision enables (+1) industrialization (SDG 9.2), as well as people's mobility (SDG 11.2). Industrialization and mobility, in turn, enable (+1) the further creation of jobs and incomes (SDG 8 - various targets). Nevertheless, the burning of non-renewable energy sources is a critical contributor to climate change, similarly cancelling (-3) climate action (SDG 13.2). Climate change consequently further counteracts (-2) water- and land-based ecosystems (SDGs 14 and 15 - various targets), and

constrains (-1) the resilience of communities (SDG 11.5), and particularly of the poor (SDG 1.5) (e.g. IPCC, 2018).

Resilience (arrows 7 - 8). The company's direct and indirect SDG interactions influence the resilience of the SESs in which it is embedded (arrows 7 and 8). Positive interactions support, while negative interactions harm, SES resilience. And a company may simultaneously influence the resilience of multiple SESs, that are nested across scales, and that may be related to other SESs. Note that the framework hereby assesses a company's influences on – not ultimate changes in - social-ecological outcomes, since these outcomes are not only shaped by the individual company within the framework's scope. Rather, these outcomes follow from the cumulative and interconnected activities of all agents within a system.

Shell's collection of SDG interactions likewise influences the resilience of SESs at different, geospatial scales. As Ostrom (2009) explains, the delineation of an SES's boundaries depends on the type of research question that is addressed. What is clear is that Shell presents confounding influences on SESs' resilience. On the one hand, it supports socio-economic development in the numerous SESs in which it operates by promoting employment, providing incomes, and supporting industrialization and mobility. On the other hand, Shell's adverse impacts on ecosystems and, most significantly, the incompatibility of its energy production with the Paris Agreement, harm the resilience of SESs. This applies at the small-scale SESs' in which it extracts energy, at the large-scale SES of the global climate, and at the small- and intermediary-scale SESs that bear the adverse consequences of climate change. This leads the company to negatively, and significantly, impact various SDGs, thus undermining the resilience of various SESs, and ultimately eroding sustainable development.

Feedbacks between SESs (arrow 9). The adaptive cycles of SESs are nested across geospatial scales. Smaller-scale SESs influence the adaptive cycles of larger-scale SESs (bottom-up), while larger-scale SESs' influence the cycles of smaller-scale SESs (top-down). Arrow 9 indicates these feedbacks across SESs. This implies that a company's SDG interactions not only influence the resilience of an individual SES. Rather, these effects may trickle down, or travel up, to influence the resilience of other SES.

To illustrate, Shell influences the planet's climate at the global scale, whereby the consequences of climate change materialize in small-scale SESs (top-down). Similarly, bottom-up effects may, for instance, occur when industrial firms gain access to energy at a small-scale, setting in motion indirect positive effects on industrialization, employment, and incomes that reach larger-scale SESs. This suggests complex, cross-scale, feedbacks that influence different SESs' adaptive cycles. Although it is difficult to measure and manage these feedback loops, they do influence SES' resilience, and thus their sustainable development pathways.

5.5 A Nexus Approach to Corporate Sustainability: Managing Interactions Between SDGs

The framework introduced in the previous section helps understand how, through their positive and negative and direct and indirect interactions with the SDGs, companies influence the resilience of the systems in which they are embedded. So, how can companies manage these interactions with the SDGs in order to improve their influence over SES resilience?

5.5.1 A nexus approach to the SDGs

Traditional approaches to sustainable development governance have long ignored interactions across the concept's economic, environmental, and social dimensions. Contrasting a system's approach, it is attractive to adopt narrowly focused "silo" approaches because they are relatively easy to conceive and implement (Obersteiner et al., 2016), as well as to monitor and to communicate to diverse stakeholders (Boas et al., 2016). They also avoid critical questions relating to the persistence of sustainability issues (Giddings, Hopwood, & O'Brien, 2002). But fragmentary approaches to sustainable development create policy incoherence and may lead to failure in achieving the SDGs (Boas et al., 2016; Obersteiner et al., 2016; Weitz, Nilsson, & Davis, 2014). And as the framework in Figure 1 emphasizes, if actors adopt silo-ed approaches to sustainable development, they are likely to generate negative impacts on the SDGs, which subsequently reduces SES resilience.

The adoption of the SDGs has given an impetus to viewing sustainable development as an interrelated and systemic concept (Boas et al., 2016). It is now widely acknowledged that because sustainable development challenges are

interconnected, resolving them requires systems-based approaches that take interrelations between these challenges into account.

Various concepts advocate for addressing the interrelations between sustainability policy domains in an integrated manner. As discussed in Boas, Biermann, and Kanie (2016), this includes the 'integrated earth system' (Schellnhuber & Wenzel, 1998) and integrated 'earth system' governance (Biermann, 2014) approaches that situate socio-economic activities within the overall earth system (Griggs et al., 2013), the 'principle of environmental policy integration' (Biermann, Davies, & van der Grijp, 2009; Nilsson, Pallemaerts, & von Homeyer, 2009), the idea of 'planetary boundaries' that delineate critical thresholds of the earth system, which together denote the 'safe operating space of humanity' (Rockström et al., 2009; Steffen et al., 2015), and the 'nexus approach' that reflects the observation that different sustainability issue areas are intrinsically interconnected and have to be governed as such (Boas et al., 2016; Obersteiner et al., 2016; Weitz et al., 2014).

Of these concepts, the nexus approach can perhaps best account for the interconnections between the economic, social, and environmental dimensions of sustainable development, and especially for the interconnections among the SDGs and their targets (Boas et al., 2016). A nexus approach also has the greatest potential to attain managerial relevance (explained in the next section). A nexus approach acknowledges that the SDGs seek to simultaneously achieve diverse sustainable development outcomes. Their interconnectedness conveys an opportunity to advance multiple SDGs simultaneously (Waage et al., 2015) while reducing the risk that policies for the SDGs undermine each other (Weitz et al., 2014). These interconnections thereby enable finding synergies among the SDGs, which is said to be the source of the transformational potential of the 2030 Agenda (Pahl-Wostl, 2017; Timko et al., 2018). Rather than devising silo-ed or cherry-picking policies, the nexus approach promotes the cross-sectoral integration of different policy domains with the objective to increase the overall impacts on the SDGs (Obersteiner et al., 2016; Weitz et al., 2014). Systems analysis and scientific evidence serve as inputs to this nexus approach (Obersteiner et al., 2016; Weitz et al., 2014) which is one of its main strengths (Boas et al., 2016).

An increasing number of scholars, intergovernmental institutions like the World Bank and the OECD, and development focused organisations such as the Bertelsmann Stiftung and the Sustainable Development Solutions Network have encouraged policy makers to adopt versions of a nexus approach to the SDGs (see e.g., Boas et al., 2016; El-Maghrabi, Gable, Osorio, & Verbeek, 2018; Independent Group of Scientists appointed by the Secretary-General, 2019; Obersteiner et al., 2016; OECD, 2016; Pahl-Wostl, 2017; Sachs et al., 2019; Weitz et al., 2014). Such calls follow a broader promotion of nexus thinking in diverse areas of sustainable development. This includes the interactions between water, energy, climate, and land and food systems (Howells et al., 2013; Ringler, Bhaduri, & Lawford, 2013), the environment-poverty nexus (Uitto, 2016), the inclusive growth and inclusive green growth concepts (OECD, 2012; World Bank, 2012), the linkages between gender, education, health, and poverty (Clancy, Skutsch, & Batchelor, 2003), and the connections between education, health, and water (Kitamura et al., 2014).

By tackling the interactions between SDGs, a nexus approach aims to improve the efficiency of the entire SES, rather than enhancing isolated parts of the system (e.g. Hoff, 2011). Since the resilience of SESs is influenced by the ways in which the system's actors manage their interactions with the system's components (e.g. Chapin et al., 2009; Reyers et al., 2018), a nexus approach can be one way for actors to use their adaptive capacity to manage these interactions in an integrated, systemic, manner that supports desirable sustainable development pathways. The wide support for a nexus approach to the SDGs has the additional benefit that around the world many statistical offices are trying to align their data gathering to make relevant indicators available and cross-country comparable. These efforts increase the potential for studies to focus on micro-level (corporate) initiatives, while taking more macro-level (SES) effects into account as well.

5.5.2 Corporate sustainability based on a nexus approach

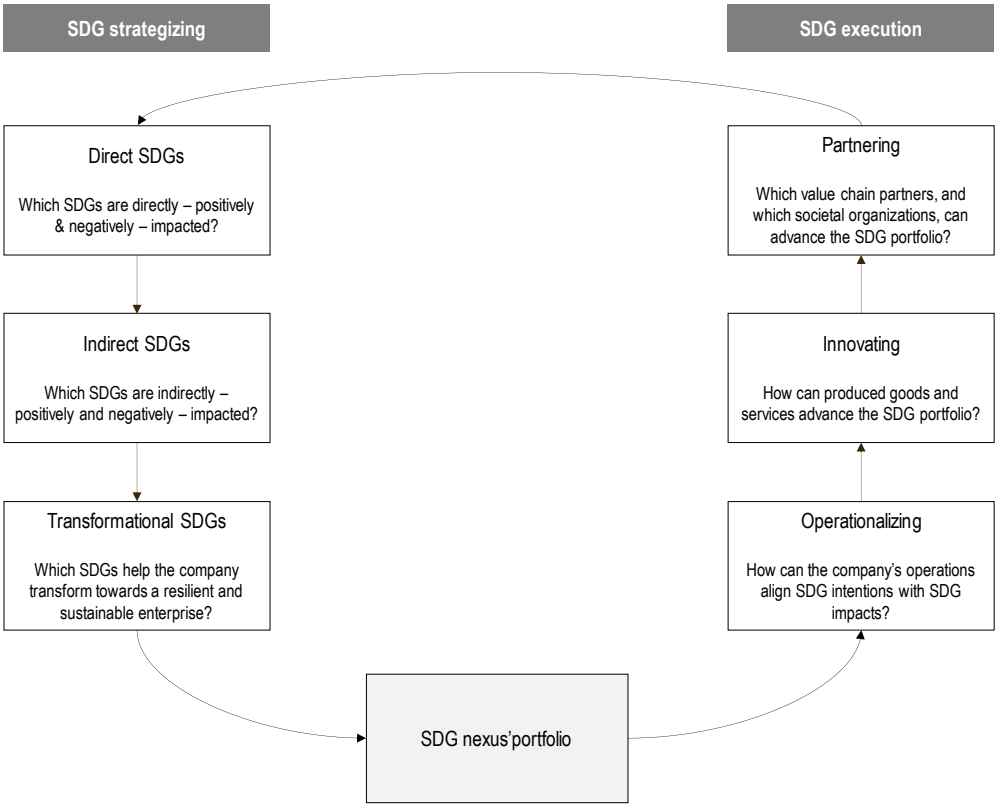
We argue that, although they are to date typically applied to policy making, the principles of the nexus approach are equally relevant at the corporate level. A nexus approach to corporate sustainability can help companies create sustainability strategies that advance the resilience of SES, and thus (more) effectively promote sustainable development.

A nexus approach to corporate sustainability would aim to manage a company's positive and negative, and direct and indirect, interactions with SDGs in an integrated, cross-sectoral, and cross-systems manner. This acknowledges that sustainable development challenges are interconnected. By zooming in on these interactions, a nexus approach induces companies to create and maximize mutually reinforcing (positive) interactions while avoiding, or minimizing, trade-offs associated with negative interactions. This increases the likelihood that gains in one of the SDGs' areas positively contribute to, and do not lead to losses in, another SDG area. In this sense, a nexus approach helps companies use their adaptive capacity to ensure that their operations, and the goods/services they deliver, interact with SDGs in ways that support SES resilience (cf. Leach et al., 2018). In short, by managing their interactions with the SDGs in an integrated manner, the nexus approach helps companies to create systemic corporate sustainability strategies.

Figure 5.2 presents a flowchart that guides managers in implementing a nexus approach to their interactions with the SDGs through six navigating questions[18], divided along two main stages: a strategizing and an executing stage.

[18] Applying the technique of 'navigating questions' is based on developmental evaluation methods (Patton et al., 2016) and is particularly relevant for more complex projects that aim at systems change (cf. van Tulder & Keen, 2018).

Figure 5.2 - Implementing a nexus approach to corporate sustainability in six navigating questions



First, a portfolio of SDGs must be selected for the company to pursue. The company's existing interactions with the SDGs (table 5.2, based on Nilsson et al., 2016) are a starting point, enabling the company to select three groups of SDGs:

1. **Direct SDGs:** SDGs that are directly, and positively and negatively, impacted by the company's present operations and the goods/services it produces;
2. **Indirect SDGs:** SDGs that are indirectly, and positively and negatively, impacted as a consequence of the company's direct SDG interactions, due to the interconnectedness of the SDGs;
3. **Transformational SDGs:** SDGs that help the company transform towards a resilient and sustainable enterprise. These SDGs amplify the company's positive impacts while mitigating its negative impacts, in

order to ensure the company enhances the resilience of the SESs in which it operates.

Hence, the 'SDG-nexus portfolio' created through this first step not only contains SDGs that are directly and indirectly impacted by the company. It also includes additional – transformational – SDGs that ensure that the company exerts positive impacts on the resilience of SES. In line with the ambitions of the nexus approach, the objective of this SDG portfolio is to ensure that the company impacts SDGs that mutually reinforce each other while reducing the likelihood of trade-offs. Ultimately, this strategizing step sets the scope for a systemic corporate sustainability strategy.

Second, the company must then execute this 'SDG nexus portfolio'. This requires taking three forward-looking steps, including:

4. **Operationalizing:** adjusting the company's operations to ensure that the future SDG ambitions can be realized. This may require changes to the company's institutional framework and governance structure (SDG 16), its business model (SDG 12), but also the pursuing of, for instance, gender equality (SDG 5), decent jobs (SDG 8), and equal opportunities (SDG 10), which can all be advanced through changing the company's processes and its corporate governance (e.g., Martínez-Ferrero & García-Meca, 2020);
5. **Innovating:** creating new, and innovating existing, goods and services to improve impacts on the SDGs in the portfolio, for example by producing goods/services that improve well-being, and/or innovating to reduce these products' environmental footprints (e.g., Nylund, Brem & Agarwal, 2021; van Zanten & van Tulder, 2021);
6. **Partnering:** collaborating with value chain partners to improve SDG impacts associated with the production (upstream) and the consumption (downstream) of goods/services (e.g., Negri, Cagno, Colicchia, & Sarkis, 2021); and partner with civil society and governmental organizations to ensure that SDG interactions lead to desired sustainable development impacts within societies (e.g., van Zanten & van Tulder, 2018).

As the flowchart shows, the stages form an ongoing cycle. This would encourage companies to continuously assess how their activities interact with the SDGs and thus influence their present and their preferred 'SDG-nexus portfolio', which is aimed at enhancing their contributions to more resilient systems.

5.5.3 Example of a nexus approach to corporate sustainability

Since we used an oil major (Shell) to illustrate our framework (Figure 1), let us use a generic (hypothetical) oil company to illustrate in broad terms how a company might implement a nexus approach to corporate sustainability. In line with our illustrative purposes, we simplify this discussion and only focus on the most poignant SDG interactions.

This oil company would first establish an 'SDG-nexus portfolio' by following the three strategizing steps in Figure 2. First, directly impacted SDGs include SDG 7.1 (access to energy), which the company positively interacts with through its core business. Second, indirectly impacted SDGs may include SDG 9 (industrialization, infrastructure and innovation) and SDG 11 (sustainable cities and communities), since these SDGs may benefit from the energy that the firm provides. However, SDG 13 (climate action), and consequently SDGs 14 (life below water) and 15 (life on land) are likely to be negatively – and indirectly - impacted from the greenhouse gases emitted by burning the non-renewable energy delivered by the firm. Third, transformational SDGs would help this company transform its business model. Relevant SDGs that expand the company's direct positive SDG impacts include SDG 7.2, which aims to provide renewable energy, and SDG 7.3, centered on energy efficiency. Adopting these SDG targets would see the company transform into a renewable energy provider, leading it to maintain its existing positive impacts on providing people with access to energy (SDG 7.1), yet strongly reducing the negative impacts caused by the firm's high GHG emissions. To mitigate the existing GHG emissions during the transformation of the company, the creation of carbon sinks through afforestation activities may be explored, relating to SDG 15 (reforestation). Combined, these SDGs and sub-targets form a portfolio that – when implemented – increase the company's support to systems' resilience.

The executing stage then advances these SDGs by changing the company's operations, enhancing its innovation, and through partnering. First, operationalizing

this SDG portfolio requires actions such as aligning the company's (scope 1, 2 and 3) emissions with the ambitions of the Paris Agreement on climate change, for instance by linking executive pay to the SDGs in the portfolio, and by targeting markets that have the highest need for the SDGs that the company positively impacts. Second, innovating is required to transform towards a renewable energy provider and to improve the energy efficiency of the products delivered. Third, partnering is crucial: working with suppliers upstream in the value chain can help innovate in order to improve energy efficiency, while working with clients downstream in the value chain is important to ensure that new (renewable) sources of energy match clients' needs. Moreover, partnering with environmentally oriented organizations may help set up and scale forestry activities for creating nature-based carbon sinks.

The cycle then repeats, inviting a re-exploration of the company's SDG interactions. It may, for instance, turn out that reforestation efforts intended to mitigate climate change conflict with land used for agriculture, thus limiting SDG 2 (zero hunger). Conversely, it is possible to direct reforestation efforts to areas facing water scarcity and land degradation, and thereby advance multiple SDGs at the same time (including SDG 6 – water and sanitation – and SDG 15 more broadly). Hence, the nexus approach allows a company to constantly manage its interactions with the SDGs, thereby influencing SESs' resilience on an ongoing basis, in order to improve overall sustainable development impacts.

5.6 Implications and Future Research

Companies are increasingly engaging with sustainable development and most large companies say to embrace the SDGs. However, the world is hardly developing in a sustainable direction. As progress is too slow around the world (Independent Group of Scientists appointed by the Secretary-General, 2019; Sachs et al., 2019), there is increasing consensus that "a much deeper, faster and more ambitious response [is needed] to unleash the social and economic transformation needed to achieve our 2030 goals" (UN, 2019:2). Sustainable development is critical for companies' activities. Companies depend on ecosystems and on economic and social capital (Whiteman et al., 2013; Williams et al., 2017; Winn & Pogutz, 2013). The quote that "business cannot succeed in societies that fail", reiterated by leaders such as

former UN Secretary General Kofi Annan and current WBCSD president Peter Bakker, point to the need for systemic theories of sustainability management.

Companies have a significant influence on systems' sustainable development pathways. We introduced a nexus approach to corporate sustainability. This approach helps companies use their adaptive capacity to manage positive and negative, and direct and indirect, interactions with the SDGs in an integrated manner, in order to improve SESs' resilience and advance sustainable development. This way, we respond to calls for helping advance a theory of sustainability management capable of incorporating the complexity and interconnectedness of sustainable development in general (Starik & Kanashiro, 2013; Winn & Pogutz, 2013) and the SDG-agenda in specific (Kolk, 2016; Kourula et al., 2017).

The nexus approach also helps the company to accumulate evidence of its impact on the SDGs' indicators. This makes it easier to report about progress in an integrated manner – which various organizations proclaimed to be critical for accelerating the SDG Agenda (e.g., GRI & UN Global Compact, 2019). Corporate reporting on their impacts on the SDGs generates transparency. Consequently, this may help companies and policy makers to map and prioritize dilemmas and trade-offs that require more focused interventions. Alignment of corporate and government strategies on the level of the nexus is a necessary – not sufficient - condition to speed-up the implementation of the SDG agenda.

Our paper faces limitations concerning its scope yet opens avenues for future research. First, a nexus approach advises companies to simultaneously increase positive and reduce negative SDG interactions, in order to improve SESs' resilience. This may prove challenging for managers who need to navigate these complex interactions between their company and the SDGs, within and across diverse SESs. Future research can build on scholarship investigating how managers' mental models help make sense of, and improve, systems' resilience (e.g., Biggs et al., 2012; Holling, 2001; Pahl-Wostl, 2007) with a particular view on the interconnections between the SDGs.

Second, our analysis centred on individual companies although SESs comprise numerous companies and various public- and civil-society actors. Ultimately, the resilience of SES is the consequence of the actions of all actors within the system. Future scholarship can explore the interconnections and

collaborations among these actors in the context of creating positive sustainable development impacts that support SES resilience (e.g., Mintzberg, 2015; Valente, 2010; van Tulder, 2018; van Tulder et al., 2016; van Zanten & van Tulder, 2018). Another avenue of research can focus on "Theories of Change". There is a growing understanding in monitoring and evaluation practice that systemic effects are difficult to specify ex-ante. Complexity sensitive Theories of Change commence with delineating the approach and goals, which then can be fine-tuned during implementation in ever more complex loops or research and learning in partnership with all actors involved (van Tulder & Keen, 2018). Our framework provides an ex-ante approach for understanding the interactions between a company and SESs' resilience. Case studies and action research can help specify these interactions through experiential learning.

Third, SES resilience is a function of the interactions between SESs' components. This begs the question how much of a negative influence one company may have on SESs resilience. Future studies can define which parameters might determine the influence that one company may have on the entire system, for instance by using the planetary boundaries framework (Rockström et al., 2009; Steffen et al., 2015; Whiteman et al., 2013) or the targets of the SDGs.

5.7 Concluding Remarks

Sustainable development challenges are interconnected and systemic. Because corporate sustainability now is becoming a mainstream ambition, indicating that companies intend to help solve such challenges, we think it is useful to adopt a systems lens and tease out lessons that could help companies contribute more effectively to sustainable development.

We drew from the social-ecological systems literature to argue that companies' contributions to sustainable development stand to be improved if they contribute to nexuses of integrated SDGs, rather than treating the SDGs as isolated silos. The SDGs and their underlying targets provide metrics that specify whether SESs are able to provide human well-being and promote environmental sustainability by adapting to and transforming with change. Companies interact with the SDGs through their operations and the goods and services they deliver. A company's positive interactions with the SDGs support the resilience of the SESs in

which they are embedded, while negative interactions reduce SES resilience, thereby leading to undesirable sustainable development pathways. A nexus approach to corporate sustainability aims to enhance resilience by inducing companies to pursue a portfolio of interconnected SDGs, selected based on the company's present SDG interactions, in order to drive multiple SDGs simultaneously through the creation of co-benefits, while minimizing the likelihood of trade-offs between the SDGs as well as guide the company's future SDG interactions.

The SDGs aim to "transform our world" by the year 2030. This means that there are still nine years left to achieve them and ensure that everyone, including future generations, can live a fulfilling life on a healthy planet. In particular big companies hold a key to the success of the SDG agenda: they exert significant positive and negative impacts on the SDGs which influences the world's ability to advance sustainable development. The nexus approach introduced in this paper, provides a systemic and necessary approach to corporate sustainability that can potentially accelerate companies' impacts on sustainable development.

6. Beyond COVID-19: Applying "SDG Logics" for Resilient Transformations[19]

Abstract

The Sustainable Development Goals (SDGs) provide a realistic approach to navigate societies through and beyond the COVID-19 pandemic. But the SDG Agenda is not without flaws. Even before the pandemic, progress towards achieving the SDGs has been too slow. COVID-19 presents a stress test for the SDG approach. The SDG Agenda provides three 'logics' that could help transform towards sustainable societies: (1) a governance logic that sets goals, adopts policies, and tracks progress to steer impacts; (2) a systems (nexus) logic that manages SDG interactions; and (3) a strategic logic that enables (micro-level) companies to develop strategies that impact (macro-level) policy goals. We discuss key hurdles that each of these SDG logics face. Transforming towards sustainable societies beyond COVID-19 requires that multinational enterprises and policy makers (better) apply these logics, and that they address operational challenges to overcome flaws in the present approach to the SDGs.

6.1 Introduction: Could we have seen it coming?

The COVID-19 pandemic presents a particularly vivid wake-up call for globalization pundits: repeated systemic crises are inevitable if open societies are unable to transform from fragile into more sustainable and resilient economies. COVID-19 also emphasizes that health, social inclusion, economic development, and ecological sustainability are not only deeply entwined in the present stage of globalization, but are also accompanied by increasing risks that even threaten the stability and resilience of the whole system.

The risk of repeated crises affects the operation of multinational enterprises (MNEs) that have thrived during the era of globalization (e.g. Van Assche &

[19] van Zanten, J. A., & van Tulder, R. (2020). Beyond COVID-19: Applying "SDG Logics" for Resilient Transformations. *Journal of International Business Policy. https://doi.org/10.1057/s42214-020-00076-4*

Lundan, 2020). The number of risks that MNEs are reporting on has more than doubled over the years, including a large number of sustainability and systemic risks (van Tulder and Roman, 2019). For years, the disruptive societal impact of spreading infectious diseases had been included in the Top-10 of Global Risks, annually listed by the World Economic Forum (WEF, 2019). Moreover, scenarios of a pandemic outbreak had been repeatedly sketched as part of economic and public health policy discussions. Most famous is Bill Gates' 2015 TED Talk entitled "The next outbreak? We're not ready", which has secured over 30 million views to date. In his talk, Gates predicted: "*If anything kills over 10 million people in the next few decades it's most likely to be a highly infectious virus rather than a war. Not missiles, but microbes"* (Gates, 2015).

So, yes, in many ways we could have seen the pandemic coming. But could we have properly acted upon it and are we grasping the lessons of the events to prepare ourselves for future pandemics? Reflecting on his experience with the Ebola crisis during his TED Talk, Gates particularly focused on government and technological challenges and solutions. Quoting Gates further: *"we need strong health systems in poor countries. (…). We need a medical reserve corps: (…). And then we need to pair those medical people with the military, taking advantage of the military's ability to move fast, do logistics and secure areas. We need to do simulations, germ games (…). Finally, we need lots of advanced R&D in areas of vaccines and diagnostics."*

Will this approach suffice? This is doubtful for both theoretical and practical reasons. Gates' approach underrates the 'wickedness' of the systemic nature of the COVID-19 pandemic. Systems theory argues that 'wicked problems' have no set solutions or clear causes. Rather it challenges society to tackle the challenge in a collaborative manner in which many pathways are explored, many stakeholders are engaged in processes of joint solution-seeking activities guided by common and interrelated goals. The original thinkers behind wicked problems theory – urban planners Rittel and Webber (1973) – argued against rational planning or top-down approaches, but they faced problems in operationalizing their approach into specific goal-oriented schemes. Critical assessments of the present state of wicked problems research conclude that *"there is extensive literature on complexity and wicked problems, but limited efforts to link sets of ideas in thinking about their implications for systems"* (Waddock et al., 2015: 996). For this reason, '*second-generation'*

wicked problems thinking (Head, 2019) aims for a better framing of problems and the further development of analytically more precise tools to define dimensions of wicked problems, such as conflict, complexity and uncertainty (Termeer et al., 2019), as well as for introducing governance models that can navigate these processes. Viewing wicked/systemic problems simply as organizational or technological challenges, in any case, has been found to lead to unintended consequences that might be worse than the disease. The effectiveness of Gates' approach – not his positive intent though - can be questioned for these reasons. For instance, what to think of the role of the 'military' in the Gates approach? Second-generation wicked problems theory shows that challenges are not only related to government roles or technological issues. They require the involvement of the whole society (state, market, civil society, knowledge institutes).

The relatively chaotic manner in which the pandemic has been addressed to date further exposes the systemic problems related to the way globalization processes have been navigated over the past 30 years. In a way systemic problems re-iterate Rodrik's 'globalization paradox' (2011) which argues that it is impossible to simultaneously attain hyper-globalization, national sovereignty, and democracy. Gates' reference to military approaches to the pandemic, illustrates a more technocratic 'solution' to Rodrik's globalization paradox, in this case applied to a concrete challenge like a global pandemic. It might result in the creation of a vaccine – let's hope so - but will not address the root-causes of the global pandemic. So, how to move beyond COVID-19 while moving to more resilient societies at the same time?

Following complexity/wicked problems theory, we argue that the paradox and thus a systemic crisis like COVID-19, *cannot be resolved*, but needs to be *navigated* along three lines: (1) a governance challenge: how to fill a multitude of global governance gaps in an increasingly volatile and uncertain ('VUCA') world to increase the speed with which pandemics can be addressed, (2) a systems challenge: how to take the systemic nature of the pandemic into account without simplifying it too much; (3) a strategic challenge: how to align countries' and companies' strategies to advance resilient and sustainable societies. To tackle these three challenges, we call for a revamping of the Sustainable Development Goals (SDGs) as a navigating platform and frame for helping societies move beyond

COVID-19 by adding to their resilience. We argue that the SDG agenda offers three valuable 'logics' - a number of valid rules of inference that can help identify and classify arguments and their validity (Ruigrok and van Tulder, 1995) – that induce a transformation towards more sustainable and resilient societies beyond COVID-19.

The next section of this paper discusses how COVID-19 presents a stress-test for the SDGs (Section 2). Then we argue that the SDGs offer distinct logics that are arguably the best chance available the world has for achieving a sustainable transformation on a global scale (Section 3). Yet operationalizing these logics requires tackling hurdles, which are discussed in Section 4. Section 5, finally, discusses relevant implications.

6.2 COVID-19: A stress test for the SDGs

Arguably the most promising initiative to cover the systemic nature of the COVID-19 pandemic, has been the introduction of the SDGs in 2015. The SDG approach introduced 17 laudable and interrelated goals, supported by 169 measurable targets to be obtained by the year 2030. They can also be framed as introducing a novel 'logic' to wicked problems that takes globalization 'trilemmas' in an increasingly VUCA world into account. This logic is particularly relevant for the business-policy interface.

The SDGs were promoted as a "*blueprint for shared prosperity in a sustainable world—a world where all people can live productive, vibrant and peaceful lives on a healthy planet"* (UN, 2019). And while the SDGs originated in international public policy, they directly affect the operations of companies. The SDGs translate imminent sustainability risks, societal needs and global ambitions into 'business solutions' for sustainability (Business & Sustainable Development Commission, 2017). In the words of former Unilever CEO Paul Polman: *"the SDGs provide the world's long-term business plan by putting people and the planet first. It's the growth story of our time."*

Since the COVID-19 pandemic hit the world, the United Nations (UN) raised the stakes for the SDGs. It views the SDGs as "*vital for a [COVID-19] recovery that leads to greener, more inclusive economies, and stronger, more resilient societies*" (UN, 2020a). Achieving the SDGs would bring about a safer,

more stable world with fewer natural and manmade hazards, thus lowering the likelihood of future crises occurring. They simultaneously aim to 'leave no one behind' (UN, 2015), which implies that once the SDGs are achieved, people and societies will have become more resilient to crises when they do strike (e.g. Walker & Salt, 2012).

COVID-19 presents an excellent stress-test for the 2030 Agenda. Reports on the first phase of the SDG agenda (2015-2020) show unequivocally that progress towards achieving the SDGs has been slow in all parts of the world (Sachs, Schmidt-Traub, Kroll, Lafortune & Fuller, 2019; UN, 2019; 2020a). The UN claims that this lack of progress has aggravated the severity of the current crisis. The UN Secretariat's May 2020 SDG progress report bluntly explains: "*what began as a health crisis has quickly become the worst human and economic crisis of our lifetime. (…) Had we been further advanced in meeting the SDGs, we could better face this challenge – with stronger health systems, fewer people living in extreme poverty, less gender inequality, a healthier natural environment, and more resilient societies*" (UN, 2020a: 2, 11). Yet critics of the SDG agenda had already argued earlier that the SDG agenda itself was ill-conceived and not apt for the job. It was too ambitious ("promise all good things to everyone"; Lomborg, 2018: 501), or not ambitious enough (van Tulder, 2018). The slow pace with which the SDGs have been embraced and implemented, in this view, provides evidence of design flaws.

COVID-19 is exposing the fragility of the 2030 Agenda. Various commentators started to wonder whether we should not just rethink the world's sustainable development strategy (e.g. Naidoo & Fisher, 2020; Nature, 2020). For instance, Naidoo and Fisher (2020) expect progress on the SDGs to further worsen due to COVID-19, arguing that the world needs to better define priorities and probably focus on a few broad strategic goals rather than all 17 SDGs. A Nature (2020) editorial goes further to proclaim it is time to revise the SDGs, in order to make the goals more achievable.

Others are not so sure. Responding to the Nature (2020) editorial, Bhattacharya, Kharas and McArthur (2020) stated that *"great feats are rarely a product of lowered ambition"*. And great feats are sorely needed to transform towards sustainable societies beyond COVID-19. Adding to that, and in response to criticisms on the operationalization of the SDGs, various intergovernmental

agencies supporting the SDGs (e.g. OECD, UNDP, UNSTATS, WHO, World Bank) have been trying to improve the relevance of the underlying indicators and theories of change. Moreover, in reaction to the slow progress, in 2019 – and even before the pandemic entered the global stage - the UN announced the 2020-2030 era to be a 'decade of action' for the SDGs.

In this context, the stress-test that the present pandemic provides to the SDG agenda materializes in two directions: First, the extent to which the chosen governance approach can address the kind of pandemic challenge that we face – better than other approaches; the kind of 'intelligence' that the SDG approach brings to the fore on addressing complex/wicked problems; and possible insights into corporate interventions that are needed to address the pandemic and help MNEs in stepping up the pace of their contributions to sustainable development. Second, the COVID-19 stress-test also helps to identify hurdles and areas of 'improvement' in the interaction between government policies and MNE strategies. We consider both directions and argue that the SDGs provide three unique logics for transforming towards sustainable and resilient societies beyond COVID-19.

6.3 Three SDG logics for sustainable transformations

Achieving the SDGs proves challenging and goes too slow. But the global adoption of the SDGs in 2015 also mobilized researchers, international organizations and statisticians in investigating what it takes to accelerate sustainable development. The pooled efforts in the 2015-2020 period around the SDG agenda - leading to a wave of reports, road maps, websites, national initiatives, implementation tools around common themes - has seriously increased the 'intelligence' of the world community in creating more sustainable and resilience societies. We can thereby identify three 'logics' that the SDGs provide, which facilitate a sustainable transformation during this crisis and beyond: a governance logic; a systems logic; and a business-policy logic.

6.3.1 Governance logic: The relevance of setting goals and measuring progress

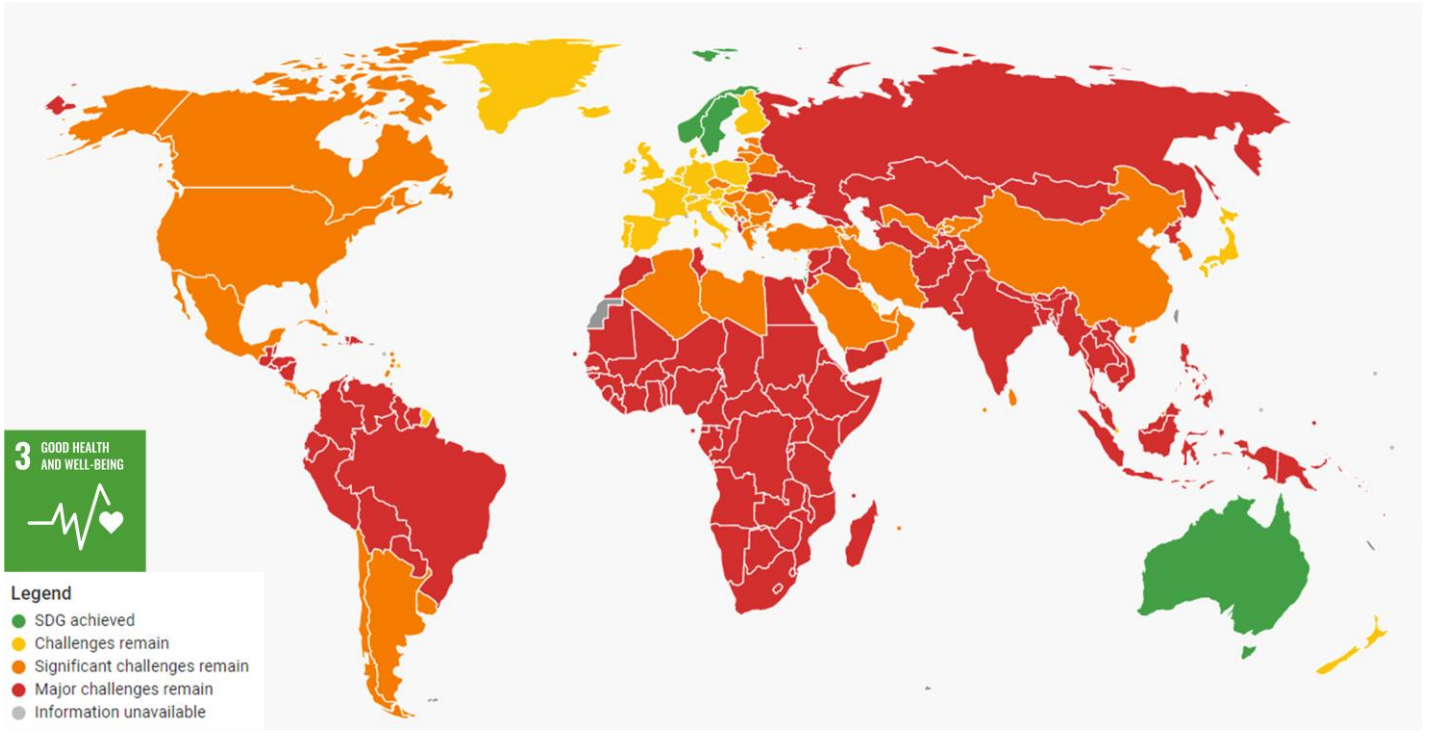
After their global adoption in 2015, the SDGs became the leading global frame of sustainable development. The SDGs define priorities that apply to all countries around the world, defined during an extensive multiple-stakeholder process and political negotiations (Kharas & Zhang, 2014). The 17 SDGs represent an international agreement, understood as soft international law (Persson, Weitz & Nilsson, 2016), that governs sustainable development through setting goals (Biermann, Kanie & Kim, 2017). The SDGs can be understood as a goal-based institution that mobilizes all actors in societies – including governmental, corporate, and civil society agents - to advance specific dimensions of sustainable development (van Zanten & van Tulder, 2018). The SDGs consequently provide a 'hybrid' governance system that specifies 'pathways' to leverage innovation and partnering as ways to achieve the SDGs, rather than by generically prescribing 'one-size-fits-all' measures into hard laws. Hybrid governance presents perhaps the best – and in any case the most realistic - approach to global ('wicked') sustainable development challenges, which feature complex governance problems (e.g. Ostrom, 2010). The present pandemic is no different.

Implementing the novel goal-based governance logic of the SDGs requires tracing how well countries are doing on achieving them. To this end, the UN Statistical Commission adopted a framework that comprises of 232 indicators that measure countries' progress towards the 17 SDGs and their 169 underlying targets. This measurement framework is so ambitious that the President of the 70th session of the UN General Assembly called it an *"unprecedented statistical challenge"* (MacFeely, 2020). But although the data gaps are vast – of the SDGs' 232 indicators, 72 indicators are not regularly compiled by countries, and another 62 indicators even lack a methodology or standards for data collection (MacFeely, 2019) – the past years witnessed a tremendous concerted effort to collect and provide statistics on countries' progress towards the SDGs. So-called 'guardian' organizations for the SDGs, like ILO, UNDP, World Bank, and national statistics offices, undertook substantial efforts to harmonize their databases. These efforts, which are ongoing, thus fill knowledge gaps for tracking the SDGs' indicators.

A view on the SDG indicators that are measured to date illuminates how countries' slow progress on the SDGs increased their vulnerability to COVID-19. For instance, the SDG Index published by the Sustainable Development Solutions Network and the Bertelsmann Stiftung ranks how countries progress on each of the SDGs, including numerous SDG targets (Sachs et al., 2020). It reveals that apart from Australia, Norway, and Sweden, no country is on track to achieve SDG 3 – Health and Wellbeing (Figure 1). It also unveils that many countries that were hit hard by COVID-19 faced additional sustainable development challenges. For example, in the United States (which in August 2020 accounted for some 25% of all COVID-19 cases, but only 4% of the world population), 36% of adults have obesity and the richest 10% of the population accumulates 1.76 times more income as the poorest 40%. The prevalence of health challenges combined with societal inequality undoubtedly exacerbated the burden of the disease in terms of morbidity and mortality in that country.

As the UN forcefully argued, the world would have been better able to battle COVID-19 if more progress was made on the SDGs. The SDGs' governance logic works by setting goals and measuring progress to continuously steer policies towards achievement of those goals. This allows for identifying pathways that work but also for unearthing areas requiring improvement (see e.g., Eden & Wagstaff (2020) for a discussion on evidence-based policymaking in the context of SDG 5 – Gender Equality). In monitoring and evaluation theory this approach is also known as 'back-casting' which provides a different logic than 'forecasting' or 'foresight' techniques that are usually applied to measure progress (cf. van Tulder, 2018).

Figure 6.1 – Countries' progress towards achieving SDG 3



Source: Adapted from Sachs et al. (2020)

6.3.2 Systems logic: Managing interactions between SDGs

At first sight the SDGs seem to be 17 distinct goals, with each of them trying to solve an individual sustainability problem like hunger, biodiversity, or poverty. But nearly all sustainability challenges facing the world are deeply entwined and therefore systemic in their nature (Chapin, Kofinas, & Folke, 2009; Leach et al., 2018). Consequently, tackling sustainability challenges requires systemic solutions that manage interactions (nexus) between multiple SDGs, rather than an alleviation of symptoms associated with targeting individual SDGs.

A closer look at the SDGs, acknowledged in the 2030 Agenda for Sustainable Development, reveals that they *"are integrated and indivisible and balance the economic, social and environmental dimensions of sustainable development"* (UN, 2015:1). This indivisibility causes the SDGs to share diverse, positive and negative, interactions (e.g. Nilsson, Griggs & Visbeck, 2016). Positive interactions indicate that contributions to one SDG promote progress on another SDG. Negative interactions arise when positive impacts on an SDG reduce progress on others.

For instance, alleviating poverty (SDG 1) may positively enable people to escape hunger (SDG 2); while industrialization (SDG 9) typically negatively impacts climate action (SDG 13). Such interactions between the SDGs elucidate the systemic nature of sustainable development challenges. They also operationalize a systems logic that promotes viewing sustainable development challenges as inherently interconnected, whereby the interconnections between specific SDGs provide opportunities to accelerate sustainable development impacts. In the words of Gro Harlem Brundtland - name-giver to the most quoted definition of 'sustainable development'- : *"The true transformative potential of the 2030 Agenda can be realised through a systemic approach that helps identify and manage trade-offs while maximising co-benefits [between the SDGs]"* (Independent Group of Scientists, 2019:xvii)

The systems logic that the SDGs provides stands in contrast to dominant scientific and policy approaches to sustainability. Traditionally, policymakers adopt silo-ed approaches in which they tackle one sustainability challenge at a time, with little regard to its interactions with other sustainability challenges. Silo-ed

approaches are appealing: they are clear, they helpfully delineate responsibilities, can be measured and their clear-cut nature facilitates policymaking (e.g. Boas, Biermann & Kanie, 2016; Giddings, Hopwood & O'Brien, 2002; Obersteiner et al., 2016). This is no different during crises.

However, a major problem in using silo-ed approaches to sustainable development challenges – including at the start of systemic crises like COVID-19 - is the tendency to respond in an improvised – non-coordinated – manner, by only addressing the direct expressions, or symptoms, of the crisis. This can exacerbate negative sustainable development impacts.

COVID-19 underscores how important a systems logic is to solving sustainability challenges. The transmission of the virus from animals to humans had been propagated by environmental degradation (UN Environment, 2020) while the spread of the virus across populations is closely linked to inequality: people living in poverty and those having underlying health conditions – which are correlated – are most vulnerable (Ahmed, Ahmed, Pissarides & Stiglitz, 2020). In turn, the economic crisis that followed the pandemic is estimated to fling 400 million people below the $1.90 poverty line (Sumner, Ortiz-Juarez & Hoy, 2020), while the number of people who are likely to face acute food shortages is likely to double this year to 265 million (FAO & WFP, 2020).

Overall, COVID-19 impacts nearly all SDGs while, conversely, progress on the SDGs would help to mitigate the pandemic's blows to human wellbeing (Naidoo & Fisher, 2020). Wicked problems theory shows that systemic problems make it extremely difficult to separate causes from consequences or direct and indirect effects of interventions. Popular research techniques such as randomized control trials (e.g. Banerjee, Duflo, & Kremer, 2016) for instance do not suffice under these circumstances.

The SDG framework and metrics makes it easier to intervene using a systems logic - also in times of crisis – in two ways: by mapping possible interaction effects and by prioritizing possible intervention pathways.

The COVID-19 crisis provides a clear case in point. The SDG project makes it possible to map the consequences of the crisis instantly. Figure 2 shows this assessment made by UN Desa (UN, 2020b) in the midst of the start-up phase of the pandemic. The systemic effects in this picture are qualitatively described, but the

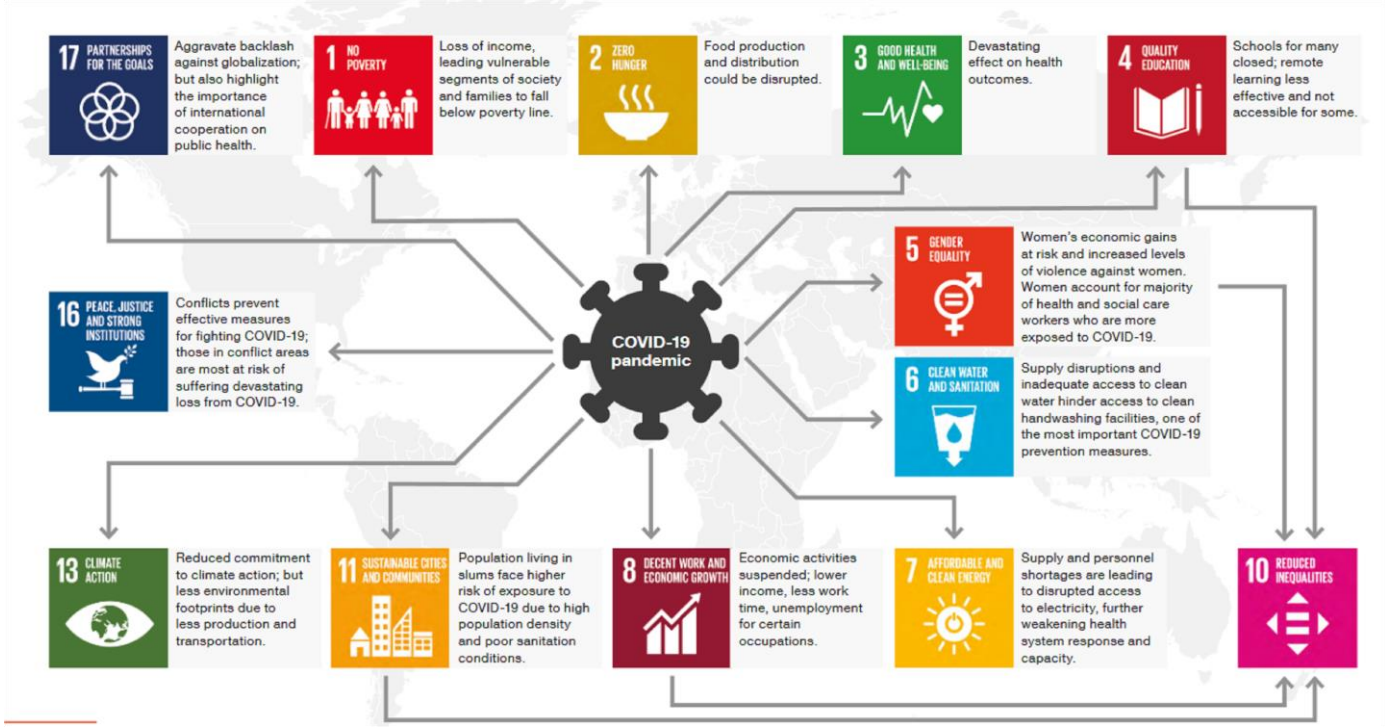
SDG database that covers countries, sectors and even regions (to a certain extent) makes it possible to further quantify major effects. For instance the severity of the effects of COVID-19, according to a UN Desa policy brief in June 2020 (#78) is influenced by the extent to which countries booked progress on the SDGs prior to the pandemic in numerous – systemic - ways:

- SDG 3 (good health and well-being): lack of health care workers, insufficient health facilities and medical supplies, high mortality rates from NCDs and air pollution which increase risks
- SDG 6 (clean water and sanitation): 1 in 4 health care facilities lack basic water services; 3 billion people lack soap & water at home
- SDG 9 (industry, innovation and infrastructure): some 46% of people are without internet access needed for remote education & health services
- SDG 11 (sustainable cities and communities): more than 1 billion people live in slums with crowded housing & no running water; overcrowded public transport
- SDG 15 (life on land): over 1/5 of the Earth's land is degraded; the number of species at risk of extinction continues to increase; wildlife trafficking has put lives at risk through exposure to zoonotic diseases

This kind of mapping exercise also provides benchmarks for interventions beyond the 'health topic' (SDG 3) and consequently make it possible that the 'logic' can also be reversed: turning the arrows around can help prioritize systemic interventions with a positive (mitigating) effect on COVID-19 related issues: (1) address poverty (provide a minimum income for perhaps a year in developing countries as has been proposed by the IMF); (2) make food systems more resilient by sourcing more locally (SDG 2) and a different organization of the food value chain (also impacting SDG 12 - not included in the UN Desa map); (3) reduce income inequalities (SDG 10) which has an indirect effect on COVID-19 and is mediated by SDG 11 (contribution to more equal, resilient cities), SDG 8 (decent jobs and economic growth); via sustained attention to gender (SDG 5) and education (SDG 4).

For example, if school reopening is made possible by restricting the access of girls to education, then the longer term effects on public health (and climate change as proven by other research) might be extremely negative.

Figure 6.2 - Systemic effects of COVID-19 viewed through the SDGs



Source: UN Desa, reported in UN (2020b)

6.3.3 Strategic logic: enabling companies to promote sustainable development

The SDG agenda has facilitated a sea change in corporate sustainability practices – at least in the framing of ambitions and activities. MNEs have been engaging with sustainable development topics for a long time. Yet definitions on what sustainable development really means, and which objectives are most important to pursue, were lacking. Consequently, corporate sustainability practices tended to be rather coincidental: they hardly integrated sustainability objectives into companies' core strategies (Baumgartner & Ebner, 2010). Moreover, the discourse between sceptics and supportive researchers and policy makers has generally been organized in separate circuits - with hardly any cross-referencing between them, therefore causing syntheses of insights to be lacking. Furthermore, separate circuits of micro-level (business) and macro-level (policy) research have proliferated. This is problematic, both from a business and a policy perspective: ad hoc and fragmented corporate engagement with sustainability challenges is unlikely to deliver effective solutions, and neither is it likely to fulfil corporate sustainability's potential to contribute to the company's bottom-line.

The advent of the SDGs in 2015 provided businesses with a clear logic for aligning their corporate sustainability strategies with the world's most pressing sustainable development challenges. For the first time in history, the 17 SDGs and their underlying targets gave an integrated understanding of what sustainable development means and which objectives are to be pursued by all countries around the world, no matter how rich or poor they are. This frame also made it possible to reverse the logic for companies in considering development issues: from one defined by 'problems' to one (also) defined by business opportunities.

For instance, achieving the SDGs is argued to present an annual $12 trillion investment opportunity (Business & Sustainable Development Commission, 2017). Achieving the SDGs requires investments, as well as technological and managerial innovation, that can deliver on the goals. Businesses are well positioned to provide these inputs and to consequently seize these opportunities and reap long-term rewards (Hajer et al., 2015). In this sense, the SDGs reflect business opportunities that are awaiting to be seized. This is akin to the discourse on the business

opportunities at the 'bottom of the pyramid' (Prahalad, 2004). As a global 'consensus', the SDGs made it easier for companies (at the micro-level) to engage with, and contribute to (macro-level) policy objectives, allowing companies to strategically think about their role in addressing sustainable development challenges – while also keeping track of progress (or lack of it). Moreover, the global recognition of the SDGs – and their colourful logos – facilitate companies' communication with stakeholders on specific sustainability objectives.

It is therefore not surprising that companies responded supportively to the global adoption of the SDGs (e.g. van Zanten & van Tulder, 2018). Surveys reveal that most large companies embraced the SDGs (PwC, 2018; WBCSD & DNV-NL, 2018), while policymakers recognize the power of the private sector. The UN reiterated the importance of the private sector when they proclaimed the 2020-30 period as a "Decade of Action" for the SDGs and identified the private sector as being able to make a difference between complacency and action. COVID-19 only increases the stakes for companies to help achieve the SDGs: these goals define long-term, sustainable, growth areas that align with policymakers' agendas.

6.4 From SDG logics to SDG impacts: addressing intelligence hurdles

So, there is a case to be made for the usefulness of the SDG framework for guidance in times of systemic crisis: to raise awareness, but also to define 'ways' out of the crisis. The metrics are helpful and informative, as is the hybrid governance approach of the SDGs. It provides an alternative to the relatively chaotic and fragmented approaches adopted by most countries that do not cover the complex root-causes of the crisis. MNEs can potentially act as big-linkers that connect policy objectives to societal impacts, provided they are also able to use the SDG framework to shape their strategies. We already argued, however, that the SDG agenda is far from perfect. What are the main hurdlers that need to be overcome in order to ensure that the three SDG logics lead to impact?

6.4.1 Governance hurdle: Sustainably reforming during the COVID-19 crisis

The SDGs' governance logic thrives on setting goals, creating policies to achieve them, and measuring progress over time in order to steer towards improved impacts.

By adopting the SDGs, 195 countries set goals. Since 2016, 142 countries have presented Voluntary National Reviews (VNRs) to the UN, in which they monitor their progress towards implementing the 2030 Agenda (UN Desa, 2019). Interestingly, the US is the only G20 country that has not submitted VNRs yet – possibly illustrative of the state of denial the country is still in. Yet there is a key hurdle: COVID-19 increases the complexity of sustainable development governance, as policymakers have to create policies that simultaneously tackle interrelated health, economic, environmental and social crises. Timely and intelligent policies are needed to steer through these crises and towards long term sustainability and resilience.

Overcoming this hurdle requires governments to integrate long-term policy objectives – like the SDGs – with the short-term interventions required to fight COVID-19 and its socio-economic consequences. COVID-19 led to many governments adopting more active and interventionist roles than they could have ever imagined (on the basis of neo-liberal policies for instance). But will they simply mitigate the main consequences of COVID-19 and return to 'business as usual', or will they use the pandemic as a catalyst for transforming towards sustainable and resilient societies in line with the objectives of the SDGs? The European Union (EU) and the United States (US) offer different insights.

The EU is reducing the economic pain of the pandemic yet it simultaneously emphasizes using the current crisis as an opportunity for long-term sustainability. For instance, the European Commission's recovery instrument, comprising of EUR 1.85 trillion (combining the EUR 750 billion recovery fund and reinforcements from the EU's long-term 2021-2027 budget), looks at investing in sustainable, future oriented activities. The EU thereby actively links its recovery instrument to the European Green Deal – the continent's growth strategy that strives to create the world's first climate-neutral continent by 2050. The Green Deal focuses creating policies that facilitate a sustainable transition of diverse sectors, ranging from food production and biodiversity, to mobility, energy, and buildings (European Commission, 2020). Introducing the EU recovery instrument, European Commission President Ursula von der Leyen said: *"The recovery plan turns the immense challenge we face into an opportunity, not only by supporting the recovery but also by investing in our future: the European Green Deal and digitalization will*

boost jobs and growth, the resilience of our societies and the health of our environment. This is Europe's moment. Our willingness to act must live up to the challenges we are all facing" (European Commission, 2020). Hence, the EU is steering its recovery investments towards multiple SDGs within a longer term budgetary and governance set-up.

In contrast, the present US government is seen to fight a short-term battle, aimed at mitigating the financial consequences of COVID-19 which negatively impacts various SDGs, thus presenting a challenge for a long-term, sustainable recovery. The White House's decision to keep the economy running for as long as possible led to the US being one of the countries where COVID-19 spread particularly rapidly and severely around the population. And although the Federal Reserve and the federal government released significant support packages, they centred on conventional macroeconomic activities (for an overview, see Cheng, Skidmore & Wessel, 2020) rather than actively pursuing opportunities that help shift towards a more sustainable future. Instead of sustainability, the Trump administration took COVID-19 as a pretext to ease environmental regulations and neglect social inclusion. It lessened environmental standards for major construction projects, it lowered fuel economy standards for cars (which is estimated to burn 2 billion barrels of oil), it encouraged new oil and gas exploration in national forests, and it opened a marine protected area to commercial fishing, among other measures (Financial Times, 2020). Meanwhile, the US is expelling migrants, including children, from the country using an emergency declaration citing the COVID-19 pandemic, allowing the administration to circumvent US law that would normally allow migrants to live with relatives while bringing their case through immigration courts (The Guardian, 2020).

These illustrative examples of the EU and US[20] reveal that it is possible for countries to take COVID-19 as an opportunity to accelerate a transition towards

[20] This discussion is for illustrative purposes. It is not meant as an exhaustive analysis of the US' and EU's governance of COVID-19 and sustainable development nor as a statement on 'right' or 'wrong' policies. We can see for instance that in the US, many local cities and states have actually embraced the SDG Agenda. See for instance: www.brookings.edu/blog/up-front/2019/10/14/american-leadership-on-the-sustainable-development-goals.

more resilient and sustainable societies. A long-term perspective, thereby, is a prerequisite. Progress must be tracked over time to gauge how well countries are doing on achieving the SDGs, and to subsequently steer towards improved impacts. The prognosis, based on the policies that are now being implemented, would be that the EU's performance on the SDGs will further improve, while the US will fall further behind.

6.4.2 Systems hurdle: Escaping economic bias

The SDGs' systems logic works through the interactions between SDGs, in which contributions to one SDG can advance, but also deteriorate, progress on another SDG. Tackling sustainable development challenges requires targeting the interactions between the SDGs, rather than focusing on individual goals. How can the SDGs' systems logic be operationalized in order to create bigger impacts?

To date the SDGs suffer from a lack of a systems approach to their implementation. Arguably the biggest challenge plaguing the SDG agenda is the priority given, in theory and practice, to SDGs that drive economic growth compared to SDGs that promote social development and ecological sustainability (Gupta & Vegelin, 2016). Economic growth sustains livelihoods and helps fight poverty (Dollar & Kraay, 2002; Dollar, Kleineberg & Kraay, 2013; World Bank, 2018), but is also linked to increasing inequality (Ravallion, 2001, Stiglitz, 2019), climate change (IPCC, 2018) and widespread extinction of animal species (IPBES, 2019). Hence, growth does not automatically translate into improved well-being. So, when companies' and countries' priorities are focused on economic growth (SDG 8) and industrialization (SDG 9) there is a real risk that other SDGs, most notably those aiming to improve equality (SDG 10) and the environment (SDGs 12 - 15), are undermined.

For the SDGs' systems logic to be operationalized, this economic bias must be avoided. Scholars and policymakers identified various "SDG transformations" that can achieve this objective. For instance, Sachs, Schmidt-Traub, Mazzucato, Messner, Nakicenovic and Rockström (2019) introduce six SDG Transformations in an effort to help governments, civil society, science and business implement the SDG Agenda. The six transformations are: (1) education, gender and inequality; (2) health, well-being and demography; (3) energy decarbonization and sustainable

industry; (4) sustainable food, land, water and oceans; (5) sustainable cities and communities; and (6) digital revolution for sustainable development (Sachs et al., 2019).

Economic activities can be used as a lever for advancing these transformations. Companies can undertake numerous types of economic activities – ranging from agriculture and mining, to manufacturing and marketing. These economic activities sustain livelihoods and produce goods and services that help people attain a better life, but they also create negative externalities. Different types of economic activities thereby impact different SDGs. They thus also influence each of these SDG transformations. We recently investigated how the economic activities undertaken by companies impact SDGs, in order to assess how a systems approach to the SDGs can be operationalized (van Zanten & van Tulder, 2020).

At an overarching level, the findings reveal that economic activities bring ample opportunities for advancing SDGs. Most are sources of economic productivity (SDG 8) and drive industrialization (SDG 9) while many individual economic activities create and/or distribute goods and services that help people meet their basic needs (SDGs 2, 3, 4, 6, 7, 11). However, negative impacts are widespread, most prominently afflicting ecosystems (SDGs 14 and 15), driving climate change (SDG 13) and harming human health (SDG 3). Yet these interactions vary widely across individual economic activities. Agriculture activities, for instance, feed the world, thereby having clear potential to help achieve SDG 2 (zero hunger). However, they also account for some 70% of water withdrawals globally which raises concerns for SDG 6 (water and sanitation), and the use of fertilizers and pesticides threatens SDGs 14 and 15 (life on land and below water). As another example, electricity generation promotes SDG 9 (industrialization). But if electricity is generated through non-renewable sources, SDG 13 (climate action) is at risk, while SDG 3 (health and well-being) may be harmed due to air pollution. Estimates suggest that in China 15 million and in India 11 million years of life lost can be avoided by eliminating power generation emissions (see van Zanten & van Tulder, 2020 for a discussion and synthesis).

Understanding how specific economic activities promote, but also hamper, each of the SDGs is imperative for escaping the economic bias that currently plagues the SDG Agenda. Such an understanding allows for promoting economic activities that

drive SDG solutions, and limiting economic activities with undesirable negative externalities. Managing these impacts of economic activities on the SDGs with the SDG transformations (cf. Sachs et al., 2019) holds potential for creating systemic change.

6.4.3 Strategic hurdle: From SDG intention to SDG realization

The SDGs agenda has led to companies enthusiastically embracing the SDGs, yet companies seem to face a real hurdle in incorporating and implementing the SDGs into corporate strategies. While most large companies have embraced the SDGs (PwC, 2018; WBCSD & DNV-NL, 2018) they primarily adopted SDGs that positively link to their present business models. These are easy to legitimize to stake/shareholders and represent a continuation of 'business as usual' (van Zanten & van Tulder, 2018). In response, organizations like the UN Global Compact demanded companies to stop 'cherry-picking' SDGs (UN Global Compact, 2018), urging them to instead create proactive strategies that that move beyond the status quo by contributing to a wider range of interlinked SDGs.

Companies' supportive uptake of the SDGs facilitated quite detailed analyses on how companies contribute, as well as on the hurdles that constrain the extent of their positive impacts. The main picture shows that companies prioritize SDGs focused on economic growth, industrialization, and responsible consumption and production (SDGs 8, 9, 12). Least prioritized are SDGs that can be considered enablers of systemic change like SDG 1 (poverty), SDG 2 (hunger), SDG 10 (inequality), SDG 14 (life below water) and SDG 15 (life on land) (e.g. PwC, 2018; UN Global Compact, 2020; WBCSD and DNV-GL, 2018). Interesting results also arise in the context of COVID-19. For instance, a 2020 UN Global Compact study concluded that, except for the financial services sector, all sectors ranked SDG 3 (good health and well-being) in their top-five of most prioritized SDGs. In the healthcare and life sciences industry, SDG 3 is, unsurprisingly, featuring much more prominently, with 93% of the companies ranking this SDG on top. Yet companies in various sectors also are found to have difficulty in taking action on the SDGs, particularly in terms of setting concrete targets, even on SDGs that strongly link to their business models (UN Global Compact, 2020). Another finding of recent surveys is that many companies identify their positive impacts on the SDGs, yet few

companies also consider negative impacts (WBCSD and DNV-GL, 2018; UN Global Compact, 2020).

The main hurdle for improved corporate impacts on the SDGs thus refers to overcoming the intention-realization gap (van Tulder, 2018). A 2018 World Business Council for Sustainable Development (WBCSD) survey among its members found that companies lack a thorough understanding of the business case that the SDGs represent. This is the main barrier to aligning core operations with the SDGs. Companies "are struggling to articulate the business case within their own operations" (WBSCD, 2018). A 2019 survey by UN Global Compact and Accenture among 1,000 CEOs of the world's largest companies corroborated that finding. It observed that one in three CEOs cite 'lack of market pull' as the top barrier to sustainable business; over half said they faced the 'key trade-off' of operating under extreme cost-consciousness versus investing in longer-term strategic objectives that are at the heart of sustainability (UN Global Compact & Accenture, 2019).

Embracing but not implementing the SDGs creates a particular danger: that of unintended "SDG washing". Green-washing, blue-washing, and white-washing practices out of ill-intent have been relatively well covered in the literature. Companies' current SDG engagement hints at a different logic. Positive intentions (embracing the SDGs) coincide with poor execution. Embracing the SDGs seems, in many cases, to limit further progress through so-called 'moral self-legitimation' processes (van Tulder, 2018). Such processes lower the willingness to learn and to create strategies that advance more complex SDGs. I In practice this mechanism plays out as follows: once the SDGs are included in corporate communication materials, many companies seem to sit back, thinking that the 'SDG box' has been ticked, even though this would be the time to step up and start strategizing and steering – to ensure that corporate strategies advance the SDGs, and simultaneously translate into long-term, sustainable business models. Overly positive reporting on UN and national websites (as part of national voluntary reporting exercises) reinforces the 'self-legitimation' effect that intentions are more important than realizations.

Crossing this hurdle requires companies to integrate the SDGs into their entire organization: from the upper echelons (executive committee / board), to

product development and R&D, and corporate strategy. Yet to date, the SDGs are primarily owned by companies' sustainability, communications, or corporate affairs departments (PwC, 2018). Hence, it is no surprise that companies find it hard to reap the long-term, sustainable, business opportunities that the SDGs are said to represent (Business & Sustainable Development Commission, 2017). Moreover, companies then too face the need to operationalize the first two logics that the SDGs represent. Following the governance logic, there is a need to set goals that delineate the contributions that the company wants to make, and to continuously measure and steer progress towards achieving these goals. At the same time, the SDGs' systems logic must be implemented: companies must manage the positive and negative interactions between their activities and the SDGs in order to increase the likelihood of advancing multiple SDGs at the same time, while reducing the likelihood of trade-offs (e.g. van Zanten & van Tulder, 2020).

6.5 Implications: beyond COVID-19

Milton Friedman once famously said: "*Only a crisis – actual or perceived – produces real change. When that crisis occurs, the actions that are taken depend on the ideas that are lying around"* (Friedman, 1982:7). We have argued in this contribution that there are a number of very interesting and relevant ideas surrounding the SDG Agenda. We assessed how these ideas can be operationalized to move beyond the present crisis and transform towards sustainable and resilient societies that are better able to withstand imminent future crises (e.g. climate change, biodiversity loss, inequality).

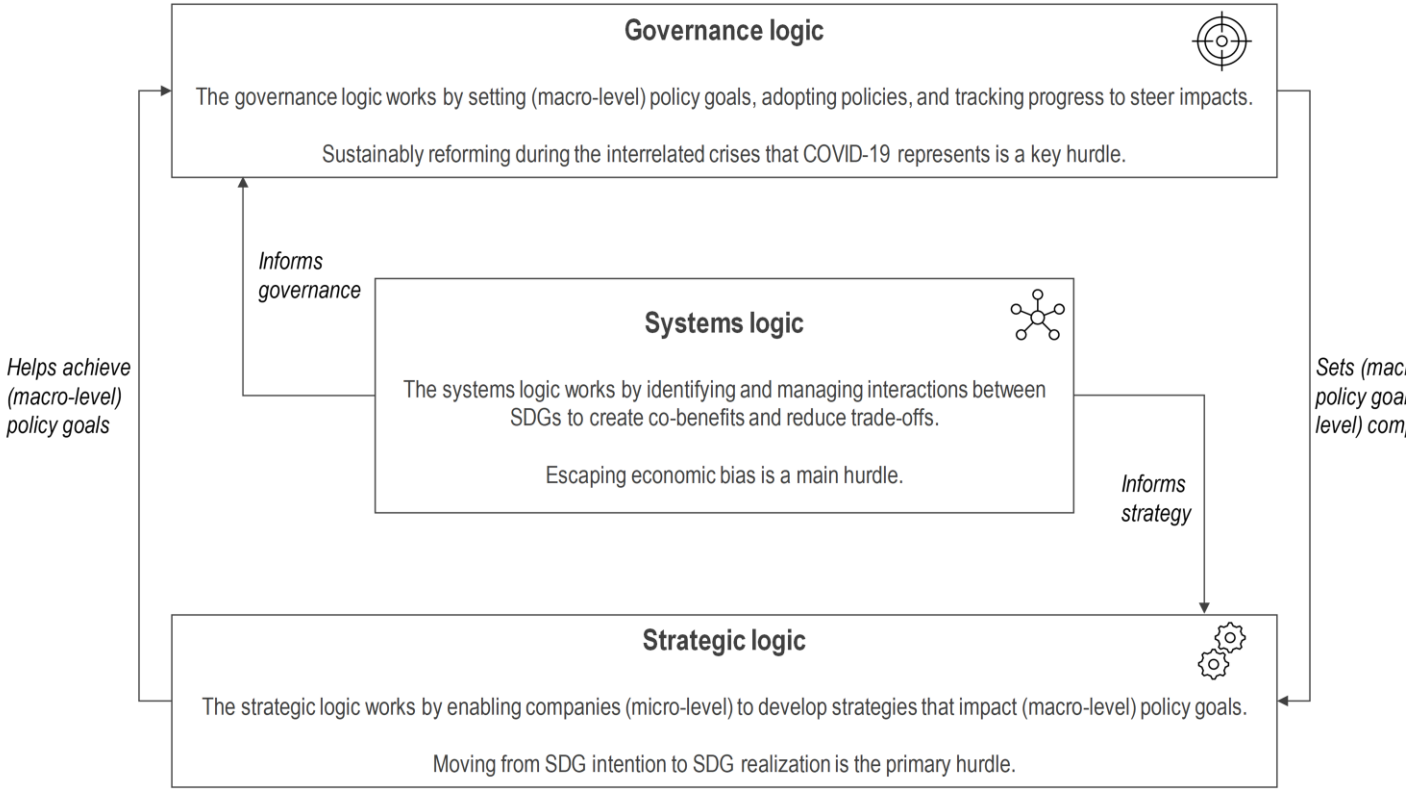
COVID-19 presents a stress test for the SDG approach. It reinforces the relevance of the SDG Agenda. For better or worse, the SDG Agenda presents the best possible approach to managing COVID-19 with the objective of ensuring that, now and in the future, human wellbeing is met while safeguarding ecological and economic sustainability. The SDGs are a global agreement between all UN member states, which incorporated feedback from numerous stakeholders in civil society and the private sector. A shared agenda and the formulation of common goals is what is needed for transformations beyond COVID-19 and towards sustainability and resilience. Yet the COVID-19 stress test also reiterates the need to remain critical about some of the basic flaws in the design of the SDGs, as well as in the

ways in which companies embrace them. If addressed inappropriately, the risk of SDG washing looms large. This then likely reinforces partial and improvised policy approaches to the present crisis, which will only prolong its duration and is bound to present even larger problems for societies and MNEs in the immediate future.

To operationalize the ideas that the SDG Agenda represents, we argued that there is a need to go deeper than simply addressing individual SDGs. To that end, we identified three 'SDG logics': a governance logic; a systems logic; and a strategic logic. These logics mobilize the metrics, create collective intelligence and present intervention repertoires in support of innovative systems approaches that can move societies beyond COVID-19 and towards more resilient and sustainable societies. These three logics address the trilemma of the present stage of globalization (cf. Rodrik, 2011) and help to navigate societies and companies to reap the benefits of today's VUCA society, while at the same time mitigate its threats. These three SDG logics need to be addressed concurrently and collectively, while their hurdles must be tackled as part of the proposed 'decade of action'.

We summarize these SDG logics, their hurdles, and the ways in which they strengthen one another in Figure 3. The governance logic works towards achieving the SDGs from the top down, and influences companies. Companies, in turn, work towards achieving the SDGs from the bottom up through the adoption of the strategic logic of the SDGs. The SDGs' systems logic, finally, links the governance logic and strategic logic. It provides insights into positive and negative interaction effects as a result of public and private approaches. The three logics, thus, also present an agenda for further research by policy makers and (international) business scholars. Further researching these three logics, will help to step-up the pace of the SDG agenda. And, perhaps more importantly, it will help to prioritize those (smart) interventions that have the greatest potential in mitigating the effects of the pandemic, as well as for identifying and supporting pathways that build a more sustainable and resilient global system.

Figure 6.3 - Three SDG logics for transforming towards resilient and sustainable societies



7. Concluding Remarks

Each of the chapters in this study drew its own conclusions. This chapter therefore offers general concluding remarks.

7.1 Contributions

This dissertation studied how companies' activities impact the ability of societies to meet people's needs – today and in the future – while at the same time ensuring the sustainability of our natural environment. In short, this dissertation investigated the role of companies in sustainable development.

This is an urgent and important topic in "the age of sustainable development" (cf. Sachs, 2015). An unprecedented global health crisis is devastating people's lives and livelihoods, hundreds of millions of people around the world still live in poverty and lack access to food, water, and sanitation, inequality of income and opportunity is sky-high, the loss of biodiversity is alarming, and climate change is threatening both social wellbeing and environmental sustainability. Business plays a key role in this age in which we have the ability to tackle these problems. Companies can positively deliver much-needed solutions. Yet companies also frequently negatively impact different dimensions of sustainable development. At the same time, advancing sustainable development will bring about a more prosperous, safer, more inclusive world that stays within the carrying capacity of our planetary boundaries. In short, sustainable development is good for business by reducing risks and increasing opportunities.

The first study (chapter 2) investigated how an institutional approach can help understand corporate engagement with particular SDGs. Based on the institutional literature, it developed propositions that argued that corporate engagement is influenced by two traits of SDGs (i) whether an SDG is internally or externally actionable; and (ii) whether an SDG aims to 'avoid harm' on sustainable development or whether it seeks to actively 'do good'. Institutional theory further suggests that corporate engagement with particular SDGs is influenced by two traits of MNEs, which we incorporated in our propositions: (i) the institutional environment of the MNE's home-country, and the institutional environment in its host-countries; and (ii) the MNE's industrial sector. Exploratory survey findings

were collected from 81 European and North American Financial Times Global 500 companies to test these propositions. The results indicate that MNEs engage more with SDG targets that are actionable within their (value chain) operations than those outside of it, and more with SDG targets that "avoid harm" than those that "do good". MNE's home-countries influence engagement with the SDGs. European MNEs engage with more SDGs in general, and they engage more with externally actionable SDGs. Yet North American MNEs indicate greater involvement with SDGs that aim to "do good". No significant differences between more internationalized SDGs were found. Finally, companies active in industrial sectors with greater negative externalities were found to engage more with SDG targets aimed at "avoiding harm" than companies with smaller social-ecological footprints. Based on these findings, the study concluded that companies actively embraced the SDG Agenda. Yet if the SDGs are to be achieved there is a need to go further and help companies also engage more with externally actionable SDG targets that aim to "do good". The study argued that cross-sector partnerships offer a promising tool for achieving this.

The second study (chapter 3) explored how companies' economic activities impact SDG targets. It conducted a systematic literature review to provide an externally valid evidence-base on the impacts of a wide diversity of economic activities – as a proxy of corporate strategies - on the SDG Agenda. The review of 876 academic and grey articles covers 420 types of economic activities, ranging from crop production and mining, to manufacturing, transport, and services. The findings revealed that companies have ample opportunities for advancing the SDGs – especially concerning SDGs aimed at helping people meet their most basic needs and advancing economic growth and industrialization. Yet it also revealed the complex trade-offs that companies face in sustainable development. Most economic activities are harmful to our climate and natural environment, which may have negative consequences for human well-being. These positive and negative impacts between individual economic activities and SDG targets were synthesized. This improves our understanding of the role of companies – who are undertaking numerous, diverse economic activities – in advancing sustainable development. The chapter argued that sustainable development stands to benefit if the impacts of economic activities on the SDGs are managed (by companies) and governed (by

policy-makers) in an integrated manner that seeks to optimize positive, and reduce negative, interactions. This way, the chapter concluded that the economic activities can be used as a lever for operationalizing a nexus approach to sustainable development.

The third study (chapter 4) dug deeper into the impacts of companies' economic activities on the targets of the SDGs. It used network theory to analyze the positive and negative interactions between 67 types of economic activities and 59 SDG targets. Of the potential 3,953 interactions, 225 were found to be positive and 214 negative (the rest were neutral interactions, in which an economic activity was deemed not to have a significant positive or negative effect on an SDG target). The network analysis revealed: (i) which economic activities are most central to the SDG Agenda by virtue of impacting most SDG targets; (ii) how similar economic activities are by means of impacting the same SDG targets; (iii) which SDG targets are most central by being impacted by most economic activities; and (iv) how similar SDG targets are by being impacted by the same economic activities. The chapter argued that these findings help improve our understanding on how companies that are doing different types of economic activities help advance the SDGs. It posited that the indicators of centrality and similarity help operationalize a nexus approach to sustainable development. Through analyzing the extent to which diverse economic activities are aligned with the ambitions of the SDG Agenda, the paper identified four types of activities, each having a particular corporate sustainability imperative. First, 'core activities' predominantly generate positive, while having few negative, impacts on the SDGs, challenging companies to *scale* their contributions to further align with the SDG Agenda. Second, 'mixed activities' have moderate/high degrees of both negative/positive impacts, posing a *decoupling* imperative. Third, 'opposed activities' provide few benefits yet cause significant adverse impacts, implying that companies must *transform* in order to better align with the SDGs. And fourth, 'peripheral activities' have immaterial positive and negative impacts, creating an imperative to *explore* innovative avenues for creating SDG contributions.

The fourth study (chapter 5) contributed to developing a theory of sustainability management that enables companies to improve their impacts on sustainable development. Having been framed in the social-ecological systems

literature, it argued that improving sustainable development is a challenging task due to the complex interactions between the social-ecological components in, and across, the systems in which companies operate. To tackle this challenge, the chapter introduced a nexus approach to corporate sustainability. This approach induces companies to assess and manage their direct and indirect, and positive and negative, interactions with the SDGs in an integrated manner. Instead of treating SDGs as isolated silos, a nexus approach aims to advance multiple SDGs simultaneously (thus creating 'co-benefits') while reducing the risk that contributions to one SDG undermine progress on another (thus avoiding 'trade-offs'). This strategy was argued to improve the overall impacts that companies exert on the resilience of the systems that are affected by its operations. To make this actionable for managers, the chapter introduced two frameworks: one for mapping how a company's interactions with the SDGs lead it to influence the resilience of the social-ecological systems in which it operates; and one for operationalizing a nexus approach to corporate sustainability.

The fifth study (chapter 6) reflected on the relevance of the SDG Agenda in moving towards more sustainable and resilient societies beyond COVID-19. Having appreciated the flaws inherent to the SDG Agenda, the paper argues that the SDGs still offer a valuable blueprint. It was argued that the SDG Agenda provides three 'logics' that help companies and policymakers transform beyond COVID-19: (1) a governance logic that sets goals, adopts policies, and tracks progress to steer impacts; (2) a systems (nexus) logic that manages SDG interactions; and (3) a strategic logic that enables (micro-level) companies to develop strategies that impact (macro-level) policy goals. The paper discussed the key hurdles facing each logic and how to overcome them.

7.2 Managerial implications

The studies in this dissertation yield relevant findings for managers. Through the concept of corporate sustainability, sustainable development now is mainstream in business practice. Companies increasingly aim to reduce their negative, and improve their positive, impacts on sustainable development topics. A majority, and growing share, of companies frame their sustainability endeavors in terms of the SDGs. Surveys reveal that more than two-thirds of large companies embraced the

SDGs in their operations and communications. The financial sector too is ever more active in sustainability. A rising number of investors aim to divest from companies that negatively impact sustainable development (like those producing alcohol, tobacco, weapons and other 'sin stocks'). The trend also shows investors seeking to channel more financing towards those companies that provide solutions to sustainable development problems, like those delivering health solutions, renewable energy, and access to finance.

For business to play a serious role in this age of sustainable development, there is a need to move from rhetoric to impact. While many managerial implications are listed in each of the chapters, I highlight the three most important ones below.

First, business can advance sustainable development through their influence over (inter)governmental institutional arrangements, as well as via the institutions they initiate to govern their (value chain) operations (chapter 2). Formal and informal institutions can be understood as 'rules', 'regulations', or 'policies' that influence behavior. Institutions are highly relevant in the context of sustainable development. Institutions can advance sustainable development outcomes and regulate the minimization of negative impacts. Companies can develop institutions to ensure that their (value chain) operations advance sustainable development. These institutions can aim to help the company "avoid doing harm". Yet they can go further to also encourage "doing good", for instance by stimulating and regulating partnerships with governments and civil society. Ultimately, companies operate by creating institutions: integrating sustainable development objectives in these institutions is a good way to advance the SDGs.

Second, for businesses to contribute to sustainable development, it is imperative that they understand their positive and negative impacts on the SDGs (chapters 3 and 4). A key challenge for managers is to have a robust understanding of how the economic activities that companies undertake impact specific SDGs. This is challenging for at least three reasons: (i) most managers are not sustainability experts; (ii) companies may engage in numerous economic activities, each of which may have different impacts on the SDGs; and (iii) the SDGs and their targets define numerous types of economic, social, and environmental sustainability objectives, each of which may be impacted by economic activities in different ways. Chapter 3

aims to offer manager an understanding of these impacts, as reported in the literature. Chapter 4 goes further to also inform managers on the centrality and similarity of economic activities' positive and negative impacts on the SDG Agenda. These results therefore aim to provide managers with an evidence base for their corporate sustainability strategies.

Third, beyond understanding how companies impact the SDGs through their economic activities, this dissertation helps managers manage their impacts on sustainable development (chapter 5). A nexus approach is introduced as a tool that induces companies to govern their interactions with the SDGs to generate bigger impacts across wider scales. This nexus approach can be implemented in two steps: (i) assessing a company's direct and indirect, and positive and negative, interactions with the SDGs and their influence over the resilience of social-ecological systems; and (ii) creating and implementing a portfolio of SDGs that advance multiple SDGs simultaneously while reducing the risk that contributions to one SDG undermine progress on another. Actionable frameworks are introduced in chapter 5 to navigate managers through each of these two steps.

7.3 Limitations

Limitations for each of the studies are listed in the relevant chapters. However, here I would like to also briefly comment on two broader limitations that I faced in my research.

The first is data availability. Although companies exert significant positive and negative impacts on sustainable development, there is extremely limited data available that sheds light on these impacts. To be sure, some data providers report on companies' greenhouse gas emissions or the controversies they are involved in. ESG datasets, used in the financial sector, reveal whether the expected financial returns of companies may be affected by Environmental, Social, and Governance factors. Aside from the fact that such datasets are behind pricy paywalls, they also do not tell us much about companies' societal and environmental impacts. This posed a serious constrain to my research. I tried to overcome this by surveying the largest companies in the world (which led to the additional limitation of reaching a large enough portion of companies) and by systematically reviewing the literature (which led to the additional limitations of shifting the scope to economic activity as

a proxy for company strategy, and for dealing with an extremely wide body of research). Collective efforts (involving companies, governments, and academics) that define and collect relevant impact indicators can make a huge contribution to scholarship on the role of companies in sustainable development. This can include, but is not limited to, indicators on: (i) the types and volumes of products and services that companies deliver to society; (ii) the number of people reached by the products and services that companies distribute; (iii) the cost of delivering such outputs and companies' associated revenues. Once we have measurable impact indicators, a whole world of studying the role of companies in sustainable development will open up.

The second limitation is the challenge of doing and publishing interdisciplinary research with a broad scope. To be sure, I am grateful that the papers included in this dissertation have been published. However, I also experienced that some journals are wary of interdisciplinary research. This is a well-known concern (e.g. Dunning, 1987; Doh et al., 2017). Research that draws from different academic perspectives may easily fall prey to readers not recognizing the relevance of that research. At the same time, it is widely established that sustainable development requires solutions that cross disciplinary boundaries. Sustainable development is a broad topic that encompasses economic development, social inclusion and equality, and environmental sustainability. And numerous actors are involved in shaping sustainable development outcomes. This necessitates incorporating different types of literature in research on sustainable development. Hence, the conundrum is that sustainable development needs interdisciplinary perspectives but that it is hard to publish such insights.

7.4 Final Thoughts

I have been studying corporate engagement with the SDGs since the moment they were adopted by UN member states in September 2015. These past five years were not just spent reading and writing. I spent my workweeks in the private sector, working on topics related to improving corporate impacts on sustainable development. Having placed one foot in the academic world and one in the private sector gave me a firm foundation for gaining new ideas and to test them immediately. It made me aware of what types of insights are needed to allow the

private sector to engage more deeply with sustainable development topics. And it gave me an opportunity to identify gaps in the literature that practitioners would value to see filled.

In these first five years of the SDG Agenda, I witnessed how the SDGs made a major contribution to corporate sustainability practice. They have crystalized an understanding of sustainable development, allowing it to move from an ill-defined notion with different interpretations, to a blueprint for a better world with 17 specific goals, 169 underlying targets, and more than 200 approved and measurable indicators. The SDGs enabled companies to better understand how their strategies impact different dimensions of sustainable development. Moreover, the SDGs' global adoption enhanced corporate reporting on sustainable development.

Despite the incredible attention that the SDGs have gained, there is a long way to go to achieve them by 2030. To be sure, some progress has been inspired by the SDGs. Since 2015, the number of women elected to parliaments has risen from 19% to 24% (SDG 5 - Gender Equality); 17.5% of total final energy consumption now comes from renewables (SDG 7 - Affordable and Clean Energy); and the portion of the ocean now legally protected has more than doubled to 17% (SDG 14 - Life Below Water) (e.g., UN, 2020a). At the same time, the challenges are alarming: biodiversity is eroding at unprecedented rates (SDG 14 – Life Below Water and SDG 15 – Life on Land), the world continues to warm (SDG 13 – Climate Action), inequality is widening (SDG 10 – Reduced Inequalities) and hunger is on the rise (SDG 2 – Zero Hunger) (e.g., UN, 2020a). Meanwhile, the Covid-19 pandemic is an unparalleled health challenge (SDG 3 – Good Health and Wellbeing) with dire economic consequences (UN, 2020b).

The success of the SDG Agenda hinges, in part, on the actions of the private sector. In 2019, the UN marked the next ten years as a "Decade of Action" for the SDGs. In proclaiming this Decade of Action, the UN reinstated the critical role of the private sector in achieving the SDGs. After five years, the SDGs have found their place in the world. We know what to do. Now it is time to act in order to ensure that we translate the significant momentum that the SDGs obtained into positive societal and environmental impact. And the science is clear: advancing sustainable development is good for business.

Doing academic research on this topic allowed me to better understand the challenges and opportunities that companies face in the age of sustainable development. My motivation for writing this dissertation quite simply stemmed from my fondness of trying to untangle the complexity of the nexus between business and sustainable development. Looking ahead at 2030, the year in which the SDGs are supposed to be achieved, I aspire to continue to use my interest in academic research to develop insights that are practically relevant. Vice versa, I aim to continue to find inspiration in my career that can inform academic research. The age of sustainable development is interdisciplinary: not only in terms of academic disciplines, but also in terms of bridging theory and practice.

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Summary

This dissertation studies the role of companies in sustainable development. In 2015, the United Nations (UN) adopted 17 Sustainable Development Goals (SDGs) that aim to *"free humanity from poverty, secure a healthy planet for future generations, and build peaceful, inclusive societies as a foundation for ensuring lives of dignity for all"* (UN, 2017:4). Although all 193 UN member states have committed to the ambition of achieving the SDGs by the year 2030, success is unlikely without the support of the private sector. The studies comprising this dissertation aim to improve our understanding of the relationships between companies and sustainable development. Appreciating the interdisciplinary nature of this research topic, I draw from diverse literatures, which can be broadly categorized into the international business and management, and sustainability sciences disciplines, and I use a variety of methods, in order to shed light on companies' engagement with, and their impacts on, the SDG Agenda. Overall, the dissertation is defined by the problems that it addresses rather than by its disciplinary embedding (cf. Clark, 2007), thus taking a phenomena-driven perspective that has recently been called for in the business and management literature (Buckley et al., 2017).

In Chapter 2 I study how corporate engagement with the SDGs can be explained using an institutional approach. The study first conceptualizes the SDGs as a goal-based institution for international business. Based on this conceptualization, the study develops propositions that help explain how the engagement of MNEs' with the SDGs is influenced by traits of SDGs and by traits of the MNEs themselves. It proposes that two SDG traits are relevant: i) the actionability of an SDG target, which can be internal or external to MNEs' (value chain) operations; and ii) the ethical duties conveyed by the SDG target, which can be positive ("doing good") or negative ("avoiding harm"). Additionally, it proposes that two traits of MNEs help explain their engagement with the SDGs: i) their home- and host-country contexts; and ii) their industrial sector. Survey results from 81 European and North American Financial Times Global 500 companies indicate that MNEs engage more with internally than externally actionable SDG targets, that SDG engagement is higher for SDG targets that seek to avoid harm rather than do good, that European MNEs engage with more SDG targets than North American

MNEs, and that MNEs in industrial sectors with negative externalities engage more with SDG targets that seek to avoid harm.

In chapters 3 and 4 I study the impacts of the economic activities that companies undertake on the SDGs' targets. In the third chapter, I systematically review 876 academic and grey articles published between 2005 and 2019 to unearth how 420 types of economic activities (as a proxy for corporate strategies) impact the SDG targets. The study reveals the ample opportunities, but also the many trade-offs, companies face in contributing to the SDGs. Economic activities are critical for advancing economic and social SDGs. They often are sources of economic productivity (SDG 8) and drivers of industrialization, infrastructure, and innovation (SDG 9). Specific types of economic activities help people meet their most basic needs by producing and distributing food (SDG 2), health services and medicines (SDG 3), education (SDG 4), water and sanitation (SDG 6), energy (SDG 7), housing and transport (SDG 11), and information (SDG 16). But trade-offs abound and are not just related to economic activities that are the usual suspects. Rather, the study finds that nearly all economic activities emit greenhouse gases (SDG 13). Many activities use and/or pollute water (SDG 6). Numerous activities also generate pollution and waste more generally (SDG 12), degrading ecosystems (SDGs 14/15) and harming people's health (SDG 3). The chapter synthesizes economic activities' positive and negative impacts on SDG targets to provide an evidence-base for companies' SDG strategies, and for governments' SDG policies.

In Chapter 4 I argue that the degree of alignment between corporate strategies and the SDG Agenda is an indicator of long-term sustainability success. By building on the findings of Chapter 3, this article investigates which types of economic activities that companies undertake are most, and which are least, aligned with the ambitions of the SDG Agenda. The chapter selects 67 unique economic activities and uses a qualitative scoring framework – developed in the sustainability science literature – to assess their positive and negative interactions with 59 SDG targets. Using mathematical techniques, the identified and scored interactions are then studied as a network. The results allow for distinguishing between four types of corporate activities based on their alignment with the SDG Agenda, each facing a particular sustainability imperative: (i) *core activities* predominantly generate positive, while having few negative, impacts on the SDGs, challenging companies

to scale their contributions; (ii) *mixed activities* have moderate/high degrees of both negative/positive impacts, posing a decoupling imperative; (iii) *opposed activities* provide few benefits yet cause significant adverse impacts, which challenges companies to sustainably transform their business models; and (iv) *peripheral activities* have immaterial positive and negative impacts, challenging companies to explore innovative avenues for creating SDG contributions.

In Chapter 5 I investigate how companies can more effectively advance sustainable development. The chapter thereby contributes to developing a theory of sustainability management that enables companies to improve their impacts on sustainable development, as conceptualized by SDGs. It introduces a nexus approach to corporate sustainability. This nexus approach induces companies to assess and manage their direct and indirect, and positive and negative, interactions with the SDGs in an integrated manner. Instead of treating SDGs as isolated silos, a nexus approach aims to advance multiple SDGs simultaneously (thus creating 'co-benefits') while reducing the risk that contributions to one SDG undermine progress on another (thus avoiding 'trade-offs'). Two frameworks are introduced: one for mapping how a company's interactions with the SDGs lead it to influence the resilience of the social-ecological systems in which it operates; and one for operationalizing a nexus approach to corporate sustainability. This interdisciplinary chapter is grounded in the social-ecological systems literature. A nexus approach is a step towards creating systemic corporate sustainability strategies that appreciate the complexity of sustainable development.

Finally, in Chapter 6 I survey how the SDG Agenda can inform the navigation of societies through and beyond the COVID-19 pandemic. The chapter argues that the SDG Agenda is not without flaws. It also underscores that the first five years of the SDGs – indeed even before the pandemic - witnessed (too) slow progress. However, in this chapter it is argued that the SDG Agenda provides three 'logics' that could help transform towards sustainable societies: (1) a governance logic that sets goals, adopts policies, and tracks progress to steer impacts; (2) a systems (nexus) logic that manages SDG interactions; and (3) a strategic logic that enables (micro-level) companies to develop strategies that impact (macro-level) policy goals. The chapter discusses key hurdles that each of these SDG logics face.

Transforming towards sustainable societies beyond COVID-19 requires that multinational enterprises and policy makers (better) apply these logics.

Samenvatting (Summary in Dutch)

Dit proefschrift onderzoekt de rol van bedrijven in duurzame ontwikkeling. In 2015 lanceerde de Verenigde Naties (VN) 17 duurzame ontwikkelingsdoelen (SDGs). Deze hebben het doel om *"de mensheid te bevrijden van armoede, een gezonde planeet voor toekomstige generaties te verzekeren, en vredige, inclusieve samenlevingen te bouwen als een fundament voor het waarborgen van waardige levens voor iedereen"* (UN, 2017;4: vertaald door de auteur). Ondanks dat alle 193 VN lidstaten zich hebben gecommitteerd aan de ambitie om de SDGs te bereiken in het jaar 2030, succes is onwaarschijnlijk zonder support van de private sector. De studies die deel uitmaken van dit proefschrift hebben als doel om de relaties tussen bedrijven en duurzame ontwikkeling beter te begrijpen. Dit onderzoeksonderwerp is interdisciplinair van aard. Daarom bouw ik voort op diverse stromingen in de academische literatuur, welke breed te categoriseren zijn in de bedrijfskundige en duurzaamheidswetenschappen disciplines, en gebruik ik verschillende onderzoeksmethodes, met als uiteindelijk doel de betrokkenheid van bedrijven bij, en hun impact op, de SDG Agenda beter te begrijpen. Over het algemeen wordt het proefschrift gekenmerkt door de problemen die het aanpakt, in plaats van door haar academische inbedding (cf. Clark, 2007). Hierbij neemt het een fenomenen-gedreven perspectief waartoe onlangs oproepen voor zijn gedaan in de bedrijfskundige- en management-literatuur (cf. Buckley et al., 2017).

In Hoofdstuk 2 onderzoek ik hoe de betrokkenheid van bedrijven bij de SDGs kan worden uitgelegd met een institutionele benadering. In de studie worden de SDGs eerst geconceptualiseerd als een 'goal-based' institutie voor internationale bedrijvigheid. Op basis van deze conceptualisering ontwikkelt de studie proposities die helpen verklaren hoe de betrokkenheid van multinationale ondernemening (MNOs) bij de SDGs wordt beïnvloed door kenmerken van SDGs en door kenmerken van de MNOs zelf. Het hoofdstuk stelt voor dat twee SDG-kenmerken relevant zijn: i) de 'actionability' van een SDG-doelstelling, die intern of extern kan zijn van de (waardeketen) operaties van MNOs; en ii) de ethische plichten die door het SDG-doel worden overgebracht, die positief ("goed doen") of negatief ("schade vermijden") kunnen zijn. Daarnaast stelt het voor dat twee kenmerken van MNOs hun betrokkenheid bij de SDG's helpen verklaren: i) hun thuis- en gastlandcontext;

en ii) hun industriële sector. Enquêteresultaten van 81 Europese en Noord-Amerikaanse Financial Times Global 500-bedrijven geven aan dat MNOs zich meer bezighouden met interne dan extern actiegerichte SDG-targets, dat SDG-engagement hoger is voor SDG-targets die schade willen voorkomen in plaats van goed te doen, dat Europese MNOs zich meer bezighouden met meer SDG-targets dan Noord-Amerikaanse MNOs, en dat MNOs in industriële sectoren met negatieve externe effecten zich meer bezighouden met SDG-targets die schade trachten te voorkomen.

In hoofdstukken 3 en 4 bestudeer ik de impact van de economische activiteiten die bedrijven ondernemen op de doelstellingen van de SDGs. Het derde hoofdstuk is een systematisch literatuuronderzoek, van 876 artikelen die tussen 2005 en 2019 zijn gepubliceerd, met als doel te achterhalen hoe 420 soorten economische activiteiten (als een proxy voor bedrijfsstrategieën) de SDG-doelstellingen beïnvloeden. Het onderzoek laat de ruime kansen zien, maar ook de vele afwegingen waarmee bedrijven worden geconfronteerd bij het bijdragen aan de SDGs. Economische activiteiten zijn essentieel voor het bevorderen van economische en sociale SDGs. Ze zijn vaak bronnen van economische productiviteit (SDG 8) en aanjagers van industrialisatie, infrastructuur en innovatie (SDG 9). Specifieke soorten economische activiteiten helpen mensen om in hun meest elementaire behoeften te voorzien door het produceren en distribueren van voedsel (SDG 2), gezondheidsdiensten en medicijnen (SDG 3), onderwijs (SDG 4), water en sanitaire voorzieningen (SDG 6), energie (SDG 7), huisvesting en vervoer (SDG 11), en informatie (SDG 16). Maar afwegingen zijn er in overvloed en zijn niet alleen gerelateerd aan economische activiteiten die de gebruikelijke verdachte zijn. De studie stelt vast dat bijna alle economische activiteiten broeikasgassen uitstoten (SDG 13). Bij veel activiteiten wordt water gebruikt en / of vervuild (SDG 6). Talrijke activiteiten genereren ook vervuiling en afval (SDG 12), degraderen ecosystemen (SDGs 14/15) en schaden de gezondheid van mensen (SDG 3). In dit hoofdstuk worden de positieve en negatieve effecten van economische activiteiten op de SDG-doelstellingen samengevat om een bewijsbasis te bieden voor de SDG-strategieën van bedrijven en voor het SDG-beleid van overheden.

In hoofdstuk 4 beargumenteer ik dat de mate van overeenkomst tussen bedrijfsstrategieën en de ambities van de SDG Agenda een indicator is van lange-

termijn duurzaamheidssucces. Voortbouwende op de bevindingen van hoofdstuk 3, wordt in dit artikel onderzocht welke soorten economische activiteiten die bedrijven ondernemen het meest en welke het minst aansluiten bij de ambities van de SDG Agenda. Het hoofdstuk selecteert 67 unieke economische activiteiten en gebruikt een kwalitatief scoringskader - ontwikkeld in de duurzaamheidswetenschap literatuur - om hun positieve en negatieve interacties met 59 SDG-doelstellingen te beoordelen. De geïdentificeerde en gescoorde interacties worden vervolgens met wiskundige technieken als een netwerk bestudeerd. De resultaten maken het mogelijk om onderscheid te maken tussen vier soorten bedrijfsactiviteiten op basis van hun afstemming met de SDG Agenda, die elk met een specifieke strategische duurzaamheidsuitdaging worden geconfronteerd: (i) 'kernactiviteiten' genereren overwegend positieve, en hebben weinig negatieve, impact op de SDGs, waardoor bedrijven worden uitgedaagd om hun bijdragen te schalen; (ii) 'gemengde' activiteiten hebben een medium / hoge mate van zowel negatieve als positieve effecten, wat een ontkoppelingsprobleem vormt; (iii) 'tegengestelde' activiteiten leveren weinig voordelen op, maar hebben toch aanzienlijke negatieve gevolgen, waardoor bedrijven worden uitgedaagd om hun bedrijfsmodellen duurzaam te transformeren; en (iv) 'perifere' activiteiten hebben immateriële positieve en negatieve gevolgen, waardoor bedrijven worden uitgedaagd om innovatieve wegen te verkennen om SDG-bijdragen te creëren.

In hoofdstuk 5 onderzoek ik hoe bedrijven hun impact op duurzame ontwikkeling effectiever kunnen bevorderen. Het hoofdstuk draagt daarmee bij aan de ontwikkeling van een theorie van duurzaamheidsmanagement die bedrijven in staat stelt hun impact op duurzame ontwikkeling (zoals geconceptualiseerd door de SDGs) te verbeteren. Het introduceert een nexusbenadering van duurzaam ondernemen. Deze nexusbenadering zet bedrijven ertoe aan om hun directe en indirecte en positieve en negatieve interacties met de SDGs op een geïntegreerde manier te beoordelen en te beheren. In plaats van SDGs te behandelen als geïsoleerde silo's, beoogt een nexusbenadering meerdere SDG's tegelijkertijd te bevorderen (waardoor 'co-benefits' worden gecreëerd) terwijl het risico wordt verkleind dat bijdragen aan de ene SDG de voortgang op een andere ondermijnen (en zo 'trade-offs vermijden). Er worden twee kaders geïntroduceerd: één om in kaart te brengen hoe de interacties van een bedrijf met de SDGs ertoe leiden dat het

de veerkracht beïnvloedt van de sociaal-ecologische systemen waarin het opereert; en één voor het operationaliseren van een nexusbenadering van duurzaam ondernemen. Dit interdisciplinaire hoofdstuk is gebaseerd op de sociaal-ecologische systeemliteratuur. Een nexus-benadering is een stap in de richting van het creëren van systemische duurzaamheidsstrategieën voor bedrijven die de complexiteit van duurzame ontwikkeling in acht nemen.

Tenslotte onderzoek ik in hoofdstuk 6 hoe de SDG Agenda de navigatie van samenlevingen tijdens en na de COVID-19-pandemie kan informeren. Het hoofdstuk stelt dat de SDG Agenda niet zonder gebreken is. Het onderstreept ook dat de eerste vijf jaar van de SDGs - zelfs vóór de pandemie - getuige waren van (te) trage vooruitgang. In dit hoofdstuk wordt echter betoogd dat de SDG-agenda drie 'logica' biedt die kunnen helpen bij de transformatie naar duurzame samenlevingen: (1) een bestuurslogica die doelen stelt, beleid vaststelt en voortgang bijhoudt om op impact te sturen; (2) een systeemlogica (nexus) die SDG-interacties beheert; en (3) een strategische logica die bedrijven (op microniveau) in staat stelt strategieën te ontwikkelen die van invloed zijn op beleidsdoelen (macroniveau). Het hoofdstuk bespreekt de belangrijkste hindernissen waarmee elk van deze SDG-logica's wordt geconfronteerd. Transformatie naar duurzame samenlevingen voorbij COVID-19 vereist dat multinationale ondernemingen en beleidsmakers deze logica (beter) toepassen.

About the Author

Jan Anton Poppe van Zanten was born on July 8 1990 in Leiden, the Netherlands. His academic background spans the business and management and the sustainable development disciplines. In 2012 he obtained a Bachelor of Science (BSc) degree in International Business & Management, and a Bachelor of Arts (BA) degree in Philosophy of Economics and Business, both from the University of Groningen. In 2014, he graduated cum laude from the Rotterdam School of Management, Erasmus University, with a Master of Science (MSc) degree in Global Business & Stakeholder Management. In 2016 he received his Master of Philosophy (MPhil) degree in Development Studies from the University of Cambridge (high pass).

Jan Anton started his PhD in May 2017 under the supervision of Prof. dr. Rob van Tulder and Dr. Frank Wijen. As a part-time PhD candidate, his research was done while working full-time in the private sector.

Jan Anton's professional experience centers around the role of the private sector in sustainable development. In 2013, he interned at ING Bank's Economics Department, doing research on the role of Dutch SMEs in international trade. During 2014 and 2015, he worked at the United Nations Environment Programme in Nairobi, Kenya, and did research on early warning systems for climate-related hazards. Following the completion of his MPhil degree in Cambridge in 2016, he returned to The Netherlands to work at Steward Redqueen, a strategy consulting firm that advises public and private organizations on sustainability and impact. In 2020 he joined asset management firm Robeco as SDG Strategist, where he is responsible for further integrating the SDGs into investment strategies.

Portfolio

Education

- PhD in Management, 2017-21
  Rotterdam School of Management, Erasmus University Rotterdam
- MPhil in Development Studies, 2015-16 (high pass)
  University of Cambridge
- MSc Global Business & Stakeholder Management, 2012-14 (cum laude)
  Rotterdam School of Management, Erasmus University Rotterdam
- BA Philosophy of Economics and Business, 2010-12
  University of Groningen
- BSc International Business & Management, 2008-12
  University of Groningen (exchange semester at Soochow University, Taipei)

Peer reviewed academic publications

van Zanten, J. A., & van Tulder, R. (2018). Multinational enterprises and the Sustainable Development Goals: An institutional approach to corporate engagement. *Journal of International Business Policy, 1*(3–4), 208–233. https://doi.org/10.1057/s42214-018-0008-x

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Presentations

- Sustainability and Development Conference, University of Michigan, Ann Arbor (2019)
- International Conference on Sustainable Development, Columbia University, New York City (2018)

Professional Experience

- SDG Strategist, 2020-present
  Robeco Institutional Asset Management, Rotterdam
- Senior Consultant, 2016-20
  Steward Redqueen, Haarlem
- Consultant, 2014-15
  United Nations Environment Programme, Nairobi
- Intern – Economics Department, 2013
  ING Bank, Amsterdam

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