Playing with Hyenas

Renovating the strategy of environmental product policy

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Keywords

decoupling, environmental product policy, hybrid analysis, innovation, sustainable transition, eco-design

Summary

The authors observe the 1990's policy trend has ended to intervene at specification level over a broad range of products. Today's environmental product policies rather focus on a few arbitrary product groups. Selectiveness should serve absolute environmental impact reduction, which asks for a rational product selection and target framework. The authors propose 'life cycle impact per consumer expenditure' as a key criterion. It helps to connect macro environmental impact reduction aims with product innovation targets, even under continuous economic growth, consumption pattern shifts and rebound threats. As an exercise they analyze the Dutch economy. It results in 44 product groups, labeled 'Hyena' by the authors, that ought to improve their ratio score drastically between now and 2040. Some magnitudes of desired change are given. Finally intervention processes at Hyena group level along the lines of sustainable transition management are proposed. Joint visioning, experimental portfolios, interaction between micro, meso and macro change levels, and gradual pressure building are crucial elements in this concept for complex change management.

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Introduction

From the late eighties lifecycle thinking created dynamics in environmental product policy. The science of Life Cycle Analysis (LCA) emerged as a method to evaluate impacts at all stages of production, consumption and waste (SETAC 1991). It created the possibility to rationalize design for the environment, or shortly, eco-design. This brought a new dimension to product quality. It also added to a new, optimistic world view which has been entitled the ‘eco-innovation paradigm’ by Ryan (2004). The paradigm had been coming up since the Brundtland’s Our Common Future (WCED 1987) and acquired substantial support during the 1992 UNCED Summit in Rio.

The eco-innovation paradigm builds on the proposition that long-term economic growth and environmental protection ‘are mutually dependent: solving environmental problems requires resources which only economic growth can provide, while economic growth will falter if human health and natural resources are damaged by environmental degradation’ (Matthews et al. 1997). To this it adds the conviction that sustainable development can be achieved through innovation both in technical domains and in non-technical (economic, social and institutional) structures: the economy can be uncoupled from environmental degradation (Ryan op cit. p.29). Ryan identifies lifecycle thinking and eco-design as two key principles to unlink growth and degradation, which has been pursued by so many policymakers (e.g. OECD 2001, EC 2001).

Against this background the ‘90’s policy dynamics are imaginable. Taking the Netherlands as an example, the Dutch government started pilot projects in ‘92 in order to demonstrate the potential of reducing impact through design (for instance Te Riele et al. 1994). These pilots preceded broader governmental intervention programs. Between ’95 and ’98 about a hundred diverse and self-specifying (determining the specs of their products) SME’s participated in eco-design programs (Van Hemel 1998). Parallel to this intervention scheme, LCA knowledge transfer to designers was stimulated (Goedkoop et al. 1995, 2000), back-casting was promoted as a strategy to bring pursued long-term futures into today's designers and developers minds (Van Grootveld et al. 2000), and a program was launched that would finally cover 230 research alliances, each in the long term aiming at substantial advance in economy, ecology and technology (NOVEM, 2000).

Similar developments can be documented from some other European and non-European industrialized countries (Tukker et al. 2001). As a result product policies generated considerable attention from industry. Nevertheless, ten years later Tukker's comparative analysis of the results throughout the European Union showed a rather disenchanting state of the art. Even in the most advanced countries, practical application of eco-design appeared to be limited. Apart from a few front running multinationals in electronics, packaging and cars, in most firms, particularly small and medium-sized enterprises, eco-design hardly played a role. Experiments rarely lead to implementation in product development processes, eco-innovation was not a management issue and strategic goals were rare. Firms who did pay attention to it, concentrated on incremental improvements rather than on function fulfillment re-design and system innovations.

These rather limited results provoked a reorientation of today's environmental product policies. Firstly, the initial broad scope has now faded (Ryan 2004). Had the scope of the 1990s been *all* industrial sectors, today's product policies of e.g. the EU and Japan show a strict focus on a few, more or less arbitrarily chosen product categories like electronic and electrical products. As an example, the main intervention by the EC concerning eco-design in the years to come obliges energy-using products to meet with efficiency standards throughout their lifecycle as a precondition for being sold on the European market (EC 2005). In our view, selectivity can be an improvement, provided that selected product categories offer best chances for environmental impact reduction. This stresses the need for a rational selection method.

Secondly, the policy's initial focus on product level interventions has, in some countries, given up its place to systems interventions (or sustainable transitions) policies, in order to cope with ecological, economic and institutional dynamics at macro level (Rennings 2004). The question in this context is how to attune – in targets and instrumentation – product policies to long term environmental policy goals, taking account of disturbing phenomena like rebound effects, structural change in consumption patterns and consumption growth. In our opinion, only by meeting this challenge environmental product policies truly start to contribute to Ryan's eco-innovation paradigm, to the assignment to decouple economic growth from environmental degradation.

We conclude there is a need to rationalize the selectiveness of environmental product policies and to connect these with the decoupling perspective. This article develops a value based prioritization method which accommodates both desires. The ratio *environmental pressure per unit consumer expenditure* is proposed as the main selection criterion and measuring-rod for setting and taking track of product policy goals. First the utility of this so-called Load per Value ratio (L/V ratio) is analyzed theoretically. We then test its practicability, building on a top-down analysis of the environmental load of Dutch private consumption, reported recently in this journal (Nijdam et al. 2005). Next we examine the function of the L/V ratio as route indicator, elucidating policy goals and keeping track of strategies to improve products and their related systems. Finally some conclusions are drawn and topics for further research are identified.

Value-related prioritisation

A rational product selection framework seems conditional for future product policy dynamics. This framework should enable product policies to focus on categories of products which give best chance for unlinking environmental impact from economic growth. It may also bridge the gap between the environmental & innovation policy agendas. Selectivity asks for a criterion. In principle, we see three options:

- the absolute environmental pressure of a product (group), expressed in one or more physical parameters ('laundry dryers as a group add over their entire lifecycle X to acidification, Y to ozone depletion, and Z to climate change');
- the relative environmental pressure of a product (group), relative to its level of expenditure ('each euro spent on laundry dryers, adds directly and indirectly X to acidification, Y to ozone depletion, and Z to climate change');
- cost effectiveness of improvement potentials ('each euro spent on improving laundry dryers reduces X acidification, Y ozone depletion, and Z climate change').

The third option looks attractive, but does not qualify as a suitable *ex ante* criterion. Typically, reliable cost effectiveness data are only available for specific products and for short to mid term improvement paths. This criterion therefore does not match with the comprehensive and long term perspective we aim at. As we'll see later in this article, as a second order criterion however, cost effectiveness will play its important role for defining mid-term beacons.

Absolute environmental pressure has been applied as a criterion by several authors, e.g. Kok et al. (2003), Moll et al. (2004), Nijdam and Wilting (2003). The EIPRO study, commissioned by the European Commission, appears as the most ambitious and comprehensive example (Tukker et al. 2005). *Relative* environmental pressure has been applied by Weidema et al. (2005) and De Vries and Te Riele (2005). Both approaches require comprehensive data on the direct and indirect environmental pressure caused by consumption.

Such data can be found by means of a so-called hybrid analysis, combining the environmental data of all business sectors in a product's lifecycle, with economic Input Output Analysis data (IOA), and expenditure statistics. Environmental data may refer to impact indicators like acid emissions, global warming potential, resource use, and so on. The total consumption is categorized into tens or hundreds of product groups and the environmental load attributed to each of them is calculated for each environmental pressure indicator separately. The product groups are then ranked, either after their *absolute* environmental pressure, or after their (*relative*) environmental pressure in terms of the L/V ratio. As said, this Load/Value ratio is defined as environmental impact (expressed in several physical parameters) per Euro spent.

Both ranking concepts offer a basis for selecting environmental harmful products, but obviously, their resulting ranks differ. Ranking based on absolute environmental pressure combines two factors, the expenditure volume in Euros and the environmental load per Euro spent. Using this criterion, a high score of a certain product group may result from a large share in total consumption, from a high impact per Euro, or from both.[i] With ranking based on relative environmental pressure only a high score per Euro leads to pole position.

Theoretical analysis points at *relative* environmental pressure as the preferable criterion, especially in the context of policies aiming at decoupling environmental pressure from economic (consumption) growth. The rationale here is twofold. One, the L/V ratio helps to connect macro level (total consumption) and meso/micro (consumption pattern/innovation) level aims, even under consumption pattern shifts and continuous growth. It helps to cope with the rebound problem as well. And two, while keeping these levels connected, the criterion can steer innovation moves.

[figure 1]

Figure 1 illustrates the casus of changing consumption patterns. Take any product group P. Consumers spend an amount of Vp euro, which causes Lp environmental load over the product's lifecycle. The steepness of the vector represents the ratio Lp/Vp, or environmental pressure per unit expenditure. Under constant technology, which means constant environmental load of the product, a declining (growing) consumption of product P simply shortens (prolongs) the vector. Given a certain income level, other expenditures will now increase (decrease). It depends whether this consumption shift works out positively for the entire economy's environmental impact. The higher the ratio of the decreasing product, the bigger the chance that the shift results in a *net* beneficial environmental effect. Apparent conclusion: under consumption pattern shifts, this vector is capable of connecting the environmental score of products and the macro environmental policy agenda.

[figure 2]

Casus 2 concerns environmental product improvement, i.e. lowering the Lp score of our product (see figure 2). When it comes to the overall environmental effect, three possibilities show up. First, the improvement results in a higher product price, causing 1) less units sold, 2) higher expenditures on the product (the so-called negative income effect will only partly be shifted on to this product), and 3) less consumption of other products. In the figure this is depicted as I_1 (Innovation 1) . The extent to which the expenditures on product P increase and on other products decrease depends on relative elasticities.[ii] Improvements of this type combine environmentally positive effects both on the product's level and on the economy's level.

As a second possibility, our improvement reduces costs, lowers the unit price and creates a positive income effect. This is depicted as I_2. The product vector now moves into the area of win-win options, opening a window – the rectangle R_2 – determined by the original and the new product vector. This window indicates the playing area for the well-known rebound effect (see Hertwich, 2005 for a recent evaluation of rebound effects from the perspective of industrial ecology). Its horizontal axis shows the budgetary room coming from saved expenditures. This will be spent partly on more units of product P and partly on other products (again depending on elasticities), causing additional environmental pressure. The vertical axis of window R_2 indicates how big this additional load may be, before totally neutralizing the initial environmental gain of Innovation 2. In short, window R_2 visualizes that net environmental gains relate positively to the angle decrease of product vector P, and negatively to the average L/V ratio of the newly bought products. Or, to put it differently: one may expect rebound effects to be typically small when products with high L/V ratios are improved.

There is a third possibility. Here the price falls more than proportionally compared to the innovation's environmental gain. This is innovation type I_3, with rectangle R_3, again delimited by both product vectors, indicating the playing ground for rebounds. Now, the product's L/V ratio goes up in stead of down, causing strong positive income and hence rebound effects (note the different dimensions of window R_3, compared with R_2). Here rebounds may easily offset (more than) completely the environmental gain from the original product improvement. Unless of course the saved expenditures are spent on products with extraordinary low L/V ratios (singing lessons, management coaching, *whatever*), type 3 improvements typically result in a environmentally neutral or negative effect on the economy's level.

From this graphical analysis, the relevance of the ratio environmental impact per Euro spent seems obvious. In the context of consumption patterns, this L/V ratio shows the way towards pattern change with net environmental gain. In the context of innovation, lowering the L/V ratio promises the key for reducing the total environmental impact of consumption, while focusing on products with high ratio scores limits rebound effects. Decreasing the L/V ratio is evenly important under the dynamics of rising consumption levels. Here the (mean) ratio should decrease at a pace which compensates not only for rebound effects but also for economic growth.

We conclude that environmental product policies should preferably focus on product groups with high impact per expenditure ratios. Only here, the chance is low on undesirable rebounds and therefore high on environmental impact reduction of the economy as a whole. This rationalizes the framework behind environmental product policies and connects the macro agendas to the micro improvement arena.

Selecting products within the Dutch consumption universe

We have tested the applicability of our selection criterion in the context of the Dutch economy, which may be characterized as prosperous, with extensive use of both domestic and foreign resources, products and services, and causing heavy environmental pressures, both domestically and abroad. Crucial for such exercise is the availability of comprehensive and reliable environmental and economic data. In our research no new data have been gathered. We based our computations on the data and categorizations, reported by Nijdam et al. (2003, 2005). In their research Nijdam and colleagues followed the logic of hybrid analysis, described above. Consumer expenditures on 360 product categories were obtained from the expenditure survey of Statistics Netherlands. Data on direct environmental loads of these product categories (for ten environmental parameters) were taken from standard environmental databases. Environmental loads occurring during production processes were calculated by linking four environmentally extended IO tables to consumer expenditures. Nijdam's IO tables represent different regions of the world (the Netherlands, OECD-Europe, other OECD, non-OECD), each with their own technologies and environmental load intensities, and all related to Dutch consumption. They were available on a rather aggregated level of 30 to 100 sectors only. Reliability of data forced Nijdam et al. to join the original 360 product categories into 70 to 80 combined categories, grouped into seven consumption domains. We took these results as the starting point for our exercise.

Our universe now consists of:

- 70 product groups (*like footwear, lighting, hard floor covering, self medication, holidays, books & hardware, coffee/tea/cocoa, dairy products & eggs, fruit & vegetables, etc*);
- categorized under seven functionally coherent consumption domains (*leisure, labour, personal care, housing, furnishing, food, clothing*);
- which together cover total private consumption in the Netherlands (*approximately 8900 Euro/person/year*);
- ten environmental pressure indicators or 'stressors', ranging from climate change potential, via natural resource and biodiversity pressure, to potential health effects *(greenhouse gases, acidification, eutrophication, land use, wood extraction, fish extraction, fresh water use, summer smog, road noise and pesticides use).*

These data allow for a systematic, top-down product group selection procedure in three steps. *First*, we ranked all 70 product groups along their environmental load/expenditure score (L/V ratio), irrespective their consumption domain. The ranking is done for each stressor separately (Pesticides, Noise, etc). Environmental loads cover the entire lifecycle of each product group, as calculated by Nijdam et al.

[figure 3]

Second, product groups are placed according to this ranking along the X-axis of a graph, plotting the consumption expenditures on all product groups and their environmental impact, both cumulatively. Typically these curves show a limited number of product groups causing the majority of environmental pressure while representing only a small expenditure share. Fig. 3 presents Pesticides Use as an example. Note that in such cumulative environmental pressure curves, some points of abrupt gradient change can be marked (e.g. in fig. 3 after two, after eleven and after 23 product groups). Exceptions occur however, like in the case of Acidification (see fig. 4), which show a rather even distribution without obvious gradient changes.

[figure 4]

Third, the product groups located left in each graph, up to the first significant gradient change in the environmental pressure curve, are labeled 'Hyenas'. It's our nickname for product groups which during their lifecycle cause avowedly high environmental impact per Euro spent. E.g. for Pesticides the first eleven product groups are labeled Hyena. These eleven pesticide Hyenas cover only 14% of the expenditures but 75% in pesticides pressure.

[table 1]

The Hyenas are the product groups we were looking for. All in all 44 product groups have been selected as hyena on one or more stressors, together covering 60% of Dutch consumption. Table 1 shows the number of Hyenas per domain, their share in total environmental pressure and their economic coverage. Table 2 gives full specification. It appears that the domains Food, Clothing and Furnishing clearly contain more Hyenas than others, like Labour and Housing. It also appears that the environmental impact share of the selected Hyenas diverges per stressor, from 20-25% (Acidification, Wood extraction) to 80-90% (Fresh water use, Fish extraction), while their expenditure share in comparison is much smaller for all stressors.

For the Dutch case we may conclude that taking the L/V-ratio as a selection criterion is practicable and useful. For most environmental stressors it selects product groups which together combine large environmental pressure coverage with small coverage of the economy (consumption). Acidification and Wood extraction are exceptions. But here, too, some product groups can be selected scoring extremely bad on environmental impact per unit expenditure.

[table 2]

Attuning environmental product policy to targets

We showed that applying the L/V ratio as *ex ante* criterion can improve the selectiveness of product policies. It's about selecting product groups with high ratios. Lowering these ratios will most probably deliver net environmental benefits and contribute to macro environmental policy targets. But this is just the first step. Next questions are which *rate* of improvement to aim at and how targets could be provided with effective policy strategies.

First the extent to which the L/V ratios should be lowered. This of course depends on two factors: the expected economic growth, or rather consumption growth, and environmental policy goals defining maximum acceptable environmental pressure.

Expected growth can easily be derived from long term forecasts by economic analysts. For the Dutch case, consumption growth expectations have been taken from economic scenarios, recently published by the Dutch Central Planning Bureau (CPB 2004). Future consumption is expected to increase by 50 to 120% till 2040 (moderate growth scenario) or 150 to 240% (high growth scenario), depending on two assumption sets.

Environmental policy targets, again for our Dutch case, have been derived from the Dutch 4th National Environmental Policy Plan (VROM, 2001). They refer to the long term (2040). Environmental policy goals, formulated in such plans, normally refer to the domestic environment or domestic production sectors, whereas most products experience truly international lifecycles. The principal solution here would be to compute a weighted average of policy goals set by all lifecycle dominating countries. For practical reasons however, we've taken a short track in our Dutch case by neglecting this. A second complication is that long term policy goals normally specify desired environmental qualities, but seldom relate these to targets in terms of the impact parameters which we applied. In our exercise we filled some of these gaps with assumptions. For example we assumed that sustainability in wood, fish, and water extraction means 1) halving the absolute amounts extracted, and 2) consuming the remaining half from sustainable sources only. Assumptions like these are acceptable since they only serve to illustrate the *principal* applicability of a rational product selection framework including a set of product change targets. As a result, table 3 gives the calculated improvement targets for ten environmental stressors. The long term targets are computed against static environmental product and industry profiles[iii] and represent the *mean* required improvement for all products.

[table 3]

Of course targets can be differentiated between product groups. Nevertheless it seems clear that the targets are so radical that they ask for systems scale interventions, including the surrounding beliefs, laws, institutions, bodies of knowledge, and structures, rather than for series of incremental product improvements. Meanwhile, actors of course can not start intervening but from their current position. In order to connect these far remote sides of the process, a new change management concept is needed. We consider *transition management* as the most promising candidate to fulfil this task. It has been introduced by the UN in 1997 in order to cope with ecological, economic and institutional dynamics and targets at macro level (Matthews et al. 1997), but it came to growth only recently (Geels 2002, Rotmans 2003). In the Netherlands transition management has become part of the national sustainability policy since 2000, with the Fourth Environmental Action Plan (VROM 2001). *Transitions* can be defined as shifts in society from one mode of operation to another. They represent development paths which often have already been experienced by subpopulations and which provide insight into likely futures, dependent on economic, social and environmental circumstances (Matthews et al. 1997).

For policy makers, the importance of this concept is that the direction and speed of change can be significantly influenced by policy intervention. This is called transition *management.* After reviewing five on-going systems changes, Matthews et al. reckon the environmental impact of industrial activities as sensitive to policy interventions. 'But the pace of change is slow, and innovation must be speeded up in order to have a serious impact on global levels of productivity and pollution.' Transition management, more than other change management concepts, acknowledges the reciprocity between micro, meso and macro scale developments during processes of long-term systems change. It deals with longer timescales, more uncertainty and non-linearity, and it binds actors through a shared agenda building, which is necessary since no single actor is capable of handling the system complexity (Rotmans 2003). It claims to provide with a philosophy and toolkit for normative purposes like sustainability.

Following Loorbach (2004) and Geels (2004) this may result in the following change process phases for each Hyena constellation.

1. Complex systems analysis (CSA)

- making a system analysis to deliver and share insight in the complexity of the product group system, its history, its major subsystems, the causal relations and loops, and the roots and nature of the structural problems.

2. System targets and development paths

- initiating a collective goal-seeking process that delivers long-term system objectives, accompanied by potential future development paths. The paths in fact are multi-perspective roadmaps and allow for non-linear developments like surprises, catastrophes and interventions.

3. *Experimental portfolios*
   - starting experiments in each development path. Linking experiments within and between system levels in order to build up coherent experimental portfolios.
   - stimulating promising portfolios, but keeping paths open to prevent lock-ins.
4. *Evaluating and readjusting*
   - evaluating, learning and adapting targets and development paths, and providing terminal care if needed.

In short, we propose to organize a transition management network for each Hyena product group, by and by becoming a push for innovation into the desired direction. Shared vision building, experimenting, stimulating, monitoring and testing, should lead to introduction and application of product systems with a radically improved Load/Value profile. Actors play a role in line with their specific strength. Gradual pressure increase can be crucial for keeping up long term dynamics.[iv]

Transition management is typically oriented towards long term change. Here, the most promising strategies seem to build upon co-operation and cohesion, leading to shared visions and shared pre-competitive research. Cost effectiveness (delivering environmental gain against the lowest possible costs) can not play a dominant role within this time frame, since reliable cost information simply lacks. Reducing the *mean* L/V ratio score of product groups can be taken as the dominant beacon instead, leaving it up to designers and marketers whether to decrease the nominator, increase the denominator or both.[v] Elaborating on such long term strategies, short to mid term offspring will arise. Within *such* projects and action plans cost effectiveness should play its role as an important added beacon.

Conclusion and discussion

The difference between this article’s approach and most other studies concerns the selection criterion and the change management philosophy. We presented the Load/Value ratio as a first order criterion and showed its applicability by applying it to the Dutch final consumption. Through this we believe to have developed a rational base for future environmental product strategies. We also identified transition management as a change management philosophy capable of dealing with shared agenda building, micro-meso-macro interaction patterns, and non-linear development in a sector and its surrounding societal system. Through this we believe to have provided in a change management structure that can facilitate long-term and drastic change targets.

These main conclusions of course do not exclude that many improvements are possible and desirable. Further research and practical applications should lead to refinement of the approach outlined here. Four topics at least deserve serious attention:

Improving the selection criterion. We have argued that the relative impact of product groups appears as the preferable first order selection criterion. Supplementary to this, the absolute impact of products could be introduced as a second order criterion. This follows the procedure by Weidema (2005) and would focus product improvement strategies on the biggest Hyenas in terms of expenditure share, without losing much of environmental relevance.

A second improvement may be to apply our selection procedure on final *and* intermediary products, like has been done in the EIPRO study (Tukker et al. 2005). In a sense, this introduces an inconsistency, because the impact of intermediary products has been accounted for in the ‘cradle to grave’ indicators of final products. However, from a practical innovation perspective, it seems illogical to focus on final consumption products only and neglect (sometimes identical) intermediary products.

Third, given that product categorisations always remain arbitrary, one might create logical product clusters, both within and between Hyenas, sometimes even overlapping with non-Hyena product groups. Such clusters may cohere because of their environmental impact, or as a suitable starting point for innovation research (the EU focus on electrical equipment being a good example of this).

Improving the demarcation line. We used a visual method to separate Hyenas from the rest of the curve (see figures 3 and 4). A full-blown mathematical method, based on Load/Value gradient development, would decrease the arbitrariness of our demarcations. This would not alter our results fundamentally however. Still products will be selected combining a large impact with small expenditure shares. One could also add a sensitivity analysis, showing which increase of the environmental impact share follows from an increase in expenditure share (or vice versa).

Improving the target assumptions. We made some assumptions to deduce long term product targets from environmental policy goals. They're certainly subject to improvement. A high level of accuracy however is neither possible, because of their long term orientation, nor necessary, because their main function is indicate the order of magnitude of improvements to aim at. In this sense our targets are comparable to the well-known 'Factor 4' and 'Factor 10' targets, except that our targets are differentiated per stressor and are expressed in terms of the L-V ratio.

Implementing transitions management. The concept of transition management, though promising, has not yet been implemented at the level of product group constellations. Empirical knowledge, based on practical experience, needs to be developed.

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i. Not surprisingly, environmentally harmful products selected in this way represent a substantive part of total environmental pressure as well as a comparable big fraction of total consumption. E.g. in the EIPRO study, the top 35 out of 284 product groups typically represent 70-75% of total environmental pressure as well as two-third of total spending, both referring to each parameter separately (Tukker et al 2005).

ii. These effects represent the dynamics of (in economic terms) 'normal goods'. We confine our analysis of all three innovation types to this standard case. Effects are different in the special cases of 'inferior' and 'luxury goods', as Hertwich (2005) points out correctly. Note that Hertwich's analysis is restricted to what we call type 2 innovations.

iii. In reality, most industrialized countries show a steady environmental product quality improvement. For instance for greenhouse gases in the Netherlands this has been estimated 20 to 30% between now and 2040 (CPB, 2004). This autonomous improvement helps reaching targets, but will clearly be insufficient.

iv. Some authors (implicitly) count on strictly voluntary action patterns. A facilitating government would be enough to induce a system's change. Others however stress the need for continuous pressure building, be it from within the sector (for instance covenants or continuously upgraded product standards) or from outside (governmental directives or consistent ngo-campaigning), in order to keep up dynamics (Elzen et al. 2004).

v. Including the complexities of serving the wants of different consumers. In other words, acknowledging the differences between products with similar function but entirely different value propositions. For instance between a Lotus and a Volkswagen.

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