TOWARDS A CIRCULAR ECONOMY FOR PRODUCTS

*An analysis of EU's policy and regulatory framework
in an ecological perspective*

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PhD Thesis

Faculty of Law, University of Oslo

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To Thibaud, Mathis and Eloïse,
Eskil and Amund, Kristian and Jonas,
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PART II

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PART I

Chapter 1. General introduction to the dissertation

“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 [...]”

— Charles Dickens
A Tale of Two Cities, 1859

1.1. Introductory remarks

1.1.1. Circular Economy: A quest for the Sustainability Grail

The concept of the ‘Circular Economy’ (CE) has gained a lot of attention in the last five years and has become the new all-encompassing notion for sustainable public policies.¹ There is to date no commonly agreed definition of the CE, and it is one of the aims of this thesis to propose one. A starting point for characterizing it might be in opposition to the linear ‘take-make-dispose’² economic model that has dominated economic thinking for more than 150 years, whereby the environment is an open space from which humanity can draw natural resources infinitely and discharge unlimited amount of emissions. The CE developed in particular as a way to counter the dramatic environmental consequences of the ensuing ‘throwaway society’³ – that is, the mass production of low-quality products for the purpose of rapid consumption and discarding. In this dissertation, I focus on products – i.e. items or services other than food (see 1.3.1).

The European Union (EU) stressed that the transition to the CE should help “to develop a sustainable, low carbon, resource efficient and competitive economy.”⁴ Broadly speaking, a circular economic model is one where “the value of products and materials is maintained for as

¹ See e.g. M. Geissdoerfer et al., ‘The Circular Economy – A new sustainability paradigm?’ (2017) 143 *Journal of Cleaner Production* 1, 757-768; W. Stahel, ‘The Circular Economy’ Comment (2016) 531 *Nature* 7595, 435-438; N. M. P. Bocken et al., ‘Product Design and Business Model Strategies for a Circular Economy’ (2016) 33 *Journal of Industrial and Production Engineering* 5, 308-320; P. Ghisellini, C. Cialani and S. Ulgiati, ‘A Review on Circular Economy: The expected transition to a balanced interplay of environmental and economic systems’ (2016) 114 *Journal of Cleaner Production*, 11-32; G. Brennan, M. Tennant and F. Blomsma, ‘Business and Production Solutions: Closing the loop’, in H. Kopnina and E. Shoreman-Ouimet (Eds.), *Sustainability: Key issues* (New York: Routledge Earthscan, 2015), 219-239; K. Webster, *The Circular Economy: A wealth of flows* (Isle of Wight: The Ellen MacArthur Foundation, 2015); The Ellen MacArthur Foundation (EMF), ‘Towards the Circular Economy Vol. 1: An economic and business rationale for an accelerated transition’ (2012) <www.ellenmacarthurfoundation.org/assets/downloads/publications/Ellen-MacArthur-Foundation-Towards-the-Circular-Economy-vol.1.pdf> accessed 25.03.2019, 30-32; M. S. Andersen, ‘An Introductory Note on the Environmental Economics of the Circular Economy’ (2007) 2 *Sustainability Science* 1, 133-140.

² ‘Take’ refers to the extraction of raw natural resources; ‘make’ relates to the transformation of the resources through manufacturing; and ‘dispose’ point out to the residues (emissions and waste) from both manufacturing and consumption.

³ The term was used for the first time in an article published in the 1955 issue of Life magazine, see B. Cosgrove ‘“Throwaway Living: When tossing out everything was all the rage’ (2014) *Time* <<http://time.com/3879873/throwaway-living-when-tossing-it-all-was-all-the-rage/>> accessed 25.03.2019.

⁴ Commission Communication, ‘Closing the Loop – An EU Action plan for the Circular Economy’, COM(2015) 614 final.

long as possible”, waste and the use of natural resources is minimized, and products remain in the economy through recovery loops.⁵ Establishing the CE requires, as the EU suggests, the adoption of measures with regards production, consumption and waste management.⁶ This dissertation aims to reveal how the law can contribute towards establishing a sustainable future in which humanity lives in harmony with the environment. This, in my view, can only be done if it is clear that the model that is fostered – in this case, the economic model – is able to accomplish this goal. Hence, one must define what the CE really aims to accomplish, for the CE is not the end goal, but merely a means to reinvent our economic model, our relationship with the nature, and indeed our regulatory framework. Understanding the CE requires determining what the overarching aim is, but also exposing why our society has developed *against* (rather than *with*) nature.

1.1.2. Human development against the environment

The industrial revolution represented the twilight of prevailing hardship for humanity. For most of human history, people had been living in extreme poverty, life expectancy was short and uncertainties about the future were high. People were constantly at war, not least for the control of scarce natural resources. Thomas Hobbes wrote in *Leviathan* of the shortcomings of a society leaving in fear and uncertainty and described the life of men at the time as “solitary, poor, nasty, brutish, and short.”⁷ Little did he know that some two centuries later, the faith of humanity would change radically. Whereas at the time of Hobbes’ writing over 90% of the world’s population lived in extreme poverty, today the numbers have inverted and an estimated 10.7% lived in such a state in 2013.⁸ Life expectancy has surged, child mortality has shrunk and the “continual fear and danger of violent death” described by Hobbes has largely subsided. The rise of machines, technological progress and innovations have created societies in which a majority of humans are, for the first time in history, living relatively social, prosperous, pleasant, non-violent lives.

The industrial revolution also marked the beginning of an epoch of large and widespread damage to the environment. The rise of productivity due to the use of machines radically changed the economy and changed the dominant economic model from circular to linear. For the first time in history, the economy and the population began to grow simultaneously, and prevailing ideas of scarcity in nature faded away. Growth became the new goal for human society: growth in production, growth in consumption, and growth in the use of natural resources. Quickly, however, the fundamental shortcomings of the linear model appeared; pollution, biodiversity loss and climate change became the intrinsic counterpart of the growth economy. Clearly, the idea that the economy could rely endlessly on the regenerative and

⁵ European Union (EU), ‘Circular Economy: Implementation of the circular economy action plan’ (2019) <http://ec.europa.eu/environment/circular-economy/index_en.htm> accessed 25.03.2019.

⁶ See COM(2015) 614 final.

⁷ T. Hobbes, *Leviathan: Or the matter, form, and power of a commonwealth, ecclesiastical and civil* (London: Crooke, 1651).

⁸ The World Bank, ‘Regional Aggregation Using 2011 PPP and \$1.9/day Poverty Line Statistics’ <<http://iresearch.worldbank.org/PovcalNet/povDuplicateWB.aspx>> accessed 25.03.2019.

assimilative capacities⁹ of the Earth system has reached its limits. As Boulding set forth, the linear model rests on a vision of an open economy that one can associate with the “reckless, exploitative, romantic, and violent behavior” of the cowboy.¹⁰ Just like the figure of the free and independent cowboy, the ‘cowboy economy’ did not appear to be bound by any rules other than its own, and certainly not by the laws of nature. Boulding warned that, in reality, the Earth resembled more a spaceship than illimitable plains, and that humanity was bound to develop in line with the cyclical ecological system.¹¹ In a closed system, he said, “there are no inputs from outside and no outputs to the outside; indeed, there is no outside at all.”¹²

Around two centuries of ‘cowboying’ the planet have plunged it to a state of devastation and chaos, and is threatening the mere survival of humanity.¹³ Although the Earth system is quite resilient, it is clear that the impacts of human activities are causing extensive damage. Extreme climatic events, such as violent storms, heat waves, floods and landslides, have also increased, both in frequency and in intensity,¹⁴ causing destruction and death.¹⁵ As the Earth is warming (between 0.6 and 0.9 degrees since 1906),¹⁶ ice is melting, especially at the poles, provoking in particular the release of methane from the seabed, a strong contributor to global warming.¹⁷ In addition, sea levels are rising quickly, causing flooding and freshwater contamination¹⁸ and affecting coastal plant life and wildlife.¹⁹ Deserts are expanding and increasing parts of the planet are hence becoming essentially inhospitable.²⁰ Many studies show that insect populations are declining dramatically²¹ due, in particular, to farming practices (e.g. monocultures and the

⁹ I.e. the capacity of natural resources to regenerate and the capacity of the environment to absorb emissions and convert them back into harmless or useful ecological products, see D. W. Pearce and R. K. Turner, *Economics of Natural Resources and the Environment* (Baltimore: Johns Hopkins University Press, 1990), 36-39.

¹⁰ K. E. Boulding, ‘The Economics of the Coming Spaceship Earth’, in H. Jarrett (Ed.), *Environmental Quality in Growing Economy* (Baltimore: Resources for the Future/Johns Hopkins University Press, 1966), 3-14, 5.

¹¹ Ibid.

¹² Ibid, 6.

¹³ J. Rockström et al., ‘Planetary Boundaries: Exploring the safe operating space for humanity’ (2009a) 14 *Ecology and society* 2, 32-65.

¹⁴ See e.g. G. Wang et al., ‘The Peak Structure and Future Changes of the Relationships Between Extreme Precipitation and Temperature’ (2017) *Nature Climate Change* 7, 268-274; E. M. Fischer and R. Kutti, ‘Observed Heavy Precipitation Increase Confirms Theory and Early Models’ (2016) *Nature Climate Change* 6, 986-991.

¹⁵ For example, the 2003 heat wave may have caused 70,000 deaths in 12 countries in Western Europe (see J. M. Robine et al., ‘Death Toll Exceeded 70 000 in Europe During the Summer of 2003’ (2008) 331 *Comptes Rendus Biologies* 2, 171-178); See also Z. W. Kundzewicz, ‘Extreme Weather Events and their Consequences’ (2016) 23 *Papers on Global Change* 1, 59-69.

¹⁶ See NASA Earth Observatory, ‘Global Warming’ (2010) <<https://earthobservatory.nasa.gov/Features/GlobalWarming/page2.php>> accessed 25.03.2019.

¹⁷ P. Wadhams, ‘The Global Impacts of Rapidly Disappearing Arctic Sea Ice’ (2016) *Yale Environment* 360 <https://e360.yale.edu/features/as_arctic_ocean_ice_disappears_global_climate_impacts_intensify_wadhams> accessed 25.03.2019.

¹⁸ On freshwater contamination, see J. D. Gulley et al., ‘Sea Level Rise and Inundation of Island Interiors: Assessing impacts of lake formation and evaporation on water resources in arid climates’ (2016) 43 *Geophysical Research Letters* 18, 9712-9719.

¹⁹ On threats to plant life, see C. Craft et al., ‘Forecasting the Effects of Accelerated Sea-Level Rise on Tidal Marsh Ecosystem Services’ (2009) 7 *Frontiers in Ecology and the Environment* 2, 73-78.

²⁰ See e.g. Millennium Ecosystem Assessment, *Ecosystems and Human Well-Being: Synthesis* (Washington: Island Press, 2005).

²¹ A study of butterfly species composition in southeastern Germany over nearly two decades showed a large decline from 117 species in 1840 to 71 in 2013 (see J. C. Habel et al., ‘Butterfly Community Shifts Over Two Centuries’ (2016) 30 *Conservation Biology* 4, 754-762); the honeybee population in the United States has decreased at increasingly rapid rates, and by up to 70% in Iowa according to J. Hagopian, ‘Death and Extinction

use of fertilizers and pesticides) and habitat loss.²² This decline has far-reaching consequences for the natural environment and humans, who depend on insects to pollinate crops and for subsistence.²³ Furthermore, the consequences for human health are daunting. The mortality rate due to air pollution, in particular in children living in urban areas, is reaching dramatically high levels.²⁴ The WHO estimates that in 2012 around 7 million people died in the world as a result of exposure to pollution.²⁵ A study by the Lancet Commission, estimated the number of premature deaths caused by pollution in 2015 at 9 million, at least.²⁶ This is why many argue that we have entered a new epoch, the *Anthropocene*, which is characterized by the significant impacts of human activities on the Earth system.²⁷ Although the starting date of the Anthropocene is contested,²⁸ it is clear that human influence on the environment has accelerated considerably since the Industrial Revolution²⁹ along with dynamics of economic and population growth, materialism and overconsumption, aptly described as the ‘Great Acceleration’.³⁰

1.1.3. A safe space for humanity?

Is there a space left for humanity to operate safely? According to a group of scientists led by Swedish professor Johan Rockström, the Earth system has clear limits and transgressing any of those so-called ‘planetary boundaries’ could “trigger non-linear, abrupt environmental change

of the Bees: The role of Monsanto?’ (2014) *Global Research* <www.globalresearch.ca/death-and-extinction-of-the-bees/5375684> accessed 25.03.2018; Another study found a 33% decline in IUCN-documented insect populations (see R. Dirzo et al., ‘Defaunation in the Anthropocene’ (2014) 345 *Science* 6195, 401-6.

²² See e.g. A. Vanbergen and L. Dicks, ‘What is Causing the Decline in Pollinating Insects?’ (2014) *Living With Environmental Change Policy and Practice Note No 09* <<https://nerc.ukri.org/research/partnerships/ride/lwec/ppn/ppn09/>> accessed 25.03.2019; and A. Vanbergen and the Insect Pollinators Initiative, ‘Threats to an Ecosystem Service: Pressures on pollinators’ (2013) 11 *Frontiers in Ecology and the Environment* 5, 251-259.

²³ C. Schwägerl, ‘Vanishing Act: Why insects are declining and why it matters’ (2016) *Yale Environment* 360 <https://e360.yale.edu/features/insect_numbers_declining_why_it_matters> accessed 25.03.2019; see also A. Vanbergen et al., ‘Status and Value of Pollinators and Pollination Services’ (2014) Report for the Department for Environment, Food and Rural Affairs (Defra), ID PH0514.

²⁴ See e.g. M. Kampa and E. Castanas, ‘Human Health Effects of Air Pollution’ (2008) 1 *Environmental Pollution* 151, 362-367.

²⁵ World Health Organization (WHO), ‘7 Million Premature Deaths Annually Linked to Air Pollution’ (2014) <www.who.int/mediacentre/news/releases/2014/air-pollution/en/> accessed 25.03.2019.

²⁶ P. Landrigan et al., ‘The Lancet Commission on Pollution and Health’ (2017) 391 *The Lancet* 10119, 462-512.

²⁷ E.g. S. Lewis and M. Maslin, ‘Defining the Anthropocene’ (2015a) *Nature* 519, 171-180; W. Ruddiman, ‘The Anthropocene’ (2013) 41 *Annual Review of Earth and Planetary Sciences*, 45-68; E. Ehlers and T. Krafft, *Earth System Science in the Anthropocene* (Berlin: Springer, 2006); P. Crutzen and W. Steffen, ‘How Long Have We Been in the Anthropocene Era?’ (2003) 61 *Climatic Change* 3, 251-257; P. Crutzen and E. Stoermer, ‘The “Anthropocene”’ (2000) *Global Change Newsletter* 41, 17-18; Officially, however, we still live in the Holocene, a geological epoch that started about 11,600 years ago with the retreat of the glaciers. See Working Group on the ‘Anthropocene’ of the Subcommission on Quaternary Stratigraphy (SQS) <<http://quaternary.stratigraphy.org/working-groups/anthropocene/>> accessed 25.03.2019.

²⁸ Various potential dates have been put forward to locate the beginning of the anthropogenic era: Ruddiman (2013) argues that the Anthropocene would possibly even pre-date the Holocene and have begun with the megafauna extinction (between 50,000 and 10,000 years ago) driven notably by hunting and burning, and the beginning of agriculture and domestication of animals. An alternative date could be the discovery of the Americas by Christopher Columbus, which initiated a massive exchange of plants and animals as well as diseases between the Old and New Worlds. Some argue that that date could be as late as the first atomic bomb testing on 16 July 1945 in New Mexico (see Lewis and Maslin (2015a), and in particular table 1).

²⁹ Crutzen and Stoermer (2000) in particular claim that the Anthropocene started with the industrial revolution, and more precisely from 1784, date of the invention, by James Watt, of the steam engine.

³⁰ See e.g. W. Steffen et al., ‘The Trajectory of the Anthropocene: The great acceleration’ (2015a) 2 *The Anthropocene Review* 1, 81-98.

within continental- to planetary-scale systems.”³¹ This could lead to a state where humanity would simply not be able to develop.³² The only known *safe space for humanity*,³³ they argue, is one that remains within the ecological ceiling determined by nine planetary boundaries, namely climate change (rise in global temperature); change in biosphere integrity (loss of biodiversity); stratospheric ozone depletion; ocean acidification; biogeochemical flows (interference with the phosphorus and nitrogen cycles); land-system change; freshwater use; atmospheric aerosol loading; and introduction of novel entities.³⁴

The planetary boundaries approach developed by Rockström et al. is based on three branches of scientific inquiry: 1) the scale of human action; 2) a determination of the essential processes of the Earth system; and 3) the extent and functioning of the living systems’ resilience. Much uncertainty is associated with the quantification of the various boundaries, which is due to the lack of scientific knowledge. The only thing that is known for certain is that the way the Earth system operated in the Holocene offers a sustainable environment for human development. The extent and manner in which human activities affect this system, the way the system reacts to them, how it is affected and to what extent it can withstand the harm is necessarily uncertain (although it may be quantified to various degrees of certainty) until it has actually happened. This is why, in addition to striving to set a threshold for each planetary boundary, the approach also consists in establishing a ‘zone of uncertainty’ and an ‘area of high risks of serious impacts’ for each boundary.³⁵ The zone of uncertainty corresponds to levels for which there is insufficient knowledge to establish whether the planetary boundary is safeguarded or, on the contrary, endangered.³⁶ Crossing the threshold would hence not necessarily mean the immediate collapse of the Earth system or of some of its processes, but the higher the transgression, the higher the risk.

The knowledge gaps in determining not only the threshold of the planetary boundaries, but also in calculating current values, both at regional and global levels, are wide. Of the nine identified planetary boundaries, only three are said to have been quantified with some degree of confidence – that is, with limited remaining uncertainty (i.e. climate change, ocean acidification, and change in biosphere integrity).³⁷ Four boundaries (stratospheric ozone depletion, biogeochemical flows (P and N cycles), land-system change and freshwater use) are quantified, but with high remaining uncertainty and one (atmospheric aerosol loading) is quantified only locally.³⁸ Finally, the last planetary boundary (introduction of novel entities) remains entirely unquantified due the complexity of the processes.³⁹ In spite of the knowledge gaps, the planetary boundary approach is highly relevant to determining the overarching goal

³¹ Rockström et al. (2009a).

³² J. Rockström et al., ‘A Safe Operating Space for Humanity’ (2009b) *Nature* 461, 472-5.

³³ This term of ‘safe space for humanity’ will be used throughout this thesis in reference to Rockström et al. (2009a and 2009b).

³⁴ First developed by Rockström et al. (2009a) and further refined by W. Steffen et al., ‘Planetary Boundaries: Guiding human development on a changing planet’ (2015b) 347 *Science* 6223, 1259855-1-10.

³⁵ Rockström et al. (2009a), 34.

³⁶ Steffen et al. (2015b), 1259855-2.

³⁷ Ibid, 1259855-4-5.

³⁸ Ibid.

³⁹ Ibid.

for humanity (i.e. to remain within the ecological ceiling), on the one hand, and to prompt the need to account for the level of uncertainty inherent to the functioning of the Earth system on the other.⁴⁰

1.2. Aim and research questions

The aim of this thesis is to explore how product regulation for the CE can contribute to promoting social and economic prosperity rather than threatening the planetary boundaries. The level of ambition of Part I is high. Its purpose is to define the CE in the context of a paradigm shift⁴¹ anchored in ecology. Hence, the objective of Part I is twofold: first, it is meant to unveil the foundation of the materialistic and anthropogenic paradigm that underpins the throwaway society, and to understand how that has affected environmental policy and law making; the second objective is to explore the essence of the new ecological paradigm and investigate whether and how the CE can contribute to establishing that paradigm. In other words, Part I aims to set forth what securing a ‘safe operating space for humanity’ entails, and how the CE can contribute to it. Thus, the analysis is not limited to existing characterizations of the CE provided principally by the EU or the Ellen MacArthur Foundation (EMF). Rather, it intends to push boundaries and propose new ways of thinking about both the CE and the role of the law.

The ARTICLES take a narrower and more pragmatic perspective, however. Each of them focuses on a particular aspect of the CE and analyzes the EU policy and regulatory framework for products thereof. The aim is to investigate how the EU defines the CE, how it proposes to achieve it, and how the existing framework could be enhanced or amended to promote and ensure the sustainability of the CE.

In sum, the main research question is:

What should be the main orientations of an EU policy and regulatory framework for products that promote the CE?

Addressing this first inquiry raises the following underlying questions:

1. *What is wrong with the current economic model and regulatory framework, and why do we need a new paradigm?*
2. *What does the term ‘Circular Economy’ mean in an ecological paradigm, and how can it achieve a safe operating space for humanity?*
3. *How is the CE currently regulated in primary and secondary EU law?*

⁴⁰ E.g. C. Butz et al., ‘Towards Defining an Environmental Investment Universe Within Planetary Boundaries’ (2018) 13 *Sustainability Science* 4, 1031-1044; R. Clift et al., ‘The Challenges of Applying Planetary Boundaries as a Basis for Strategic Decision-Making in Companies with Global Supply Chains’ (2017) 9 *Sustainability* 2, 279.

⁴¹ In this dissertation, I used the term *paradigm* as defined by Kuhn to mean “universally recognized scientific achievements that, for a time, provide model problems and solutions for a community of practitioners”; T. S. Kuhn, *The Structure of Scientific Revolutions*, 3rd edn (Chicago: University of Chicago Press, 1996), 10.

4. What are main legal measures are needed to enable the CE?

1.3. Important terminology

1.3.1. Products and services

This thesis focuses on products. The term may refer both to physical goods and to services.⁴² It defines what is sold to customers: an item, a service, or a combination of the two. In the thesis, I use the words *product* or *goods* synonymously to refer to physical items, not services. They are tangible and homogenous.⁴³ The word *service*, on the other hand, is used to refer to an activity or a process that is intangible and heterogeneous.⁴⁴ The core value of products derives from industrial production processes, whereas for services it arises from the buyer-seller relationship. Moreover, the consumption of products requires a transfer of ownership that does not take place in the case of service use.

Thus, the word *consumer* is used to refer generally to individuals who purchase goods or services, while the term *user* only refers to individuals who purchase services or a combination of product and service. Finally, the term *customer* is broader and includes not only individuals, but also other private and public purchasers.

Finally, in the thesis, I refer to products in the sense of *technical products* (i.e. from industrial processes) and exclude from the scope of my analysis *biological products* (such as food).

1.3.2. Earth system

The term *Earth System* refers to Earth's integrated biophysical and socioeconomic processes and interactions, which can be divided into various components or sub-systems: the atmosphere (the gaseous layer surrounding the earth), hydrosphere (water), cryosphere (ice), biosphere (all living organisms), geosphere (rock and minerals), and anthroposphere (human enterprise).⁴⁵ The 2001 Amsterdam Declaration on Earth System Science states that the "Earth system behaves as a single, self-regulating system comprised of physical, chemical, biological and human components".⁴⁶ Thus, humans and their activities are not only fully part of the Earth System; they have also become one of the most powerful driving forces of change 'within' it.⁴⁷

⁴² This is notably the view taken by the EU legislator in Directive 2001/95/EC of the European Parliament and of the Council of 3 December 2001 on general product safety, OJ L 11, 15.1.2002, p. 4, Article 2(a).

⁴³ R. Winsor, J. Sheth and C. Manolis, 'Differentiating goods and services retailing using form and possession utilities' (2004) 57 *Journal of Business Research* 3, 249-255, 251-252.

⁴⁴ Ibid, 252.

⁴⁵ Rockström et al. (2009a), 54.

⁴⁶ The Declaration was signed by four different research programmes: the International Geosphere-Biosphere Programme (IGBP), the International Human Dimensions Programme on Global Environmental Change (IHDP), the World Climate Research Programme (WCRP) and the international biodiversity programme DIVERSITAS; <www.igbp.net/about/history/2001amsterdamdeclarationonearthsystemscience.4.1b8ae20512db692f2a680001312.html> accessed 25.03.2019.

⁴⁷ M. Maslin and S. Lewis, 'Anthropocene: Earth System, geological, philosophical and political paradigm shifts' (2015b) 2 *The Anthropocene Review* 2, 108-116, 114.

1.3.3. Natural resources, ecology and the laws of nature

Natural resources are raw materials provided by the Earth. They include the three environmental media (air, water and soil), minerals, biomass, animal life, and space. There are different ways of classifying natural resources, notably based on their renewability. Non-renewable (or exhaustible resources) are those that do not renew in periods relevant to humans, typically metals (copper, iron, nickel), minerals (limestone, clays, silica), and fossil energy sources (oil, gas, coal). These resources are threatened with depletion, although it is very difficult to evaluate the lifespan of the Earth's reserves, primarily because there are many unpredictable factors, such as future consumption, undiscovered reserves, and new technologies that may allow for an increase in production or a decrease in consumption.⁴⁸

Other natural resources are renewable in the sense that they can regenerate (or renew) in a period relevant to humans provided that the rate of use does not exceed their regenerative capacity. Some renewable natural resources, such as sunlight and wind, are absolutely renewable, but the renewability of most resources is dependent upon their exploitation. Some of them are fast-growing (most fruits, vegetables, and cereals), while others need longer timescales (wildlife, forests). Some may be cultivated, while others may only reproduce naturally. The regeneration rate and properties of the natural resources is crucial because it highlights the risks related to mistreatment and overuse.⁴⁹

The term *ecology* was coined in 1866 by Ernst Haeckel, who defined it as follows:

By ecology, we mean the whole science of the relations of the organism to the environment including, in the broad sense, all the "conditions of existence". These are partly organic, partly inorganic in nature.⁵⁰

In other words, ecology is the science of natural resources, many of which are indispensable for ensuring human life on Earth. Thus, an ecological paradigm is one that aims to preserve nature and abide by its 'laws'.⁵¹ Barry Commoner laid out the four basic and inescapable *laws of nature*:⁵²

1. Everything is connected to everything else: there is one Earth system for all living and non-living things and anything that affects one, affects all;
2. Everything must go somewhere: this is a restatement of the law of physics (*first law of thermodynamics*) according to which energy can be transformed (changed from one form to another), but cannot be created or destroyed;

⁴⁸ R. Heinberg, *Peak Everything: Waking up to the century of declines* (Gabriola Island: New Society Publishers, 2010), 92-93.

⁴⁹ Ibid, 91.

⁵⁰ E. Haeckel, cited in G. Copper, *The Science of the Struggle for Existence: On the foundations of ecology* (Cambridge: Cambridge University Press, 2008), 5.

⁵¹ The word 'law' in this context is used in the sense of "a statement of fact, deduced from observation, to the effect that a particular natural or scientific phenomenon always occurs if certain conditions are present." English Oxford Living Dictionaries, 'Definition of law in English' <<https://en.oxforddictionaries.com/definition/growth>> accessed 25.03.2019.

⁵² B. Commoner, *The Closing Circle: Nature, man, and technology* (New York: Alfred A. Knopf, 1971).

3. Nature knows best: attempts to ‘improve’ or ‘master’ nature are likely to be detrimental to it;
4. There is no such thing as a free lunch: also a restatement of the *second law of thermodynamics* (or *entropy law*) that establishes that the amount of useful energy is constantly declining.

1.3.4. Eco-efficiency and sufficiency

In the thesis I discuss the main approaches to pursuing sustainable production and consumption. One approach, referred to here as *eco-efficiency*, consists in reducing the amount of resources used and waste and pollution generated while ensuring the production and consumption of more goods and services.⁵³ The concept was originally put forward by the World Business Council for Sustainable Development (WBCSD) in its 1992 publication *Changing Course*.⁵⁴ The main idea is to produce more value with less impact.⁵⁵ In the EU, the more common terminology is *resource efficiency*.⁵⁶ This approach is discussed in more detail in section 3.3 below.

The other approach, known as *sufficiency*, refers to the pursuit of absolute reduction in production and consumption.⁵⁷ The idea of sufficiency is, according to Thomas Princen, linked to that of avoiding excess when these would have serious consequences.⁵⁸ The logic of sufficiency is to ensure the consumption of the right quantity of products and services that guarantees good health, well-being and happiness without leading to overconsumption at the expense of the Earth system. The discussion is developed in section 3.2 below.

1.3.5. Industrialization and commoditization

Industrialization is taken, in this thesis, as the starting point of a fundamental change in the economic paradigm with serious consequences for human life and the environment. The term refers to “the process of converting to a socioeconomic order in which industry is dominant.”⁵⁹ Thus, the wealth of the economy depends on the prosperity of the industrial sector, which is largely driven by the mass production of standardized goods.

In the thesis, the word *commoditization* is used to refer to the “tendency to preferentially develop things most suited to functioning as commodities – things with qualities that facilitate buying and selling – as the answer to each and every type of human want and need.”⁶⁰ In line with Jack Manno, I use the term ‘commoditization’ rather than the more familiar ‘commodification’ to stress the fact that this is a process in which economic forces actively act

⁵³ P. M. Boulanger, ‘Three Strategies for Sustainable Consumption’ (2010) 3 *S.A.P.I.EN.S* 2, 1-10, 5.

⁵⁴ S. Schmidheiny and the Business Council for Sustainable Development, *Changing Course* (Cambridge: MIT Press, 1992).

⁵⁵ See about ‘eco-efficiency’ the report of the World Business Council for Sustainable Development, ‘Eco-efficiency: Creating more with less’ (2000) <https://arquivo.pt/wayback/20160515140905/http://www.wbcds.org/web/publications/eco_efficiency_creating_more_value.pdf> accessed 25.03.2019.

⁵⁶ Commission Communication, ‘Roadmap to a Resource Efficient Europe’, COM(2011) 571 final.

⁵⁷ H. E. Daly, *Beyond Growth* (Boston: Beacon Press, 1996).

⁵⁸ T. Princen, *The Logic of Sufficiency* (Cambridge: MIT Press, 2005), 6.

⁵⁹ Encyclopaedia Britannica, ‘Definition of Industrialization’ <www.britannica.com/topic/industrialization> accessed 25.03.2019.

⁶⁰ J. Manno, ‘Commoditization: Consumption efficiency and an economy of care and connection’ in T. Princen, M. Maniates and K. Conca (Eds.), *Confronting Consumption* (Cambridge: MIT Press, 2002), 67-101, 70.

to commoditize things.⁶¹ Commoditization is to consumption what industrialization is to production.

1.3.6. Paradigm

Throughout this thesis, the term *paradigm* is used in line with Thomas Kuhn's definition of "universally recognized scientific achievements that, for a time, provide model problems and solutions for a community of practitioners".⁶² At the basis of this concept are two main notions: *impermanence* (i.e. the paradigm, which reflects the knowledge and understanding at a certain period in time, is deemed to change with scientific discoveries or crises⁶³) and *dominance* (in the sense that the paradigm applies to an entire scientific community). Together, this implies that a paradigm will typically govern an entire scientific field but only for a limited period in time. In that time, however, the paradigm constrains the development of theories and rules. Hence, a change of paradigm entails questioning the very model that underpins the paradigm. Joseph Schumpeter brilliantly conveys the importance of challenging the existing paradigm and setting up the new one (which he calls 'vision') before analyzing the content of that paradigm:

In practice we all start our research from the work of our predecessors, that is, we hardly ever start from scratch. But suppose we did start from scratch, what are the steps we should have to take? Obviously, in order to be able to posit to ourselves the problems at all, we should first have to visualize a distinct set of coherent phenomena as a worth-while object of our analytic efforts. In other words, analytic effort is of necessity preceded by a preanalytic cognitive act that supplies the raw material for the analytic effort. In this book, this preanalytic cognitive act is to be called a Vision. It is interesting to note that vision of this kind not only must precede historically the emergence of analytic efforts in any field but also may re-enter the history of every established science each time somebody teaches us to *see* things in a light of which the source is not to be found in the facts, methods, and results of the pre-existing state of the science.⁶⁴

In this thesis, the materialistic and anthropogenic paradigm that underpins the throwaway society is challenged. It is argued that the shift of paradigm that has been proposed by some economists ought to inspire a similar one in law. The development of 'ecological economics' challenged the prevalent theories and methods of neoclassical economics.⁶⁵ In view of the role of traditional neoclassical economics in the current ecological crisis, they proposed that a new paradigm was needed whereby economic thinking takes ecology as its point of departure.⁶⁶ In the same manner, law has enabled the establishment of a societal model that, in pursuing

⁶¹ See J. Manno, *'Privileged Goods: Commoditization and its impacts on environment and society* (Boca Raton: Lewis, 2000).

⁶² Kuhn (1996), 10.

⁶³ T. S. Kuhn, *The Structure of Scientific Revolutions*, 4th edn (Chicago: University of Chicago Press, 2012), 66 and 77.

⁶⁴ J. Schumpeter, *History of Economic Analysis* (Great Britain: Routledge, 1954), 41.

⁶⁵ Daly and Farley (2011), 23-24; H. E. Daly, *From Uneconomic Growth to Steady-State Economy* (Cheltenham: Edward Elgar, 2014), 39-41.

⁶⁶ See 3.2 below.

principally the materialistic and utilitarian objectives of mainstream economics, also bears responsibility for the crisis.⁶⁷

In line with the scientific process put forward by Schumpeter, this thesis first aims to establish the existing paradigm (the throwaway society), then discuss the teachings of the new thinkers (in particular ecological economists), before examining how law can promote the new ‘vision’ (i.e. a safe operating space), notably in establishing a CE for products. The term *ecological paradigm* is thus used in this thesis to refer to a paradigm that aims to reconcile the human system with the ecological system that sustains it.⁶⁸

1.4. Scope of analysis

This thesis takes a broad perspective of the issue. In that sense, it reflects the broadness of policies needed to regulate products in the context of the CE. Put differently, the aim of this dissertation is not to give a comprehensive account of a particular legislative framework, but to unveil current paradigms and set the basis for new ones. It intends to explore the rationale for and the meaning of the CE and to consider whether the EU’s efforts in the field are heading in the right direction. It is my view that this can be done only by taking a wide frame of reference.

Hence, the specific policies are examined through the lens of their contribution to either one or another paradigm. Part I takes a particularly broad approach whereas, in the ARTICLES, specific policies and regulations are analyzed in greater detail. The speed of development of EU policies and the proliferation of literature have made it difficult to discuss every aspect of each policy exhaustively and to address all possible relevant issues in this thesis. I believe, however, that the thesis’s weakness is also its strength. Its added value lies in this anchoring of product regulation in a broader societal and economic perspective. Rather than taking the framework for granted and discussing the detailed policies, I question its very foundation, aiming to challenge what is taken for granted. The result is a deeper understanding of the difficulties that lie ahead and a ‘toolbox’ for building the CE towards a sustainable future.

Generally, the dissertation is anchored in a Western (mostly European and American) perspective of economic thinking and focuses on the EU when it comes to the law. This means that it excludes from its scope the examination of economic and legal developments in other parts of the world. In particular, I do not review the development and meaning of the CE in China, which was a pioneer in turning the conceptual ideas of the circular economic model into political strategy.⁶⁹

⁶⁷ Oslo Manifesto for Ecological Law and Governance, ‘From Environmental Law to Ecological Law: A call for re-framing law and governance’ (2016) <www.elga.world/oslo-manifesto/> accessed 25.03.2019, III and VIII.

⁶⁸ H. E. Daly and J. Farley, *Ecological Economics: Principles and applications*, 2nd edn (Washington: Island Press, 2011), xxii.

⁶⁹ For an overview of China’s CE approach, see e.g. J. Mathews and H. Tan, ‘Circular Economy: Lessons from China’ (2016) 531 *Nature* 7595, 440-442; B. Su et al., ‘A Review of the Circular Economy in China: Moving from rhetoric to implementation’ (2013) 42 *Journal of Cleaner Production*, 215-227; Y. Geng and B. Doberstein, ‘Developing the Circular Economy in China: Challenges and opportunities for achieving ‘leapfrog development’’ (2008) 15 *International Journal of Sustainable Development & World Ecology* 3, 231-239.

1.5. Methodological considerations

1.5.1. General considerations

The methodological approach of this thesis has evolved considerably throughout the project as a result of its duration and change in analytical scope. First, I began working on this dissertation in February 2012. Two long parental leaves and hours of teachings prolonged the project far beyond the usual three-year PhD period. Second, I began my PhD journey by aiming to explore the concept of Extended Producer Responsibility (EPR) in EU waste law. However, I gradually extended the scope of my analysis to products, the Circular Economy, and ecological economic thinking. Instead of narrowing down my research to a specific aspect of the legal framework and conducting an in-depth analysis of that particular topic, I take a very broad approach to the law, with no claims of being exhaustive. Some may rightly criticize this choice. I could have, as I was originally meant to, focused on the concept of EPR and waste law.⁷⁰ Yet I chose to zoom out and examine what it would entail to address what is, in my view, the most crucial aspect of my original PhD project's title: *Preventing environmental effects of products*. This decision prompted my analysis to move away from legal dogmatics⁷¹ and turned it into an interdisciplinary critical normative analysis of the law.

Hence, in this section, I introduce my main methodological choices as they stand after these years of research, while at the same time I reflect on my personal journey as a researcher. Legal researchers are not typically interested in reflecting on the methodologies they employ in their work. As a consequence, methodology in law is arguably less developed than in other disciplines.⁷² To make matters worse, environmental law is inherently interdisciplinary. Many see the discipline as lacking logic and coherence, as having no overarching doctrinal framework and no 'constitutional' ground. Moreover, it remains marginal to mainstream legal scholarship. This is why I begin my methodological discussion with some general considerations about what it means to conduct interdisciplinary research in environmental law. Thereupon I move to an examination of the methodological approaches that have guided my analysis in particular.

1.5.2. An interdisciplinary research in environmental law

My educational background is in law: national (Swiss) law, EU law, and finally environmental law. Interdisciplinarity was never central to my studies, but imposed itself gradually through my professional experiences, and as I specialized in environmental law. In particular, at the end of my undergraduate studies and before embarking on my doctoral journey, one of the places I worked was an environmental lawyer's organization, ClientEarth, based in Brussels. As my

⁷⁰ Originally, my PhD project was entitled 'Preventing environmental effects of products through producer responsibility' and intended to study producers' and importers' responsibility for hazardous environmental effects of products during use and as waste. See The Faculty of Law at the University of Oslo, 'Preventing Environmental Effects of Products Through Producer Responsibility (2012)' <www.jus.uio.no/english/research/areas/natural-resources/projects/products/index.html> accessed 25.03.2019.

⁷¹ In the words of Aarnio, "legal dogmatics is, at least in the Nordic tradition, defined as the study of the content of the legal rules (norms) and of the systematic order of those. The common terms referring to these tasks are 'interpretation' and 'systematization'". A. Aarnio, *The Rational as Reasonable: A treatise on legal justification* (Dordrecht: D. Reidel Publishing Company, 1987), 12.

⁷² P. Chynoweth, 'Legal Research in the Built Environment: A methodological framework' (2008) *The University of Salford Institutional Repository (USIR)*, 670-680, 670, citing T. Becher, 'Towards a Definition of Disciplinary Cultures' (1981) 6 *Studies in Higher Education* 2, 109-122.

title of ‘legal researcher’ did not indicate, I was involved among other things in lobbying activities towards the EU institutions. This experience gave me a sense of the gap between the law as I had studied it (with legal rules and jurisprudence that formed the core of the analysis), and the law as it is made that is the result of circumstances, political power struggles, and personal beliefs.

Environmental law, which forms the broader background of this research, is a relatively new area of law. Product-related legislation is even more recent. The area is fast-developing; our understanding and knowledge of the issues are progressing quickly, and new legal rules regularly adopted. Some issues are not even regulated in law,⁷³ or their scope is limited⁷⁴ or very technical.⁷⁵ Moreover, the usual materials of legal research – i.e. hard law, jurisprudence and legal doctrine – are sometimes under-developed or even inexistent.

Elisabeth Fischer et al. put forward four main methodological challenges that environmental law scholars face: 1) the speed and scale of the legal development; 2) the interdisciplinarity of the subject matter and expectations of interdisciplinarity of the scholars; 3) the fact that environmental law creates novel governance models at the interface between public and private law, or uses non-legal means; and 4) the multi-jurisdictional nature of environmental law regimes.⁷⁶ As a result, environmental law scholarship cannot rest on unified or simplified methods. In particular, the entrenched interdisciplinary nature of environmental law requires engaging not only with mainstream legal methodology discourses, but with external references and tools also.

Legal research is said to be primarily doctrinal and concerned with addressing the question: ‘what is the law?’⁷⁷ The doctrinal methodology is clearly dominant in legal scholarship and reflects the legal analysis undertaken by practising lawyers and judges.⁷⁸ Jan Smits argues that “the doctrinal approach is in many ways the necessary prerequisite for undertaking any other type of analysis of law (such as economic, comparative, empirical or behavioural work).”⁷⁹

In my dissertation, however, I take a different approach. If legal research may consist in research *in* law, it can also take the form of a legal inquiry *about* the law. Hence, following Arthurs’ taxonomy of legal research, doctrinal methodology (*research in law*) is the result of legal theory and expository research, whereas at the other end of the axis, interdisciplinary

⁷³ E.g. there is no legislation on soil in the EU.

⁷⁴ E.g. waste directives that leave a wide margin of discretion to Member States and contain only minimum obligations.

⁷⁵ E.g. Regulation (EC) 1907/2006 of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, OJ L 396, 30.12.2006, p. 1; or implementing measures adopted following Directive 2009/125/EC of 21 October 2009 on establishing a framework for the setting of ecodesign requirements for energy-related products (hereafter ‘Ecodesign Directive’), OJ L 285, 31.10.2009, p. 10.

⁷⁶ E. Fischer et al., ‘Maturity and Methodology: Starting a debate about environmental law scholarship’ (2009) 21 *Journal of Environmental Law* 2, 213-250.

⁷⁷ J. M. Smits, ‘What is Legal Doctrine? On the aims and methods of legal-dogmatic research’, in R. van Gestel, H. W. Micklitz and E. L. Rubin (Eds.), *Rethinking Legal Scholarship: A transatlantic dialogue* (New York: Cambridge University Press, 2017), 207-228.

⁷⁸ Chynoweth (2008), 673.

⁷⁹ Smits (2017).

methodology (*research about law*) comes from law reform and fundamental research (see Figure 1).⁸⁰

Figure 1. *Legal research styles* (Arthurs, 1983).

The paradigm shift that I argue for primarily requires an examination of the rationale and paradigm underpinning legal rules, before interpreting their content. Hence, the dissertation is above all a research *about* the law.

Conducting interdisciplinary research is not a straightforward endeavour, but a very fruitful and inspiring one. In particular, it helps to correct blind spots of individual research disciplines.⁸¹ Blind spots are an unavoidable part of every discipline, which are ‘self-contained and isolated domain[s] of human experience which [possess their] own community of experts.’⁸² Interdisciplinary research, in that it consists of bringing together distinctive components of different disciplines, is at the heart of environmental law research.⁸³

⁸⁰ Chynoweth (2008), 671; H. W. Arthurs, ‘Law and Learning: Report to the Social Sciences and Humanities Research Council of Canada by the Consultative Group on Research and Education in Law’ (1983) Information Division, Social Sciences and Humanities Research Council of Canada, Ottawa, 63-71.

⁸¹ D. Owen and C. Noblet, ‘Interdisciplinary Research and Environmental Law’ (2015) 41 *Ecology Law Quarterly* 4, 887-938.

⁸² M. Nissani, ‘Fruits, Salads, and Smoothies: A working definition of interdisciplinarity’ (1995) 29 *Journal of Educational Thought* 2, 121-128.

⁸³ Owen and Noblet (2015) and Nissani (1995).

Environmental law as a discipline arose largely in response to the work of environmental scientists like Aldo Leopold and Rachel Carson,⁸⁴ and developed in close relation with other disciplines, notably natural science and engineering.⁸⁵ Environmental law scholars have also drawn on scientific and economic research to make arguments about the need for governmental intervention and the choice of methods to address environmental problems.⁸⁶ Law and economics, which is in itself an interdisciplinary method, is crucial to environmental policymaking and a significant part of my own research, as discussed further in section 2.3 below.

Some authors argue that true interdisciplinarity is rare since it requires that researchers hold a degree in each discipline that they study.⁸⁷ The very nature of the law, as a professional discipline, makes it resistant to colonization and renders interdisciplinary research almost impossible.⁸⁸ In reality, what most scholars do is, according to Kroeze, mere multidisciplinary research.⁸⁹ I do not share this narrow approach to interdisciplinary research and believe that acquiring expertise that is sufficient to conduct relevant interdisciplinary work is possible outside the classroom. Thus, I concur with Owen and Noblet, who maintain that interdisciplinary work can be done by scholars who “have training or self-taught expertise in multiple disciplines and can work across disciplinary boundaries without help.”⁹⁰

The interdisciplinary enterprise may consist in legal scholars developing expertise in other disciplines, but remaining legal scholars. The expertise they thus develop is interactional expertise because they do not contribute to those disciplines directly.⁹¹ Other interdisciplinary endeavours contribute more directly to the development of ‘regulatory concepts that have a significant non-legal aspect and which are derived from other disciplines.’⁹² Typically, this scholarship relates to regulation and governance, which is particularly challenging in environmental law. Indeed, environmental governance is often hybrid – public and private – and takes novel forms. The tools developed to analyze the various environmental governance regimes – such as command-and-control, economic incentives or re-regulation – raise serious methodological challenges.⁹³ They require an understanding of certain existing economic theories – for example, the theory of externality, the Coase theorem, or the concept of Pareto

⁸⁴ They each wrote a book that contributed towards bringing environmental issues into the public eye, i.e. respectively A. Leopold, *A Sand County Almanac* (Oxford: Oxford University Press, 1949) and R. Carson, *Silent Spring* (Boston: Houghton Mifflin, 1962).

⁸⁵ Owen and Noblet (2015), 894.

⁸⁶ Ibid, 894.

⁸⁷ I. J. Kroeze, ‘Legal Methodology and the Dream of Interdisciplinarity’ (2013) 16 *Potchefstroom Electronic Law Journal* 3, 36-64, 54.

⁸⁸ J. M. Balkin, ‘Interdisciplinarity as Colonization’ (1996) 53 *Washington and Lee Law Review* 3, 949-970, 952.

⁸⁹ Kroeze (2013), 53.

⁹⁰ Owen and Noblet (2015), 897.

⁹¹ Fischer et al. (2009), 232, referring to H. Collins and R. Evans, *Rethinking Expertise* (Chicago: University of Chicago Press, 2007), 28-40.

⁹² Ibid, 233, referring to J. Scott and J. Holder, ‘Law and New Environmental Governance in the European Union’, in G. de Burca and J. Scott (Eds.), *Law and New Governance in the EU and US* (Oxford: Hart Publishing, 2006), 211-242.

⁹³ Ibid, 235.

efficiency – in order to build on them, or, on the contrary, to deconstruct them and expose their shortcomings and identify their strengths.⁹⁴

1.5.3. Short introduction to economic thinking

Products – that is, consumer goods – are at the core of my thesis. They stem from and aim at economic activities. Thus, I had to familiarize myself with basic economic thinking and methods, and explore law-and-economics theories. Little did I know that these would become such crucial parts of my dissertation and contribute over time towards changing the course of my entire analysis and approach to environmental regulation.

At the beginning of my PhD journey, back in 2012, I attended an introductory course in microeconomics. As a law student, the main lesson one learns from the first year in law school is that the answer to any question begins with “it depends”. Legal analysis depends on an individual situation at a particular time. Economic students, on the contrary, are taught on the basis of assumptions. Although often unrealistic, these assumptions are used by economists to simplify a problem “without substantially affecting the answer”.⁹⁵ Hence, neoclassical *microeconomists* make simplifying assumptions about the market, such as static equilibrium, perfect knowledge, infinite numbers of buyers and sellers, homogeneous goods, or static variable relationships. On the other hand, *macroeconomists* study the economy’s behaviour based on the assumed validity of aggregate supply and aggregate demand.⁹⁶ For a legal scholar, this approach is interesting and somewhat liberating – at first, that is.

With my environmentalist hat on, studying economics became increasingly upsetting as I realized that those basic assumptions tend to disregard and relegate the environment as a side issue. Mainstream *macroeconomics* is less concerned with whether the outcome of production requires the depletion of natural resources or results in the pollution of all environmental media than with ensuring economic growth. Thus, the success of an economy is measured in terms of ‘economic growth’ – that is, the increase in the amount of goods and services (human-made capital)⁹⁷ in an economy at any given period.⁹⁸ Environmental qualities (air, water, natural resources and biodiversity) and functioning (exhaustibility of natural resources, limited assimilative capacity, wide-ranging effects of pollution) are not part of that equation. Similarly, *microeconomics* considers environmental questions as market failures that affect economic well-being.⁹⁹ Correcting those failures does not entail, however, a questioning of the validity of

⁹⁴ An example of deconstruction is S. Bogojevic, ‘Ending the Honeymoon: Deconstructing emissions trading discourses’ (2009) 21 *Journal of Environmental Law* 3, 443-468.

⁹⁵ Mankiw compares an economist to a physicist who assumes that a cannonball falls in a vacuum because the reality of friction from the surrounding air is so negligible that it does not affect the calculation of the speed at which it would fall from a tower. See N. G. Mankiw and M. P. Taylor, *Economics*, 2nd edn (Andover: Cengage Learning, 2011), 23.

⁹⁶ I.e. the aggregate supply curve (which informs of the total quantity that a firm produces and sells at any given price) tends to move upward in the short run (higher prices on the market increases the quantity supplied), but is vertical in the long run (price does not affect quantity). The aggregate demand curve (which informs of the quantity of all goods and services demanded at any given price), however, always tends to move downward as demand contracts with increasing prices.

⁹⁷ See 2.2.4 below.

⁹⁸ Mankiw and Taylor (2011), 12.

⁹⁹ *Ibid*, 155.

assumptions and theories that places a human creation – the market – above the limitations and imperatives of the natural environment.

As I quickly discovered, I was not alone in feeling troubled by the view of traditional economists on environmental protection. By chance, my research and cogitations were taking place simultaneously to many relevant policy developments at the EU level. In 2012, the Commission adopted a new strategy for products, under the designation of the ‘Circular Economy’, that moved away from the ‘integrated product policy’ developed in the early 2000s.¹⁰⁰ This terminology, if not new, was not common at the time and definitely a first in EU official documents. The choice to use the concept of CE by the Commission was certainly decisive for my research, and influenced both its content and its direction. First, because it encompassed, among other things, all the different policies that I was studying at the time – such as EPR, life-cycle thinking and ecodesign requirements¹⁰¹ – while clearly pointing to the prominence of the economy in them all. Secondly, the use of this specific terminology helped me in unveiling less conventional macroeconomic literature from authors such as Boulding, Daly, and Raworth.¹⁰²

1.5.4. Law and economics, and the environment

At the same time as I was studying basic economic theories, I also undertook research in law and economics. Economics and law were long seen as two distinct disciplines, although some economists started inquiring early about the role of institutions in shaping the economy and opened the debate about the role of law on the economy.¹⁰³ It was not until 1960, however, that Ronald Coase, in his article on *The Problem of Social Cost*, broadly revealed how an economic analysis of law could be a compelling research method.¹⁰⁴

The American economist George Stigler asserted that “law, like other social institutions, came to be viewed by economists as an instrument for the organization of social life.”¹⁰⁵ This citation is emblematic of what ‘law and economics’ is about; an application of (liberal) *microeconomic* theory to the analysis of the law. That is, economics invading the domain of law.¹⁰⁶ Traditionally, lawyers used the legal rule to resolve disputes *ex-post*. Economists, on the other hand, are interested in how legal rules affect future actions by providing incentives.¹⁰⁷ This *ex-ante* perspective is at the heart of law and economics thinking. One way of conducting an economic analysis of legal rules is towards predicting the effects of those rules, also known as

¹⁰⁰ The first use of the term ‘Circular Economy’ in an EU official document was a Communication adopted by the then Barroso Commission in September 2014 (Commission Communication, ‘Towards a Circular Economy: A zero waste programme for Europe’, COM(2014) 398 final 2), which was withdrawn by the newly elected Juncker Commission in December that same year. The CE Action Plan was released a year later, in December 2015.

¹⁰¹ Following the Ecodesign Directive, Article 15.

¹⁰² See Boulding (1966); Daly and Farley (2011); K. Raworth, *Doughnut Economics: Seven ways to think like a 21st century economist* (London: Random House Business Books, 2017).

¹⁰³ E.g. T. Veblen, *The Theory of the Leisure Class* (New York: MacMillan, 1899); W. Mitchell, *Business Cycles* (Berkeley: University of California Press, 1913); J. Commons, *Legal Foundations of Capitalism* (New York: Macmillan, 1924).

¹⁰⁴ R. Coase, ‘The Problem of Social Cost’ (1960) 3 *The Journal of Law and Economics* 1, 1-44.

¹⁰⁵ G. Stigler, ‘Law or Economics’ (1992) 35 *The Journal of Law and Economics* 2, 455-468, 456.

¹⁰⁶ *Ibid.*, 458.

¹⁰⁷ A. Paccès and L. Visscher, ‘Methods of Law and Economics’, in B. van Klink and S. Taekema (Eds.), *Law and Method: Interdisciplinary research into Law* (Tübingen: Mohr Siebeck, 2011), 85-107.

positive law and economics.¹⁰⁸ Richard Posner was a strong proponent of using economics to understand the law as it is (and not as it should be). On the other hand, the *normative* approach uses the result of the positive analysis – i.e. predictions of people’s response to a legal rule – to make policy recommendations about which legal rules are desirable for society based on the economic consequences of various policies.¹⁰⁹

This is, in my view, a very interesting and important way of considering the law – that is, in light of its likely effect. This approach has inspired my own analysis of the law in the sense that I do not primarily aim to broaden the understanding about how current legal rules perform (*positive* analysis), but to contribute towards evaluating and defining the legal rules that can support the realization of the CE (*normative* analysis).

On the whole, however, I find myself in inherent disagreement with some of the fundamental concepts of neoclassical economics, which law and economics uses to evaluate and define environmental legal rules.¹¹⁰ Not only do they rely on (often-unrealistic) assumptions, but they also adopt an utterly anthropogenic perspective to the decision-making process. Firstly, the rational choice theory assumes that all economic actors are rational and thus aim at maximizing something: e.g. consumers maximize utility, firms maximize profits, and politicians maximize votes.¹¹¹ Hence, law and economics favours policies based on a utility maximization approach – that is, based on people’s choices.¹¹² In short, this means that environmental protection depends on how much utility people place on a clean environment. The problem is that if rational choice theory assumes (yet again) that people have access to optimal information, the reality is that information available is likely to be insufficient, biased or even incorrect. Moreover, people are confronted by an array of factors, not least current financial or family circumstances, which may affect their ‘rationality’ facing uncertain environmental – or even health – perils. The theory fundamentally disregards the environment, its complexity and inherent limitations, and reduces it to the necessarily deficient vision that people have of the current and long-term benefits they derive from natural resources.

Another important problem with law and economics analysis is the idea that policymaking should be based on ‘efficiency’.¹¹³ Law and economics scholars commonly define efficiency in terms of Pareto efficiency. A legal rule is Pareto-efficient if it cannot not be changed so as to make at least one person better off without making another person worse off.¹¹⁴ Another conception of efficiency is Kaldor-Hicks efficiency, which is meant to be less stringent than the former approach. A legal rule is Kaldor-Hicks efficient if those who gain from the change can compensate the losers so as to offset their loss.¹¹⁵ From an ecological point of view, these

¹⁰⁸ E.g. in tort law, see W. M. Landes and R. A. Posner, *The Economic Structure of Tort Law* (Cambridge: Harvard University Press, 1987).

¹⁰⁹ E.g. Calabresi and the Yale school of law have always argued that law and economics has to be normative. See G. Calabresi, ‘Some Thoughts on Risk Distribution and the Law of Torts’ (1961) 70 *Yale Law Journal* 4, 499-553; J. Buchanan, ‘The Constitution of Economic Policy’ (1987) 77 *American Economic Review* 3, 243-250.

¹¹⁰ See Chapter 2 below.

¹¹¹ R. Cooter and T. Ulen, *Law and Economics*, 6th edn (Berkeley: Berkeley Law Books, 2016).

¹¹² Paces and Visscher (2011).

¹¹³ See discussion in Chapter 5.

¹¹⁴ Cooter and Ulen (2016), 14.

¹¹⁵ *Ibid*, 42.

definitions are highly problematic. First, they focus solely on how resources can generate most monetary value, but say nothing of their potential scarcity.¹¹⁶ Second, they disregard all resources that do not have a monetary value (typically environmental goods).¹¹⁷ Finally, and most relevantly to this section, an efficient allocation of resources is made dependent on consumer preferences and willingness to pay. These factors, however, are neither objective nor constant, and certainly have no relevance to the objective of environmental protection.

Finally, from an economic viewpoint, the *raison d'être* of environmental law is to correct market failures, such as pollution, the depletion of common goods, or asymmetric and lacking information.¹¹⁸ Thus, governmental intervention is largely justified in environmental law and economics on that basis: the need to enable the market to function in full competition.¹¹⁹ Legal rules are thus the mere tools that allow the mainstream economic paradigm that has developed to be perpetuated. That the law is used as the strong arm of the economic paradigm that has established the throwaway society is highly troubling.¹²⁰

In sum, beyond the basic idea that consists in analysing legal rules from a normative perspective, there was little that I felt I could cling to to evaluate and define the legal framework of the CE. Thus, I wanted to understand why these theories and concepts had become the mainstream approach to environmental lawmaking. I also needed to find another frame of reference. This is how I moved to critical theory.

1.5.5. Critique and environmental law

Research in law and economics flourished in the traditional neoclassical economic perspective. Meanwhile, an antagonist movement, influenced by European philosophers such as Karl Marx, Max Weber or Michel Foucault, and by critical theory, emerged in the late 1970s.¹²¹ Proponents of 'critical legal studies' denounce the role of the law in maintaining power structures biased against minorities.¹²² One of their main critiques lies in the fact that liberal theory generated the doctrine of *legalism* and associated philosophy of legal positivism.¹²³ Thus, legalism rests on an analysis of the law based on the legal texts and the jurisprudence, and is oblivious to the social, economic or political context. Legalists separate the law from other forms of social control and see the law as the sole objective and legitimate normative mechanism capable of yielding determinant and predictable results in their application in the juridical process.¹²⁴ To this legalist attitude, the critical legal scholars oppose the need for legal *realism*. They argue for

¹¹⁶ Daly and Farley (2011), 422.

¹¹⁷ Ibid.

¹¹⁸ Paces and Visscher (2011).

¹¹⁹ L. Lessig, 'The New Chicago School' (1998) 27 *The Journal of Legal Studies* 2, 661-691, 661.

¹²⁰ See 2.2 below.

¹²¹ See e.g. two analyses of the genesis of the movement are provided in D. Livingston, 'Round and Round the Bramble Bush: From legal realism to critical legal scholarship' (1982) 95 *Harvard Law Review* 2, 1669-1690; and D. Trubek, 'Where the Action Is: Critical legal studies and empiricism' (1984) 36 *Stanford Law Review* 1/2, 575-622.

¹²² E.g. D. Kennedy, 'Cost Reduction Theory as Legitimation' (1981) 90 *Yale Law Journal* 5, 1275-1283; A. Hutchinson and P. Monahan, 'Law, Politics and the Critical Legal Scholars: The unfolding drama of American legal thought' (1984) 36 *Stanford Law Review* 1 and 2, 199-245; A. Hunt, 'The Theory of Critical Legal Studies' (1986) 6 *Oxford Journal of Legal Studies* 1, 1-45.

¹²³ Hunt (1986), 4.

¹²⁴ Ibid.

the need to develop a better understanding of the society by looking into various disciplines (economics, natural sciences, social sciences). The law does not operate in a vacuum, but in a complex world made of complex relations.

Critical thinking calls for a new conception of legal thinking, including about environmental protection. Carson's book *Silent Spring* was especially influential and inspired several movements that uphold the need to reconsider the basis on our approach to environmental protection. Arne Næss's 'deep Ecology' movement urges a replacement of the anthropocentric approach to environmental protection with an eco-centric one.¹²⁵ Similarly, 'ecofeminism', which came into being with the publication of a slew of influential texts, including Françoise d'Eaubonne's *Le Féminisme ou la Mort*, Susan Griffin's *Women and Nature* and Carolyn Merchant's *The Death of Nature*,¹²⁶ links the domination of women with the domination of nature, and blames the masculinist and patriarchal culture for women's oppression and environmental degradation.¹²⁷ Merchant denounced "the mainstream narrative of Western culture that has propelled science, technology, and capitalism's efforts to "master" nature" and argued that the rise of mercantile capitalism and the nation-state created the conditions for these ideas of control to become prevalent.¹²⁸

Most recently, an approach to critical environmental law was put forward that aims to combine law and ecology without belonging entirely to either one.¹²⁹ To that end, Andreas Philippopoulos-Mihalopoulos promotes

a theoretical paradigm that is acentric, fragmented, non-human centred, against delusions of facile solutions, control or influence between systems, and always returning to a description of realistic dimensions, and an awareness that it is only one theory amongst others.¹³⁰

'Decentring' environmental law hence requires a recognition and embrace of the fragmentation and complexity inherent to the field. It also means looking at environmental issues not only from a legal – and supposedly superior – perspective, but also from other frames of reference (e.g. economic, political, social).¹³¹ Foucault already pointed to a decentralization of law when

¹²⁵ A. Næss, 'The Shallow and the Deep, Long-Range Ecology Movement: A summary' (1973) 16 *Inquiry: An Interdisciplinary Journal of Philosophy* 1-4, 95-100. This is also the view held by post-ecologists; see I. Blühdorn, *Post-Ecologist Politics* (London: Routledge, 2000).

¹²⁶ F. d'Eaubonne, *Feminism or Death* (Paris: P. Horray, 1974); S. Griffin, *Woman and Nature: The roaring inside her* (New York: Harper and Row, 1978); C. Merchant, *The Death of Nature: Women, ecology and the scientific revolution* (San Francisco: Harper & Row, 1980).

¹²⁷ A. J. Emmons, 'Ecofeminism and Global Environmental Politics' (2010) *Oxford Research Encyclopedia of International Studies* <<http://internationalstudies.oxfordre.com/view/10.1093/acrefore/9780190846626.001.0001/acrefore-9780190846626-e-158?print=pdf>> accessed 25.03.2019.

¹²⁸ Merchant reflecting on her own work in C. Merchant, 'The Scientific Revolution and The Death of Nature' (2006) 97 *Isis* 3, 513-533, 516-517.

¹²⁹ A. Philippopoulos-Mihalopoulos, 'Looking for the Space Between Law and Ecology', in A. Philippopoulos-Mihalopoulos (Ed.), *Law and Ecology* (London: Routledge, 2011a), 1-17, 1.

¹³⁰ A. Philippopoulos-Mihalopoulos, 'Towards a Critical Environmental Law', in A. Philippopoulos-Mihalopoulos (Ed.), *Law and Ecology* (London: Routledge, 2011b), 18-38, 30.

¹³¹ *Ibid*, 28.

discussing what he called *biopower* – a strategy of power to achieve the control of population.¹³² He argued that ever since the 18th century and the emergence of the modern nation-state and capitalism, we have been witnessing a decline in regulatory state law.¹³³ Hence, an analysis of the law must reflect this new reality. Bettina Lange writes:

the law becomes a politicised instrument of government and plays a significant role in resolving conflicts about the allocation of resources and access to political decision-making. Norms are grounded in society itself, not in a ‘fixed, transcendent’ sphere of values. They ultimately reflect society’s relationship with itself.¹³⁴

Sources of legal discourse should hence not only include the usual tools of legal analysis, but also more unusual texts and cues, such as acts of policy implementation, novels or interviews that contribute towards providing a more complete picture of environmental law.¹³⁵ One should also be wary of what is absent or erased from texts, as this shapes the discourse of what appears in black and white.¹³⁶ A critical analysis should reveal patterns of language, cultural context(s), and expose power differentials, perpetuation of dominance, and impacts on the pursuit of justice.¹³⁷ Moreover, relevant events should be analyzed through temporal and spatial planes to trace and better understand the evolution and variation of discourses:

[E]nvironmental law is paradoxical and greatly affected by time and space. These features suggest that a [critical discourse analysis] of environmental legal matters requires the use of a methodological approach which acknowledges the ontological ‘vulnerability’ ... of its subject, evaluates how power legitimizes certain discourses (i.e. neoliberalism) while silencing others (i.e. indigenous rights) through legal and extra-legal means, and analyzes relevant texts and non-text resources which capture the temporal and spatial complexity of environmental law.¹³⁸

Lange suggests that critical environmental legal scholarship will typically seek to address three core questions:¹³⁹

- 1) How does environmental law affect structures governing social life?
- 2) Does liberal legal theory form a useful basis for developing environmental law?
- 3) How can current paradigms be transformed to achieve more sustainable forms of living?

In Part I of this dissertation, I aim to contribute towards answering these questions. This is why I explore the historical developments of economic thinking as well as of society. If environmental law has any hope of effectively addressing the pressing environmental crisis, environmental legal scholars have to examine the law in context and question the foundations

¹³² M. Foucault, *The History of Sexuality Vol. 1: The will to knowledge* (London: Penguin, 1998), 140.

¹³³ B. Lange, ‘Foucauldian-Inspired Discourse Analysis: A contribution to critical environmental law scholarship?’, in A. Philippopoulos-Mihalopoulos (Ed.), *Law and Ecology* (London: Routledge, 2011), 39-64, 47.

¹³⁴ Ibid, 47, referring to B. Golder and P. Fitzpatrick, *Foucault’s Law* (Abingdon: Routledge, 2009), 38 and 106.

¹³⁵ J. C. Gellers ‘Greening Critical Discourse Analysis’ (2015) 12 *Critical Discourse Studies* 4, 482-493, 488.

¹³⁶ D. Machin and A. Mayr, *How to Do Critical Discourse Analysis: A multimodal introduction* (Thousand Oaks: Sage, 2012).

¹³⁷ Gellers (2015), 488.

¹³⁸ Ibid, 486-487.

¹³⁹ Lange (2011), 40-41.

of current assumptions and theories. At the same time, I also explore how to change the system from within through (sometimes minor) changes to existing policies. This is in particular the intent I pursue in the ARTICLES.

1.6. Structure of the thesis and temporal considerations

This thesis comprises a collection of ARTICLES preceded by a Part I. The choice of an article-based dissertation was made late in the writing process, but imposed itself as the best and most suitable solution to approach an exceptionally fast-moving and wide-ranging field.

Part I is intended to lend coherence and to inform the interconnectedness of the individual works. However, it is more than an introduction or a summary of the arguments developed in the ARTICLES. It aims to establish the broader framework in which the ARTICLES intervene. Part I sets out the goal and the ARTICLES discuss how to pursue it. Part I is composed of five chapters following on from the current introduction:

- Chapter 2 takes an approach to understanding the foundation of the linear and throwaway economic model that is leading to a systematic destruction of the environment. It exposes the basis of the *neoclassical economic paradigm* and aims to contextualize the problems facing the traditional legal response to environmental damage. The content of this chapter is familiar to economists, though less so to lawyers, in spite of the impacts of those economic theories on the legal framework. Thus, I felt it pertinent to begin Part I with a chapter that critically explores the broader context of the dissertation.
- Chapter 3 discusses two approaches to addressing the shortcomings of the traditional thinking. First, resuming the examination of economics, I analyze the development of the *ecological economics* movement, which bases its critique of the mainstream approach primarily on its flawed vision of an ever-expanding economic scale.¹⁴⁰ Ecological economists propose the need for sufficiency in line with the functioning of the Earth system and the laws of thermodynamics. Second, I examine the main arguments of those – mainly outside the economic field – who proposed to bend the linear economic model to a circular one. In looking into and studying sources other than legal ones to inform my understanding of the new paradigm, I take a highly interdisciplinary approach that follows the method of the proponents of a critical legal discourse.
- Chapter 4 brings the findings of my investigation in the previous chapters into the legal field. It follows a recommendation to move from viewing environmental protection as a subfield of law, as per traditional environmental law, towards establishing a new independent field – that is, ecological law. Ecological law is meant to integrate law into ecology in the same way as ecological economics developed to ensure economic thinking abided by the laws of nature. This chapter is anchored into the critical

¹⁴⁰ See Daly and Farley (2011), 373ff.

discourse, but aims not merely to criticize the current paradigm, but indeed to propose the basis of a new one.

- Chapter 5 takes the analysis from broad considerations about EU primary law and environmental protection to the impact of a new paradigm for the EU's CE policy and product regulation. The approach is normative and aims to investigate how the law can contribute towards achieving an ecological CE. The chapter also contextualizes the ARTICLES that form part of this thesis.
- Chapter 6 contains a short summary of the main arguments presented in Part I and points out directions for future research.

Each of the *ARTICLES* focuses on a different aspect of the Circular Economy in an EU law framework. I wrote them between 2013 and 2019, so they reflect both the status of the law at the time of their writing and the evolution of my understanding of the broader context of product regulation. The number of the ARTICLES does not reflect their chronological order of writing, but their content as presented in Chapter 5. Here, however, I present them chronologically to show how they have influenced my thinking and the dissertation as a whole:

- At the time of writing of ARTICLE 1 – roughly between the end of 2012 and beginning of 2014 – the concept of CE had not yet appeared in official EU documents.¹⁴¹ The most comprehensive approach to product regulation was the Integrated Product Policy (IPP),¹⁴² which, when I started working on it, was already an ‘old’ policy. However, its legacy – i.e. attempting to regulating product damage from a life-cycle perspective – was very much alive and appeared to me a more promising path than what the EPR concept alone had to offer. Indeed, if EPR schemes have proven successful in reducing damage from waste management, they generally appeared to fail to achieve the main objective of EU waste law, i.e. waste prevention.¹⁴³ Thus, it seemed clear to me that should I hope to discuss ‘damage prevention’, I could not focus solely on waste law, but had to look further afield. Thus, in ARTICLE 1, I examine how three policies addressing different stages of product life cycles – i.e. ecodesign, public procurement and EPR – approach the prevention of environmental damage from products.
- Chronologically, the next article I wrote was ARTICLE 3 following the adoption by France in 2014 and 2015 of two innovative legal measures to promote longer product lifetimes, i.e. criminalization of the practice of ‘planned obsolescence’,¹⁴⁴ on the one hand, and improving access to spare parts,¹⁴⁵ on the other. Issues of durability and reparability were increasingly pointed out as key to reducing the overall environmental

¹⁴¹ The first instance was the COM(2014) 398 final 2.

¹⁴² Commission Communication, ‘Integrated Product Policy – Building on environmental life-cycle thinking’, COM(2003) 302 final.

¹⁴³ C. Dalhammar, ‘Extended Producer Responsibility’, in L. Krämer and E. Orlando (Eds.), *Principles of Environmental Law* (Cheltenham: Edward Elgar, 2018), 208-218.

¹⁴⁴ French Law n° 2015-992 of 17 August 2015, published in JORF n°0189 of 18 August 2015, p. 1426, n° 1.

¹⁴⁵ French Law n° 2014-344 of 17 March 2014, published in JORF n°0065 of 18 March 2014, p. 5400, n° 1 and French Decree n° 2014-1482 of 9 December 2014, published in JORF n°0286 of 11 December 2014, p. 20707, n° 38.

impact from products.¹⁴⁶ The idea of the article was also born from personal circumstance: in April 2015, two years to the day after purchasing it, my iPhone stopped working. In most European countries, I would have had no choice but to buy a new phone (or pay for costly repair), but Norway provides an extended legal consumer guarantee of five years for electronic equipment.¹⁴⁷ My journey in attempting to get the iPhone repaired (which proved impossible, but indeed free) inspired the approach of this co-authored article. It also intensified my interest in the historical developments and the economic and legal underpinnings of the throwaway society.

- I wrote ARTICLE 2 between 2016 and 2017 following a conference that took place in Oslo in January 2016. The purpose of the article was to examine what the CE was intended to be and do in an EU context. Hence, a large part of the article focuses on the CE Action Plan. However, the broader discussion about what the rationale for the CE that forms the core of Part I already appears there. It is following this article that I began studying ecological economic thinking in more detail, which eventually led this thesis, and Part I in particular, on its rather unorthodox path.
- ARTICLE 5 was inspired by my and my co-author's participation in a conference entitled 'Consumer Protection in a Circular Economy' held in May 2018 in Leuven, to which we were invited to present a Scandinavian perspective on the matter. In ARTICLE 5, however, we decided to focus on EU law. The issue of consumption in the CE is vast, and the research largely underdeveloped. Hence, the aim was primarily to explore the meaning of consumption in the CE, establish the main priorities, reveal the main barriers and discuss how the law can contribute towards moving in the direction of more sustainable patterns of consumption. The article was finalized and sent for publication in November 2018.
- The final article, ARTICLE 4, rounded out my PhD journey somewhat. I had started with EPR, and ended with it. However, ARTICLE 4 does not so much analyze the concept of EPR as it challenges it. The fact remained that in 2019, as in 2012, EPR does little to prevent waste. In this article, I wanted to explore the reason for that failure and lay the foundation for re-thinking waste prevention in accordance with the CE's objectives of 'closing the loop' and reducing material consumption. The article was finalized in April 2019.

¹⁴⁶ E.g. C. Dalhammar, 'Industry Attitudes towards Ecodesign Standards for Improved Resource Efficiency' (2016) 123 *Journal of Cleaner Production*, 155-166; D. Jepsen, L. Spengler and D. Augsberg, *Delivering Resource-Efficient Products: How ecodesign can drive a circular economy in Europe* (Hamburg: European Environmental Bureau, 2015); A. M. Bundgaard, A. Remmen and K. O. Zacho, 'Ecodesign Directive Version 2.0: From energy efficiency to resource efficiency' (2015) Miljøstyrelsen, Environmental project No. 1635; F. Ardente, F. Mathieux and M. Recchioni, 'Recycling of Electronic Displays: Analysis of pre-processing and potential ecodesign improvements' (2014) 92 *Resources, Conservation and Recycling*, 158-171.

¹⁴⁷ Norwegian Consumer Sales Act [Forbrukerkjøpsloven] of June 2002, nr. 34, §27, second paragraph.

Chapter 2. Understanding the current paradigm: Economics of the linear model

“The question is whether any civilization can wage relentless war on life without destroying itself, and without losing the right to be called civilized.”

— Rachel Carson
Silent Spring, 1962

“Growth for the sake of growth is the ideology of the cancer cell.”
— Edward P. Abbey
The Second Rape of the West, 1975

2.1. Introductory remarks

The purpose of this chapter is to inform the analysis and contextualise the research problems. How could the economy have become such a big threat to the environment, and ultimately, to itself? This question summarizes the aim of the first section (2.2), which investigates the role of economics in environmental degradation. From fears of scarcity that form the core of classical economic theories, neoclassical economists turned into radical optimists and developed theories that largely neglected the actual functioning and limits of the Earth system and the laws of nature. The industrial revolution marked by rise of productivity and technological advancement relegated the environment to an external cost, a failure of the market mechanisms. This section will explore how economics moved from caution to a quest for opulence. I reflect in particular on the evolution of theories about growth from a necessary but transitory state for classical economists to a prevailing hypothesis for neoclassical thinkers. I look at how the industrial era brought a culture of consumerism and endless growth in the Western world, which eventually spread worldwide. Moreover, I discuss notably the development of the ultimate neoclassical objective – the continuous pursuit of economic growth – and the problem with using GDP as a measure of well-being.

In the second section (2.3), I investigate efforts to explain environmental damage and integrate environmental concerns into economic thinking. I examine here the main responses of neoclassical economics to environmental damage and discuss what must be taken as their failure to apprehend both the reality of the functioning of the natural environment and the complexity of damage caused by products. The section studies in particular how environmental degradation has come to be perceived as a market failure that needs to be corrected, with a focus on one of them, i.e. *externalities*, which consist in uncompensated impacts arising from an economic activity, which affect the well-being of a third party.¹ I then proceed to consider environmental valuation methods, which necessarily emerge from examining externalities, an analysis of the various theories aimed at ‘internalizing’ the externalities, and a discussion about

¹ N. G. Mankiw and M. P. Taylor, *Economics*, 2nd edn (Andover: Cengage Learning, 2011), 885.

the expected benefits of wealth and technology on environmental preservation. Finally, the section ends with an inquiry into the efforts to fix the linear model through waste management.

2.2. Economics and the origins of the throwaway society

2.2.1. Economic pessimism and the dismal science

Classical economists writing during the early days of the industrial revolution were concerned about the development of trade and growth. In a time that saw rapid improvements in agricultural productivity and the emergence of manufacturing industries, classical economists feared scarcity. Great thinkers like Adam Smith and Thomas Malthus viewed national wealth and economic growth as a necessarily transitional state since natural resources were not unlimited.² Continuous economic growth, they believed, was not possible. Human populations, Malthus argued, would grow exponentially until food and other essential elements to life would no longer be available to all.³ In a steady-state scenario, people would consequently destroy the land, fight over food, and die of starvation and disease.⁴ The human population would then drop to sustainable levels and the process would start all over again.

David Ricardo and John Stuart Mill pointed to technological progress and believed international trade could help delay the coming of that undesirable state, but warned nevertheless of its drawbacks.⁵ According to Mill, even if technological improvements could sufficiently increase agricultural productivity to avoid food shortage, large population growth fostered by economic progress would ultimately lead to an undesirable state where every element of nature would be dominated by humans to satisfy their needs.⁶ Continuous growth in terms material well-being was neither possible nor desirable, he believed. It is interesting to note that at the time of Mill's writing, the global population was around 1,200 million, that is, about 15 per cent of today's estimate of 7.7 billion.⁷ The so-called 'dismal science' developed by Malthus and Ricardo in particular found corroboration in the laws of thermodynamics.⁸

2.2.2. Neoclassical optimism and the *homo economicus*

The industrial revolution appeared to prove the classical thinkers wrong. The fear of steady state and ensuing famine and destruction was expelled by the promises of the industrial revolution, marking a great discontinuity in history. For the first time, average income increased despite sustained population growth.⁹ Endless economic growth became the new norm.

On any historical accounting the industrial revolution of England began one of the great discontinuities of history, marking 'the great divide' between a world of slow economic

² R. Perman et al., *Natural Resource and Environmental Economics*, 4th edn (Essex: Pearson Education Limited, 2011), 5.

³ E. Kula, *History of Environmental Economic Thought* (London: Routledge, 1998), 22-29; T. Malthus, *Essay on the Principle of Population* (London: J. Johnson, 1798).

⁴ Ibid.

⁵ D. Ricardo, *On the Principles of Political Economy and Taxation*, 1st edn (London: J. Murray, 1817).

⁶ Kula (1998), 38; J. S. Mill, *Principles of Political Economy with some of their Applications to Social Philosophy* (London: Londhams, Green and Co., 1848), IV.6.8.

⁷ On November 2018.

⁸ See 3.2.1 below.

⁹ P. Hudson, *The Industrial Revolution* (New York: Routledge, Chapman and Hall, Inc., 1992), 3.

growth, in which population and real incomes were increasing slowly or not at all, and a world of much faster economic growth, in which population has increased at an almost frightening rate and in which there have been sustained increases in real income per head.¹⁰

Neoclassical economics was born on the wave of optimism that the rise of the machines and new technologies would lead to mass employment while annihilating the threats of scarcity and exhaustion of natural resources. Environmental concerns were pushed to the background with economists focusing instead on enabling economic development.

One of the major differences between classical and neoclassical economics is methodological. Whereas the first used empirical or historical-deductive methods, the second adopted a hypothetico-deductive approach.¹¹ Smith, Ricardo and even Marx developed theories by generalising from the economic reality they observed. Neoclassical economists such as Jevons, Menger and Walras, on the other hand, preferred formulating a hypothesis, which could then be either verified or disproved by empirical evidence. By essence, these hypotheses cannot be conclusively proven, only verified. Yet, many neoclassical assumptions have become theories notwithstanding their lack of factual confirmation. Mill (1844),¹² who put forward the *homo economicus* model as a basic assumption, was one of the people to open the door for the use of the hypothetico-deductive model in economics.¹³ Neoclassical economics developed as a prominent and popular discipline thanks to theories that tend to advance necessarily inexact assumptions and oversimplify the world. For microeconomists, assumptions about the market relate to notions of static equilibrium, perfect knowledge, infinite numbers of buyers and sellers, homogeneous goods, or static variable relationships. Macroeconomists study the economy's behaviour based on the assumed validity of aggregate supply and aggregate demand.¹⁴ Typically, this model projects two lines meeting at a supposedly desirable optimum (of production, of raw material extraction, or of pollution). While this meeting is a recurrent one, the point of equilibrium might not be desirable at all. It is not because a market is efficient that it necessarily delivers an outcome that is environmentally sound. Clearly, free markets have overexploited natural resources and overproduced commodities and product.

Moreover, whereas classical thinkers focus on the supply side, early neoclassical writers tend to emphasise demand as a means of determining the value of goods.¹⁵ Alfred Marshall

¹⁰ R. M. Hartwell, 'Introduction', in R. M. Hartwell (Ed.), *The Causes of the Industrial Revolution in England* (London: Routledge, 1967), 1-30, 1.

¹¹ L. C. Bresser-Pereira, 'The Two Methods and the Hard Core of Economics' (2009) 31 *Journal of Post Keynesian Economics* 3, 493-522.

¹² J. S. Mill, 'On the Definition of Political Economy', in J. M. Robson (Ed.), *The Collected Works of John Stuart Mill, Volume IV - Essays on economics and society part I* (Toronto: University of Toronto Press, London: Routledge and Kegan Paul, 1967), 309-340.

¹³ C. H. Hinnant, 'The Invention of Homo Oeconomicus: A reading of John Stuart Mill's "on the definition of political economy"' (1998) 21 *Prose Studies* 3, 51-68.

¹⁴ I.e. the aggregate supply curve (which shows the total quantity a firm produces and sells at any given price) tends to move upwards in the short run (higher market prices increase the quantity supplied), but is vertical in the long run (price does not affect quantity). The aggregate demand curve (which shows the quantity of all goods and services demanded at any given price), however, always tends to move downward as demand contracts with increasing prices.

¹⁵ Kula (1998) and W.S. Jevons, *The Coal Question: An inquiry concerning the progress of the nation, and the probable exhaustion of our coal mines* (New York: Augustus M. Kelley, 1965).

reconciled both approaches by submitting that the price of a good is to be determined by the market at the point of interaction between supply (amount of good available) and demand (amount of good required).¹⁶ Today, it is commonly agreed that from a supply point of view, when the price of a good rises, the quantity supplied also rises, whereas, from a demand point of view, when the price rises, the quantity demanded falls. Other factors may also influence supply, notably inputs to the good, technology, sellers' expectations and number. The same holds true of demand, which can be influenced by factors such as income levels, the price of related goods, tastes and expectations. The point at which the supply and demand curves meet is called equilibrium and fixes the price.¹⁷ Unpriced environmental goods and services enter the account by achieving equilibrium only to the extent of personal utility yielded. The apparent simplicity of the supply and demand model rests on a number of underlying assumptions. Supply and demand analysis assumes the existence of, *inter alia*, competitive markets, clearly defined groups and product differentiation, the availability of good information, and well-defined property rights. In other words, the theory takes place in a vacuum where, in particular, economic activities related to production and consumption put no pressure on natural ecosystems.

Another common assumption is that in a neutral and value-free market, individuals are acting rationally and pursuing their individual self-interest, leading in turn lead to an improvement of societal well-being.¹⁸ It follows that the market is best at regulating itself and that governmental intervention is to be minimized. The *laissez-faire* approach is a characteristics of neoclassical economics, although it was first developed by Smith.

An example of the optimism characterising the early decades of neoclassical economics is the Kuznets curve. Its basic hypothesis is that economic growth will increase income inequality at first, but that inequality would eventually decline, as more and more workers joined the high-productivity sectors of the economy.¹⁹ In other words, growth would regulate itself. This hypothesis is based, according to Simon Kuznets himself, on fragile data, which subsequently proved inaccurate.²⁰ As wealth increases, its redistribution becomes increasingly unequal, in particular GDP-based growth.²¹ In fact, increases in GDP levels seem to allow improvements in overall quality of life only to a degree before being offset by the costs associated with growing income inequality, loss of community cohesion, rising social and health problems, and

¹⁶ A. Marshall, *Principles of Economics* (London: Macmillan, 1890); see also D. W. Pearce and R. K. Turner, *Economics of Natural Resources and the Environment* (Baltimore: Johns Hopkins University Press, 1990), 10.

¹⁷ See e.g. Mankiw and Taylor (2011), part 2, chapter 4.

¹⁸ Pearce and Turner (1990), 10.

¹⁹ S. Kuznets, 'Economic Growth and Income Inequality' (1955) 45 *The American Economic Review* 1, 1–28.

²⁰ J. G. Palma, 'Homogeneous Middles vs. Heterogeneous Tails, and the End of the 'Inverted-U': It's all about the share of the rich' (2011) 42 *Development and Change* 1, 87–153.

²¹ See e.g. D. A. V. Pimentel, I. M. Aymar and M. Lawson, 'Reward Work, not Wealth: To end the inequality crisis, we must build an economy for ordinary working people, not the rich and powerful' (2018) Oxfam Briefing Paper <https://d1tn3vj7xz9fdh.cloudfront.net/s3fs-public/file_attachments/bp-reward-work-not-wealth-220118-en.pdf> accessed 25.03.2019.

(not least) natural capital depletion.²² More than the fragility of Kuznets's theory, the problem lies in the expectations and comfort it provided in focusing on economic growth.

The development of neoclassical theories was characterized by the specialization and professionalization in science that, by the end of the nineteenth century, had created a paradigm in which economics and ecology were essentially two separated areas of study.²³ The one concerned with the market and the other with the natural environment found it increasingly difficult to communicate with each other.

Every profession lives in a world of its own. The language spoken by its inhabitants, the landmarks familiar to them, their customs and conventions can only be learnt by those who reside there.²⁴

In the field of economics, this meant that concerns about natural resources, which – together with capital and labour – used to form the basis of the classical economics approach, were relegated to the side, and essentially left to ecologists to deal with. At the same time, economists were gaining in popularity with politicians and the public at large. If one is not the direct consequence of the other, neither are the two completely unrelated. The result of these assumptions – where the natural environment is abundant and forgiving – is that they simplify an increasingly complex world,²⁵ making for easy answers that are attractive to the general public, the media and politicians. John Maynard Keynes thought that, by the twenty-first century, economists would have only a small role to play in the society:

The day is not far off when the economic problem will take the back seat where it belongs, and the arena of the heart and the head will be occupied or preoccupied, by our real problems — the problems of life and of human relations, of creation and behaviour and religion.²⁶

The contrary happened. The role and influence of economists kept growing. By the time awareness about environmental limitations and human impacts sparked renewed attention in the 1970s, economics had become a highly specialized science and earlier concerns about the natural environment had largely receded into the background. David Pearce and R. Kerry Turner usefully summarise the position held by environmental economics in the early 1990s in mainstream economics:

Undergraduate economics textbooks now pay some attention to issues of environmental economics. But, typically, this attention is confined to supplying an 'add on' chapter illustrating how the theory in the rest of the book can be applied to environmental issues.

²² M. Max-Neef, 'Economic Growth and Quality of Life: A threshold hypothesis' (1995) 15 *Ecological Economics* 2, 115–118; J. Talberth, C. Cobb and N. Slattery, *The Genuine Progress Indicator 2006: A tool for sustainable development* (Oakland: Redefining Progress, 2007).

²³ R. Costanza et al., *An Introduction to Ecological Economics*, 1st edn (Florida: CRC Press, 1997).

²⁴ A. M. Carr-Saunders and P. A. Wilson, *The Professions* (Oxford: Clarendon Press, 1933).

²⁵ Mankiw and Taylor (2011).

²⁶ J. M. Keynes, *Essays in Persuasions*, First edition published in 1931 (New York: Palgrave Macmillan, 2010), xviii.

The danger in this approach is that it obscures the fundamental ways in which the consideration of environmental matters affects our economic thinking.²⁷

2.2.3. Consumerism as the solution

The industrial revolution created an unprecedented economic situation where products were increasingly available in large quantities, at remarkably low prices, and thus within the reach of virtually everyone in the industrialized Western world. Industry was producing more and faster, but was unable to sell excess supply. The imbalance between offer and demand was one of the causes of the collapse of the American economy in the 1930s, ushering in the severe worldwide economic depression that lasted until the beginning of the Second World War.²⁸ For Bernard London, an American broker, the problem of the Great Depression was one of human relationships:

Primarily, this country and other countries are suffering from disturbed human relationships. Factories, warehouses, and fields are still intact and are ready to produce in unlimited quantities, but the urge to go ahead has been paralyzed by a decline in buying power. The existing troubles are man-made, and the remedies must be man-conceived and man-executed.²⁹

There was a need, he said, to establish a strategy of economic recovery based on product obsolescence planning. Short-lived products would lead to the regular purchase of new products, thereby stimulating the economy.³⁰ In other words, he argued that the problem laid not with the offer, but the demand. His view summarizes the industry's response to the depression. Consumption habits had to change to accommodate the new production capacities. Consumers had to purchase ever larger amounts of ever more types of newly manufactured product.

Another American, the industrial designer Brook Stevens, later popularized the term 'planned obsolescence'. At a conference in 1954, he referred to the concept as 'instilling in the buyer the desire to own something a little newer, a little better, a little sooner than is necessary'.³¹ Originally, the idea of planning for product obsolescence focused on producing products with a short lifespan – even a single-use purpose – products that are meant to fail prematurely or cannot be repaired, or products that are quickly outmoded by newer technologies. Steven's definition revealed another side of planned obsolescence. Shortening the lifetime of products did not necessarily create material obsolescence, but it made perfectly functioning products 'feel' obsolete to consumers through design changes and advertising. The American automotive industry embodied this strategy of psychological obsolescence when General Motors

²⁷ Pearce and Turner (1990).

²⁸ S. Bell, *Productivity, Wages and National Income* (Washington: The Brookings Institution, 1940).

²⁹ B. London, *Ending the Depression through Planned Obsolescence* (New York: University of Wisconsin, 1932).

³⁰ Ibid.

³¹ Cited in: G. Adamson, *Industrial Strength Design: How Brooks Stevens shaped your world* (Cambridge, Massachusetts: MIT Press, 2003), 129.

introduced annual model-year design changes.³² Today, the electronics and fashion industries are clearly riding that wave.

The story of the rise of consumerism is, of course, much more complex than it is possible to discuss here. Frank Trentmann's book *Empire of Things* provides a thorough historical analysis of how our world became one of consumers. He goes back to the fifteenth century that saw the expansion of markets, purchase and choice as trading intensified between Europe and the Orient (East Africa, the Ottoman Empire and Asia) through the Silk Road and the Indian Ocean, aiding the emergence of global trading zones, notably with the newly discovered Americas.³³ It is clear, however, that industrialisation changed the game not only with regards to the scale and extent of consumption, but most importantly because consumption emerged as both an economic necessity and a leading political concern.

2.2.4. The problem of GDP as a basis for economic growth

One of problems with economic growth is the way it is measured that is what counts as growth. To this day, the most common indicator of economic growth is Gross Domestic Product (GDP). The OECD defines GDP as:

an aggregate measure of production equal to the sum of the gross values added of all resident institutional units engaged in production (plus any taxes, and minus any subsidies, on products not included in the value of their outputs). The sum of the final uses of goods and services (all uses except intermediate consumption) measured in purchasers' prices, less the value of imports of goods and services, or the sum of primary incomes distributed by resident producer units.³⁴

GDP measures the volume of the circular flow of income and expenditures in a country's economy during a specified period of time. It includes the value of the goods and services produced to be sold, but excludes the value of the goods and services needed to produce them (i.e. intermediate consumption). GDP does not account for a number of activities, such as services performed within a family (housework or childcare) or for friends, charity work, earnings from 'odd jobs' (notably within the shared economy³⁵) that are important for the society.³⁶ Also excluded from GDP are transactions of second-hand goods (seen as a transfer of ownership that does not create new value) or welfare payments.

More generally, GDP ignores the social or environmental situation of an economy.³⁷ GDP comprises only monetary transactions related to the production of goods and services. It

³² See in G. Slade, *Made to Break: Technology and obsolescence in America* (Cambridge, Mass: Harvard University Press, 2006), 36-53.

³³ F. Trentmann, *Empire of Things* (Penguin Books, 2017), 23.

³⁴ OECD Glossary of Statistical Terms, 'Gross Domestic Product (GDP)' (2001) <<https://stats.oecd.org/glossary/detail.asp?ID=1163>> accessed 25.03.2019.

³⁵ The sharing economy may produce unaccounted economic value, notably when in a service without a monetary exchange. For example, 'couch-surfing' consists in a people staying in other people's homes while travelling for free.

³⁶ S. Kuznets, 'National Income 1929-1932' (1934) Report to the US Congress, Document No. 124, 3-5.

³⁷ R. Costanza et al., 'Development: Time to leave GDP behind' Comment (2014) 505 *Nature* 7483, 283-285, 283.

accounts for the material, not for the life. It measures quantity and neglects quality.³⁸ It does not give a complete picture of the system within which the human economy operates, nor does it give any indication of the sustainability of growth.³⁹ GDP does not account for inequalities that may arise from the distribution of income among individuals.⁴⁰ GDP reveals education spending, but disregards its quality. GDP includes the healthcare expenditure of a country and the sales of pharmaceutical products, but says nothing about the health of its population. GDP accounts for the goods produced by the petrochemical and pesticide industries, but not for their devastating effect on biodiversity and human health. GDP increases when consumers buy frozen food in supermarkets, but is unaffected by the act of picking home-grown vegetables and cooking them.⁴¹

Moreover, GDP is a measure of the nation's growth in the present, of what it produces within a year, but not of its capacity to continue producing (or for that matter, surviving) in ten or in a hundred years.⁴² It is oblivious to the fact that using natural capital today reduces its availability in the future, and that human-made capital cannot perfectly substitute a diminished natural capital.⁴³

The concept of GDP was developed by Kuznets in a report to the US Department of Commerce,⁴⁴ and ultimately used by President Roosevelt's government to justify policies and budgets that were meant to bring the country out of the Great Depression.⁴⁵ Yet Kuznets himself warned against the use of quantitative measurements, such as GDP, to gauge the welfare of a nation:

The valuable capacity of the human mind to simplify a complex situation in a compact characterization becomes dangerous when not controlled in terms of definitely stated criteria. With quantitative measurements especially, the definiteness of the result suggests, often misleadingly, a precision and simplicity in the outlines of the object measured. Measurements of national income are subject to this type of illusion and resulting abuse, especially since they deal with matters that are the centre of conflict of opposing social groups where the effectiveness of an argument is often contingent upon oversimplification.⁴⁶

In a later publication, Kuznets added:

³⁸ R. Costanza et al., *Beyond GDP: The need for new measures of progress* (Boston University: The Frederick S. Pardee Center for the Study of the Longer-Range Future, 2009), 9.

³⁹ I. Kubiszewski et al., 'Beyond GDP: Measuring and achieving global genuine progress' (2013) 93 *Ecological Economics*, 57-68.

⁴⁰ Kubiszewski et al. (2013), 58; R.G. Wilkinson and K. Pickett, *The Spirit Level: Why greater equality makes societies stronger* (New York: Bloomsbury Press, 2009).

⁴¹ Kubiszewski et al. (2013), 58.

⁴² D. Philipsen, *The Little Big Number: How GDP came to rule the world and what to do about it* (Oxford: Princeton University Press, 2015), 157.

⁴³ Kubiszewski et al. (2013), 60.

⁴⁴ At the time of the report, the term used was gross national product (GNP), but was eventually replaced by GDP.

⁴⁵ Costanza et al. (2009).

⁴⁶ Kuznets (1934), 5.

Distinctions must be kept in mind between quantity and quality of growth, between costs and returns, and between the short and long run. Goals for more growth should specify more growth of what and for what.⁴⁷

GDP-based economic growth remains nevertheless the referred measure of improved well-being to many economists and politicians.⁴⁸ If the concept of GDP developed during the 1930s as a response to the Great Depression, it was still the main objective pursued by most governments in the aftermath of the 2008 global financial crisis:

The ultimate goal was to protect the pursuit of economic growth. Throughout the crisis, this has been the one non-negotiable: that growth must continue at all costs.... No politician seriously questions this.⁴⁹

In the midst of the 2008 economic crisis, the World Bank published a report in which it described GDP as a ‘remarkable statistic’ and maintained that a growing GDP is evidence of a better society.⁵⁰ The report also identified a growing GDP as the way poorer countries could ‘catch up’ with richer ones.⁵¹ The opposite appears to be happening. Wealth inequality is soaring with the richest 1 per cent owning 45 per cent of the world’s wealth in 2018.⁵² According to Oxfam, that same 1 per cent captured 82 per cent of the wealth generated in 2017, widening the inequality gap in the process.⁵³ At the same time, according to Reuters, in 2017, the countries with highest growth rate also appear to be the biggest polluters. China was the world’s biggest emitter of CO₂ releasing about 10,357 million metric tons per year, followed by India in third place and Japan in fifth place.⁵⁴ Growth, in current terms, appears neither socially nor environmentally sustainable. Of course, halting the immediate chaos and human disaster that threatened the world in 2008 was a necessity. Short-term, growth-enhancing policies have, however, not been followed by discussions about the long-term development path and sustainability of the economy. On the contrary, it was followed by even more short-term measures to guarantee temporary growth in the present.⁵⁵

2.2.5. Functioning of the linear model

In line with the focus on growth and a sense of unlimited availability of natural resources, the economy developed in a linear manner. The ‘take-make-dispose’ pattern consists in extracting raw natural resources from the Earth, manufacturing them and eventually discarding them as

⁴⁷ S. Kuznets, ‘How to Judge Quality’ (1962) 147 *The New Republic* 16, 29-31.

⁴⁸ Costanza et al. (2009), 6.

⁴⁹ T. Jackson, *Prosperity without Growth: Economics for a finite planet* (London: Earthscan, 2009), 22.

⁵⁰ Commission on Growth and Development, *The Growth Report: Strategies for sustained growth and inclusive development* (Washington: World Bank, 2008), 17.

⁵¹ Ibid.

⁵² Credit Suisse Research, ‘Global Wealth Databook 2018’ (2018) <<http://publications.credit-suisse.com/tasks/render/file/index.cfm?fileid=777FDF0E-E060-F608-52DAF97E062CC35B>> accessed 25.03.2019.

⁵³ Pimentel, Aymar and Lawson (2018), 8.

⁵⁴ With, respectively, about 2,274 million and 1,237 million metric tons per year Reuters, ‘Who are the world’s biggest polluters?’ (2017) <www.reuters.com/news/picture/who-are-the-worlds-biggest-polluters-idUSRTXRKSI> accessed 25.03.2019.

⁵⁵ See also J. E. Stiglitz, ‘Post Davos Depression’ (2018) Project Syndicate <www.project-syndicate.org/commentary/davos-ceos-tax-cuts-trump-by-joseph-e--stiglitz-2018-02?barrier=accesspaylog> accessed 25.03.2019.

waste after use. From the outset, the linear model is oblivious to the reality interconnectedness, interdependence and circularity of the Earth's system processes.⁵⁶ The loss of natural resources and time for regeneration, the damage caused to other resources and species that depend on that particular resource is unaccounted for.⁵⁷ As a result, the economy has been able to develop cheaply at the environment's expense. Costs linked to the ownership or exploitation of natural resources, including the fact that payments for releasing emissions are essentially compensating the state, a private owner or victims of pollution, not the environment itself. Natural resources, which serve to feed and dress people, to make medicines and toys, to fuel cars and airplanes, to build houses and computers, have been overexploited because they do not cost their environmental worth (nor too often their economic worth).⁵⁸ Similarly, air and water emissions, or the littering of soils and seas, are only subject to economic valuation to the extent that specific health or other damage can be associated with a particular pollution source. Moreover, the cost of environmental damage would initially be born by society at large.⁵⁹

In the linear economy, raw materials are extracted, or harvested, ('take') and transformed to become components of end products ready for consumption ('make'). Those products are commercialised and sold to customers, who use them, and eventually discard them when they no longer serve their purpose ('dispose').⁶⁰ Figure 2 shows the functioning of the linear 'take-make-dispose' economy where both materials and energy flow in a single and linear direction.

Figure 2. The linear economic model⁶¹

2.3. Attempts and limits to fixing the current model

2.3.1. Environment as externality

Pollution has existed for as long as mankind if one refers to the commonly accepted definition of pollution by the OECD:

⁵⁶ Pearce and Turner (1990), 29-31.

⁵⁷ Ibid.

⁵⁸ E. Assadourian, 'Re-engineering Cultures to Create a Sustainable Civilization' in H. Washington and P. Twomey (Ed.), *A Future Without Growth: Towards a steady state economy* (London: Routledge, 2016), 59- 69, 60.

⁵⁹ E.g. waste management was historically the duty of local authorities (and hence the taxpayers), not of the producer of the product (i.e. manufacturer) or of the waste (i.e. consumer). See e.g. R. Lifset, A. Atasu and N. Tojo, 'Extended Producer Responsibility: National, international, and practical perspectives' (2013) 17 *Journal of Industrial Ecology* 2, 162-166, 162.

⁶⁰ R. Le Moigne, *L'économie Circulaire* (Paris: Dunod, 2014), 11.

⁶¹ Inspired by Le Moigne (2014), 10.

the introduction by man, directly or indirectly, of substances or energy into the environment resulting in deleterious effects of such a nature as to endanger human health harm living resources and ecosystems, and impair or interfere with amenities and other legitimate uses of the environment.⁶²

However, pollution remained for a long time the normal corollary of humanity's activities. Discharges into the air and water, the use of natural resources, dangerous conditions for workers accompanied the industrial revolution and no safety regulations in sight.⁶³ Awareness of the problem came eventually when it became impossible to ignore the damaging effects of pollution on the environment, human health and property felt by most as industrialization progressed.

The first to lay out the concept of external economics was Marshall, though he solely discussed *positive* externalities that businessmen enjoy without payment and outside the market.⁶⁴ It is his student, Pigou, who realised that externalities were not necessarily productive of benefits, but could also result in costs. Typically, emissions into the air from a factory count as *negative* externalities in that they affect, for instance, the health of neighbouring residents, for which they receive no compensation. Simultaneously, the factory benefits from a positive externality of polluting the air without having to pay for it.

In neoclassical economics, externalities represent a type of market failure whereby the market economy delivers an outcome that does not maximise efficiency.⁶⁵ Those external costs do not take part in shaping the supply and demand curves, since neither buyers nor sellers take them into consideration in their decision-making. The price of the good leaving the factory will not reflect the pollution generated for its production. The problem is that under-priced products are over-consumed and over-produced resulting in overexploitation of natural resources, excessive use of energy, generation of emissions and waste, ultimately disrupting ecosystems' equilibrium. In other words, the market would have failed to deliver an equilibrium that maximises the total benefit to society as a whole.⁶⁶

The idea of externalities became central to modern welfare economics, in particular to environmental economics, and shaped the way the economy has dealt with environmental degradation in the last hundred years – that is, as a market failure. As something that needs to be corrected in order to make the invisible hand operate again. The environment as the enemy of the free market. The environment as a cost to be monetised and integrated in the determination of the price. The environment as a value to fit in the baseline theory that the market is perfect.

The concept of externalities is problematic for two main reasons. The first relates to the mere fact that environmental assets and damage are considered 'external' factors to the focal point, that is, the economic activities of production and consumption. For Philip Graves, the

⁶² OECD, 'Recommendation of the Council on Principles concerning Transfrontier Pollution', C(74)224.

⁶³ M. Munir, *The Polluter Pays Principle in International Environmental Law and Policy: Economic and Legal Analysis* (Islamabad: Institute of Legal Studies, 2004).

⁶⁴ Kula (1998), 69; Marshall (1890).

⁶⁵ J. Gruber, *Public Finance and Public Policy* (New York: Worth Publishers, 2011), 3 and 123.

⁶⁶ Mankiw and Taylor (2011), 199.

characterization of ‘market failure’ should be replaced by the ‘failure to have markets’.⁶⁷ The failure is not, in his view, with the market, but rather with the absence of one. The factory that otherwise pays for labour, capital and energy supply, does not pay for using society’s scarce air. The failure is that there is no market because there is nobody to charge them for the cost of using the air.⁶⁸ This difference of characterization does not change, however, the nature of the economic conception of the environment as something external, a deficiency. The economy, manufacturing companies and other suppliers, would not exist if not for the environment. The energy used to power factories, the water and chemicals employed in manufacturing processes, the materials that compose products all come one way or another from the environment. The environment is not external, it is an integral, indispensable, core element of the economy.

The second problem has to do with the response to the discovery of a market failure of externality. Since environmental harm is an external cost that occurs when one or more parties suffer a *loss of welfare*, that loss has to be recompensed. In other words, the externality has to be *internalized*.⁶⁹ In the example of a factory emission pollutants into the air, the payment of a compensation to the neighbours for the pollution they suffer effectively internalizes the externality. In this case, the air pollution is not eliminated, it may even continue for as long as there is adequate compensation.⁷⁰ This means that, faced with an external cost, economists do not necessarily recommend its elimination, but rather to calculate the optimal level of that cost and then either reduce the polluting emissions or compensate the affected third parties for any excesses. Determining the *optimal level of externality* (OLE) results from a calculation of the marginal private benefit (what the factory gained from emitting pollutants) and the marginal external cost (value of the damage caused by pollution arising from the factory’s activity), as presented in Figure 3 below.⁷¹

⁶⁷ P. E. Graves, *Environmental Economics: An integrated approach* (New York: CRC Press, 2013), 10.

⁶⁸ Ibid, 11.

⁶⁹ Pearce and Turner (1990), 61.

⁷⁰ The meaning of ‘adequate’ is linked with the discussion of the OLE calculation that follows and environmental valuation discussed above (2.3.2).

⁷¹ C. Romero, ‘Determination of the Optimal Externality: Efficiency versus equity’ (1999) 113 *European Journal of Operational Research* 1, 183-192, 184 (figure 1); R. Turvey, ‘On Divergences between Social Cost and Private Cost’ (1963) 30 *Economica, New Series* 119, 309-313.

*Figure 3. Diagrammatic representation of the optimal level of externality*⁷²

It follows that environmental harm is to be prevented only if – and to the extent that – the damage outweighs the benefit of the harm. Similarly, neoclassical economists developed theories about the optimal level of depletion.⁷³ Based on those models, exhaustion could be considered optimal, that is economically profitable, if the regenerative capacity of the natural resource is low, if harvesting costs are low or if the value of harvesting is high enough.

It is clear that human activities necessarily affect the environment. Hence, zero levels of pollution or extraction might neither be feasible nor desirable. The environment can regenerate and can be assimilative. A certain quantity of waste may be produced without it becoming harmful ‘pollution’. In other words, if raw material extraction and waste generation are unavoidable, environmental damage is not necessarily fatal. In the words of Pearce and Turner,

Zero waste is an impossibility, but zero quantities of waste affecting the environment is less fanciful.⁷⁴

Exploiting or polluting only within limits the Earth is capable of absorbing is not, however, what mainstream environmental economists recommend. Rather, they argue, the limit of harm is to be determined in accordance with the benefits the economy (or even just a single factory) can make from that harm. This outcome is all the more objectionable in that, if the benefits a firm can reap from extracting raw materials, discharging pollutants, and producing products that will consume energy in use and eventually become waste are easily calculated, the effects of all these activities on the environment are much less easy, if not impossible, to calculate adequately.

2.3.2. Cost-benefit analysis and environmental valuation

The issue of environmental calculation is fundamental to theories about internalization. Here, I will not present the various methods of environmental valuation,⁷⁵ but discuss more generally the inherent limitations of trying to price the priceless. I focus my analysis on the cost-benefit analysis (CBA), which has become an essential tool of public policy, environmental policy in particular.⁷⁶ CBA serves to inform decision-makers of the economic and environmental consequences of a policy or project:

⁷² Source: Romero (1999), 184.

⁷³ In an article entitled ‘The economics of exhaustible resources’, the Hotelling argued that the fundamental trade-off that the owner of an exhaustible resource faces is the choice between leaving that resource in the ground or extract and sell it. According to Hotelling’s rule, whether that owner leaves or extracts the resource depends, under perfect competition, on the price of the resource today and current interest rate compared to the expected price in the future. The theory implies that the price of an exhaustible resource should rise over time at roughly the same pace as interest rates. See H. Hotelling, ‘The Economics of Exhaustible Resources’ (1931) 39 *Journal of Political Economy* 2, 137-175.

⁷⁴ Pearce and Turner (1990), 66.

⁷⁵ For a thorough analysis of the environmental valuation methods, see OECD, *Cost-Benefit Analysis and the Environment: Further developments and policy use* (Paris: OECD Publishing, 2018), Part I.

⁷⁶ See e.g. Article 191(3) Consolidated version of the Treaty on the Functioning of the European Union (hereafter ‘TFEU’), OJ C 326, 26.10.2012, p. 47, which states that: “In preparing its policy on the environment, the Union shall take account of: [...] the potential benefits and costs of action or lack of action”; the proportionality principle that conditions the adoption of environmental law is often also based on a CBA calculation, see 5.3.3 below.

CBA forces the decision-makers to look at who the beneficiaries and losers are in both spatial and temporal dimensions.⁷⁷

There is a reason why CBA is so widely used. It has several advantages, not least that of revealing environmental considerations and requiring appraisal of different alternatives.⁷⁸ Problems remain, however, that seem insurmountable.⁷⁹ Firstly, the CBA is anchored in the linear paradigm it aims to mitigate. The starting point is not the environment. The starting point is maximization of personal utility. The starting point is the market, the price. Hence, the root issue with the CBA relates to the mere fact of having to price the environment and calculate the costs of ecological damage against the – more distinct – benefits to the economy.⁸⁰ Indeed, the reason why a CBA is necessary at all is exactly because the environment has an unmarketable value.⁸¹

There have been many attempts to value environmental goods and services, but the problem with current methods of valuation is that they are anthropocentric. From revealed preference methods to stated-preference methods and the subjective well-being valuation method, the techniques used to establish environmental value focus on the way people value (or are assumed to value) specific environmental benefits.⁸² There is ever-growing sophistication of econometric methods to identify the value of recreation in the wild, or the improvement of data collection with the rise of on-line surveys, or the willingness-to-pay for particular environmental benefits.⁸³ However, the vast majority of people are not able to perceive the overall value of the environment.⁸⁴ Further, the paradigm of the overconsumption society has an effect on people's behaviour and relationship to their natural surroundings. For instance, the proliferation of shopping malls has drawn recreational activities away from parks and forests and into the built environment. How then, can the use of a public park tell us anything about the intrinsic value of the ecosystem it represents (trees, plants, insects and birds) and the effect it has – beyond recreation – on air quality, water drainage and disease regulation?

On another hand, the CBA calculation assesses the benefits and costs at the margins. It investigates the effect of the next unit of pollution. Separating the consequence of a single unit of pollution from the preceding and following ones conceals the complexity of both pollution and the environment.⁸⁵ Whereas a one-off instance of environmental harm may have little

⁷⁷ OECD (2018), 32.

⁷⁸ Ibid.

⁷⁹ H. C. Bugge, 'Twelve Fundamental Challenges in Environmental Law' in C. Voigt (Ed.), *Rule of Law for Nature: New dimensions and ideas in environmental law* (Cambridge: Cambridge University Press, 2013), 3-26, 15.

⁸⁰ R. Frank, 'Why is Cost-Benefit Analysis so Controversial' (2000) 29 *The Journal of Legal Studies* S2, 913-930, 914.

⁸¹ H. E. Daly and J. Farley, *Ecological Economics: Principles and applications*, 2nd edn (Washington: Island Press, 2011), 405 and 410.

⁸² OECD (2018).

⁸³ As shown notably in OECD (2018).

⁸⁴ Frank (2000), 918; I. Ritov and D. Kahneman, 'How People Value the Environment: Attitudes vs. economic values', in M. Bazerman et al. (Eds.) *Psychological Approaches to Environmental and Ethical Issues in Management* (Jason Aronson, Inc., 1998), 33–51; and D. Kahneman and J. Knetsch, 'Valuing Public Goods: The purchase of moral satisfaction' (1992) 22 *Journal of Environmental Economics and Management* 1, 57-70.

⁸⁵ On the complexity of the environment, see Bugge (2013), 9-10.

impact on the environment, the cumulative effect of repetitive damages in space and time may result in critical environmental damage.⁸⁶ Some effects may even be difficult to predict because of their distance in space and time, and because ecosystems react differently to specific harms. The short-term view of CBA calculation is problematic, not least because future costs and benefits are calculated and converted into present value.⁸⁷ That future rate is discounted, meaning that the current worth of a future sum of money is less than that of the same sum in the present.⁸⁸ This is done, on the one hand, to reflect the inclination of individuals to prefer a lower sum today than a higher sum in the future and, on the other, economists' assumption that today's investments will produce economic growth, and that future generations will be richer.⁸⁹ Moreover, the discounting tends to be exponential so that the further the damage, the lesser value it will be granted. Discounting fundamentally ignores environmental degradation and natural resource exhaustion.⁹⁰

Although techniques are developed to mitigate discounting,⁹¹ a calculation based on necessarily uncertain and biased assumptions about the future do not seem completely satisfying.⁹² Arthur Cecil Pigou was one of a few economists who spoke at an early stage of the lack of a long-term vision of the economy. In his 1932 book, *The Economics of Welfare*, he argued that humans have a defective telescopic faculty, which makes them see future satisfactions on a diminished scale.⁹³ The more distant temporally speaking, the less attractive the future pleasures will appear in the present. Pigou's student, Frank Ramsey, considered that the practice of discounting later enjoyment in comparison to earlier ones is "ethically indefensible and arises merely from the weakness of imagination."⁹⁴ At a time when GDP was being established, both argued that measuring annual economic *activity* exclusively in terms of annual consumption was inadequate. Rather, one had to include also annual savings.⁹⁵ The savings element was to represent the contribution of the current year's economic activity to future consumption.⁹⁶ Or, as Ramsey suggested, to determine how much of its income a nation should save (rather than consume) to maximise future utility.⁹⁷ The problem, of course, would always come down to pricing nonmarket goods.

Nevertheless, the idea of economic growth based on annual expenditure flourished with only the present in sight. Donella Meadows et al. denounced endless economic growth as aiming at the sole fulfilment of present needs in disregard of the future. *The Limits to Growth* report to

⁸⁶ About cumulative effects, see e.g. L. H. MacDonald, 'Evaluating and Managing Cumulative Effects: Process and constraints' (2000) 26 *Environmental Management* 3, 299–315.

⁸⁷ Frank (2000), 915.

⁸⁸ OECD (2018), chapter 8.

⁸⁹ F. P. Ramsey, 'A Mathematical Theory of Saving' (1928) 38 *The Economic Journal* 152, 543–559; I. Fisher, *The Theory of Interest* (New York: The Macmillan Company, 1930).

⁹⁰ See Daly and Farley (2004), 268ff.

⁹¹ Such as Social Opportunity Cost (SOC) or Social Rate of Time Preference (SRTP).

⁹² See e.g. S. Kelman, 'An Ethical Critique of Cost-Benefit Analysis' (1981) 5 *AEI Journal on Government and Society Regulation* 1, 33–40.

⁹³ A. C. Pigou, *The Economics of Welfare*, 4th edn (London: Macmillan and Co., 1932), I.II.3–4.

⁹⁴ Ramsey (1928), 543.

⁹⁵ Pigou (1932), I.II.3–4.

⁹⁶ D. Collard, 'Pigou and Future Generations: A Cambridge tradition' (1996) 20 *Cambridge Journal of Economics* 5, 585–597, 587.

⁹⁷ Ramsey (1928), 543.

the Club of Rome investigated “five major trends of global concerns – accelerating industrialization, rapid population growth, widespread malnutrition, depletion of non-renewable resources, and a deteriorating environment.”⁹⁸ The authors presented calculations following which, under a business-as-usual scenario, the world economy would face limitations within the next one hundred years and eventually collapse.⁹⁹ The core of aspect of defining sustainability was time. The time horizon of a society determines decisions. At the time of the report, in 1972, Meadows et al. estimated that unrestricted economic (and population) growth could be maintained over a short time span (6 months). The more the span was extended, the growth would necessarily decline. In other words, unrestricted growth is necessarily associated with short-termism.

2.3.3. Internalization: from interventionism to bargaining

Faced with the failure of markets to recognize environmental ‘externalities’, several economists came with propositions to correct the problem. Pigou argued in favour of governmental intervention to promote social welfare when the market failed to work properly.¹⁰⁰ In his view, social improvement had to be the main motive of economic study, i.e., the goal was to promote welfare. When the market is unable to allocate resources efficiently, there was a case for governmental intervention. As Pigou wrote in his essay *State Action and Laisser-faire*, when “private self-interest, acting freely, subject to the ordinary forms of law, does not lead to the best results from a general social point of view, there is ... a prima facie case for State action.”¹⁰¹

He notably challenged the doctrine of laissez-faire, highly popular at the time among economists, based on observations about human behaviour regarding intertemporal preferences for natural resources.¹⁰² He argued that people see future pleasures on a diminished scale even when they in fact equal present pleasures. This preference for the satisfaction of present needs over future ones, even if the latter is greater than the first, is due to what Pigou calls the *defective telescopic faculty*. The further satisfaction lies in the future, the less value we will grant it. “[I]t implies that people distribute their resources between the present, the near future and the remote future on the basis of wholly irrational preference.”¹⁰³

Given the defective telescopic faculty, market transactions are not only likely to hurt future generations far more than present ones, it will also lead to the wasteful exploitation of natural resources:

Sometimes people will win what they require by methods that destroy, as against the future, much more than they themselves obtain. Over-hasty exploitation of the best coal seams by methods that cover up and render unworkable for ever worse, but still valuable, seams; fishing operations so conducted as to disregard breeding seasons, thus threatening certain species of fish with extinction; farming operations so conducted as to exhaust the fertility

⁹⁸ D. H. Meadows et al., *Limits to Growth: A report for the Club of Rome’s project on the predicament of mankind* (New York: New American Library, 1972), 21.

⁹⁹ Ibid, 23.

¹⁰⁰ Kula (1998), 82.

¹⁰¹ Pigou (1932), 124.

¹⁰² Kula (1998), 83.

¹⁰³ A. C. Pigou, *The Economics of Welfare*, 3rd edn (London: Macmillan, 1929), 25.

of the soil, are all instances in point. There is also waste, in the sense of injury to the sum total of economic satisfaction, when one generation, though not destroying more actual stuff than it itself obtains, uses up for trivial purposes a natural product which is abundant now but which is likely to become scarce and not readily available, even for every important purposes, to future generations.¹⁰⁴

It is therefore the duty of the state to intervene in order to guarantee economic welfare. Indeed, the state, according to Pigou, is the trustee of the unborn as well as the current citizens. It has a duty to defend, by legislation if necessary, the environment against reckless depletion, which the market is unable to prevent.¹⁰⁵

Three policy instruments that could achieve environmental preservation, Pigou suggested: taxes, subsidies and regulation. Here I focus on the issue of taxation (often referred to as ‘Pigouvian tax’) preferred by Pigou. Reaching a state of Pareto efficiency requires that the person who is responsible for negative externalities bear the burden of those costs which take the form of a tax.¹⁰⁶ The tax needs to be equal to the marginal damage done to others by one unit of pollution and imposed for each unit of production in line with the OLE method discussed above (2.3.1).

One of the main arguments in favour of taxes is they can lead to a more efficient reduction of pollution. Instead of inducing a specific conduct, the tax aims at removing incentives to expand activity to the point where the tax equals the benefit.¹⁰⁷ With an appropriate tax, factory A would reduce its emissions by more than what the law would have required in order to avoid paying the tax, while factory B might reduce less and pay the tax.¹⁰⁸ Whereas regulation dictates strict levels of pollution, taxation gives the factories more flexibility in choosing the optimal amount to cut back.¹⁰⁹ Hence, a tax may have a better outcome in the long run for the environment as it gives incentives to the factories to develop technologies to reduce their emissions further. Indeed, the use of cleaner technologies would ultimately allow them to pay less tax. The danger, however, is that over time the overall pollution from the factories could exceed the ceiling that the law had prescribed for.

Information is a key factor in internalization theory. The knowledge of a few (i.e. policy makers) shall guide the actions of many (i.e. all users of the environment).¹¹⁰ This means that, in order to regulate, the government needs information. It needs to know both the amount of marginal damage and the marginal cost (that is the direct cost of producing an additional

¹⁰⁴ Pigou, (1932), 28.

¹⁰⁵ Kula (1998), 85.

¹⁰⁶ N. de Sadeleer, *Environmental Principles: From political slogans to legal rules* (Oxford: Oxford University Press, 2002), 22.

¹⁰⁷ D. Schmidtchen, C. Koboldt and J. Helstroffer, *Transport, Welfare and Externalities – Replacing the polluter pays principle with the cheapest cost avoider principle* (Cheltenham: Edward Elgar Publishing Limited, 2009), 14.

¹⁰⁸ Mankiw and Taylor (2011), 211-212.

¹⁰⁹ Gruber (2011), 142.

¹¹⁰ N. Hayek, *A Tiger by the Tail* (London: Institute of Economic Affairs, 1972); Kula (1998), 102.

unit).¹¹¹ The use of a tax only requires the first. In order to achieve the same level of efficiency as a tax, it would also need to know the marginal costs of both factories. Such detailed information is typically hard to obtain, with the difficulty increasing exponentially with the number of producers. In the case of products, that problem grows exponentially with the number of environmental considerations that come into play, such as raw material use, energy efficiency in use, reparability and recoverability of products and materials.

In 1960, Ronald Coase argued that taxes or any other such intervention on pollution would not be necessary if a system of property rights were properly enforced. His approach to externalities quickly gained widespread attention among economists and indeed marked an important shift away from the Pigouvian approach. In *The Problem of Social Cost*, Coase argued that externalities result from a situation in which two or more actors are competing for the same scarce resource.¹¹² Both the polluter and the pollutee are imposing a charge on the other party because they put conflicting values on a resource. The heart of the problem of externalities is therefore their reciprocal nature. The factory values the emission, as it is part of its production process, while the residents around the factory value a pollution-free river.¹¹³ Departing from the Pigouvian view that the factory should necessarily bear the external costs of its activity, the Coasian proposition is that there should be “no a priori reason for assuming that, because the polluter’s activity involves a physical interference, her claim on the environment is less valuable than that of the pollutees.”¹¹⁴ In summary, Coase’s theorem stands on the following principles: 1) there can be no externality without rivalry of use; 2) the problem of externalities is of a reciprocal nature; 3) harm is always jointly caused.

Pigou’s approach to the problem of externality was very intuitive: the person whose activity creates the pollution must bear the costs of that pollution. The Coasian theorem takes a different stand in suggesting that the one who is best placed to do so must undertake the reduction of the externality, without that person necessarily being the polluter. A tax lacks efficiency, Coase’s proponents argue, because it presupposes that the polluter is necessarily in the best place to reduce the externality whereas in reality the polluter may be the one for whom the reduction will be most costly. In other words, if it is true that if the factory is allowed to pollute the river, residents may be harmed, the opposite is also true. If the residents have the right to stop that pollution, the factory will also suffer damage. The conflict should therefore be solved by identifying which of the two uses of the environment has a greater social value.

Coase endorsed the liberal doctrine of *laissez-faire* and argued that private parties should be left to bargain over the allocation of resources until they reached an optimal distribution.¹¹⁵ As

¹¹¹ E. Eide, ‘The Harm of Products and the Need of Information on Inputs, Production, Use and Disposal’ in E. Maitre-Ekern, C. Dalhammar and H. C. Bugge (Eds.), *Preventing Environmental Damage from Products: An analysis of the policy and regulatory framework in Europe* (Cambridge: Cambridge University Press, 2018), 87-100, 88.

¹¹² R. Coase, ‘The Problem of Social Cost’ (1960) 3 *The Journal of Law and Economics*, 1-44, 1; Schmidtchen, Koboldt and Helstroffer (2009), 28.

¹¹³ D. Schmidtchen et al., ‘The Internalisation of External Costs of Transport: From the polluter pays to the cheapest cost avoider principle’ (2007) *CSLE Discussion Paper Series No 2007-03*, CSLE, 69.

¹¹⁴ A. I. Ogus, *Costs and Cautionary Tales: Economic insights for the law* (Oxford: Hart Publishing, 2006), 167.

¹¹⁵ De Sadeleer (2002), 22; and Coase (1960), 43.

Coase himself acknowledged, however, the premise that the market can reach an efficient outcome on its own is necessarily flawed.¹¹⁶ A first difficulty regards to assignment of the blame and the damage.¹¹⁷ Is a particular polluter really responsible for the entire damage? If there are several polluters, who bears what responsibility? These assignment problems might be relatively easy to resolve if the damage is local and involves only a few people, but it becomes insurmountable in other circumstances, such as the diffuse pollution¹¹⁸ created by the mass production and consumption of products.¹¹⁹

Similarly, bargaining might fail due to the unwillingness or mere inability of the party to take part in a bargaining process. The allocational outcome of the negotiations between the parties following the distribution of property rights shall depend, in Coase's view, on the willingness to pay according to preferences. In reality, however, willingness to pay will depend on the ability of the parties to pay.¹²⁰ In addition, it is assumed that the most polluting companies (in particular multinational companies) may be more than 'willing' to compensate individuals (either by paying them directly or by subsidising the construction of schools or hospitals) in order to continue wreak harm. On the other hand, the polluter may lack the resources to pay the required amount to force companies to mitigate their pollution.¹²¹

From the point of view of distributive justice (also referred to as 'fairness'), which relates to a socially just allocation of resources, the Coase theorem raises serious concerns. The initial distribution of rights is bound to have severe consequences for the distribution of economic well-being,¹²² and may determine whether the right of the polluter to pollute trumps the right of the pollutees not to suffer from pollution. Moreover, it seems problematic to oppose the value that a person (or a group) derives from being able to access non-polluted natural goods to the value for the proponents of an activity release polluting emissions. The fact is that, beyond immediate harm to the local population, the polluting activity is likely to affect entire ecosystems and compromise the ability future generations to have access to a clean environment.

An additional criticism of Coase's approach pertains to the fact that the potential parties to a bargaining process are unlikely to be a heterogeneous group. This is particularly true with regards to environmental damage from products. Who should take part in the bargain process? European consumers, i.e. over 500 million people? Global companies that flood markets with

¹¹⁶ R. Coase, *The Firm, the Market and the Law* (Chicago: University of Chicago Press, 1988); Coase (1960), 16.

¹¹⁷ Gruber (2011), 132.

¹¹⁸ When it comes to products, the terms 'diffuse pollution' is used to refer to *non-point sources* of pollution that is when significant sources of pollution are not coming from major point sources; see e.g. N. Campbell et al., *Diffuse Pollution: An introduction to the problems and solutions* (London: IWA Publishing, 2004), 6-7. Thus, the sources of pollution from products are manifold ranging from natural resources depletion, to emissions from manufacturing and transport, energy use, and waste generation.

¹¹⁹ See e.g. N. Sachs, 'Planning the Funeral at Birth: Extended producer responsibility in the European Union and the United States' (2006) 30 *Harvard Environmental Law Review*, 51-98, 55-57.

¹²⁰ A. Endres, *Environmental Economics: Theory and policy* (Cambridge: Cambridge University Press, 2010), 38.

¹²¹ *Ibid*, 39.

¹²² Mankiw and Taylor (2011), 207-208.

low-quality products? Chinese manufacturers that produce those products or the Chinese government that owns them? It is not simply not feasible.

The Coase theorem is based on the assumption that no transaction costs are incurred in the bargaining process.¹²³ Coase himself was prompt to point out that the ‘zero transaction costs’ assumption was unrealistic, but argued nonetheless that “[o]nce the costs of carrying out market transactions are taken into account ... the initial delimitation of legal rights does have an effect on the efficiency with which the economic system operates.”¹²⁴ In short transaction costs comprises notably the costs of identification of the parties, of conducting the negotiations and of information gathering and enforcement.¹²⁵ Without going further into details, it is clear that, in the case of multiple parties and diffuse pollution that characterizes notably damage from product, the task of determining transaction costs appears to be simply insurmountable.

Finally, it is interesting to note that both of the discussed theories of externalities face shortcomings when it comes to information. The difficulty of determining the optimum level of the Pigouvian tax results notably from the government lacking the necessary information to establish the marginal damage and the marginal abatement cost functions.¹²⁶ Similarly, the fact that bargaining parties lack sufficient information about the price of emissions or of reducing them before the negotiations begin, undermines the competitiveness of the market model advocated by the rule of *laissez faire*.

2.3.4. The environmental Kuznets curve, technology and optimism

Economic growth, it is argued, will improve environmental quality in the long term. On the same premise as the Kuznets curve, the environmental Kuznets curve (EKC) hypothesises that, although economic growth might increase environmental degradation at first, it will follow eventually that damage to the environment begins to decrease as rising per capita income passes a turning point.¹²⁷ There may be several reasons for the inverted U-shaped relationship between pollution and per capita income. Higher education levels and access to information may foster awareness about and willingness-to-pay for environmental preservation.¹²⁸ Furthermore, whereas pollution may be unregulated at low levels of economic activity, beyond a certain level, environmental protection policies will kick in and possibly become binding.¹²⁹ Also, and central to the EKC hypothesis, economic developments go hand in hand with technological progress.

¹²³ M. Butler and R. Garnett, ‘Teaching the Coase Theorem: Are we getting it right?’ (2003) 31 *Atlantic Economic Journal* 2, 133-145, 134.

¹²⁴ Coase (1960), 16-17.

¹²⁵ P. Schlag, ‘The Problem of Transaction Costs’ (1989) 62 *Southern California Law Review* 1661-1700, 1673-1676; see also A. Vatn, *Institutions and the Environment* (Cheltenham: Edward Elgar, 2005).

¹²⁶ Endres (2010), 96.

¹²⁷ S. S. Babu and S. K. Datta, ‘The Relevance of Environmental Kuznets Curve (EKC) in a Framework of Broad-Based Environmental Degradation and Modified Measure of Growth – A pooled data analysis’ (2013) 20 *International Journal of Sustainable Development & World Ecology* 4, 309-316.

¹²⁸ T. M. Selden and D. Song, ‘Environmental Quality and Development: Is there a Kuznets curve for air pollution emissions?’ (1994) 27 *Journal of Environmental Economics and Management* 2, 147-162.

¹²⁹ B. R. Copeland and M. S. Taylor, ‘Trade, Growth, and the Environment’ (2004) 42 *Journal of Economic Literature* 1, 7-71, 18; A. John and R. A. Pecchenino, ‘An Overlapping Generations Model of Growth and the Environment’ (1994) 104 *The Economics Journal* 427, 1393-1410.

Innovation allows for the substitution of more polluting technologies with cleaner ones.¹³⁰ The scale of abatement increases its efficiency, hence making abatement more profitable and increasing actual abatement.¹³¹

The EKC hypothesis and the assumptions on which it rests are very controversial and have been widely debated in the last 35 years. Several empirical studies have followed the seminal work of Gene Grossman and Alan Krueger in 1991.¹³² Findings are mixed and the validity of the EKC remains controversial.¹³³ Many studies have shown the limit or even the inadequacy of the assumption.¹³⁴ Some also argue that, if the EKC might have some validity for certain types of environmental damage, it is unreliable for others such as, for instance, biodiversity loss.¹³⁵

This hypothesis embodies tremendous risks. First, it tends to clear polluters and decision-makers at the outset from their environmental responsibilities and justifies walking the path of potentially clear-cut destruction. In the absence of definite evidence, is it possible to merely assume that the model that has led to the most rapid and extensive environmental destruction will eventually be the one that protects it? Second, if it is clear that technology is deemed to play a crucial role in sustainability, it is also clear that it has drawbacks. For example, information technology (IT) is very energy-intensive and requires the use of devices (such as hardware units, computers and smartphones) the production of which is resource-intensive.¹³⁶ Thirdly, improvement of the environment from technological advancements may also be offset by mass consumption resulting from, *inter alia* population growth and the elasticity of the demand for cheap polluting goods.¹³⁷ In other words, even if economic growth were to benefit the environment, the total effect of growth may result in more pollution.

¹³⁰ M. H. C. Komen, S. Gerking, and H. Folmer, 'Income and Environmental R&D: Empirical evidence from OECD countries' (1997) 2 *Environmental and Development Economics* 4, 505-515.

¹³¹ J. Andreoni and A. Levinson, 'The Simple Analytics of the Environmental Kuznets Curve' (2001) 80 *Journal of Public Economics* 2, 269-86.

¹³² G. M. Grossman and A. B. Krueger, 'Environmental Impacts of a North American Free Trade Agreement' (1991) *National Bureau of Economic Research Working Paper No. 3914*.

¹³³ D. Baiardi, 'Technological Progress and the Environmental Kuznets Curve in the Twenty Regions of Italy' (2014) 14 *The B.E. Journal of Economic Analysis & Policy* 4, 1-42.

¹³⁴ See e.g. S. Tibaa and A. Omribe, 'Literature Survey on the Relationships between Energy, Environment and Economic Growth' (2017) 69 *Renewable and Sustainable Energy Reviews*, 1129-1146; M. H. Arouri et al., 'Energy Consumption, Economic Growth and CO2 Emissions in Middle East and North African Countries' (2012) 45 *Energy Policy*, 342-349; D. I. Stern, 'The Rise and Fall of the Environmental Kuznets Curve' (2004) 32 *World Development* 8, 1419-1439.

¹³⁵ J. H. Mills and T. A. Waite, 'Economic Prosperity, Biodiversity Conservation, and the Environmental Kuznets Curve' (2009) 68 *Ecological Economics* 7, 2087-2095.

¹³⁶ See International Energy Agency (IEA), *Digitalization and Energy* 2017, <www.iea.org/publications/freepublications/publication/DigitalizationandEnergy3.pdf> accessed 25.03.2019. In 2014, data centres consumed about 1% of the world's total energy demand, while data networks used around 1% of global electricity. According to Van Heddeghem et al., worldwide electricity use by ICT grew at an estimated 7% per year between 2007 and 2012 whereas overall electricity use grew by only 3% during the same period. W. Van Heddeghem et al., 'Trends in Worldwide ICT Electricity Consumption from 2007 to 2012' (2014) 50 *Computer Communications*, 64-76.

¹³⁷ A. R. Gill, K. K. Viswanathan and S. Hassan, 'The Environmental Kuznets Curve (EKC) and the Environmental Problem of the Day' (2018) 81 *Renewable and Sustainable Energy Reviews* Part 2, 1636-1642; M. A. Cole, 'Trade, the Pollution Haven Hypothesis and the Environmental Kuznets Curve: Examining the linkages' (2004) 48 *Ecological Economics* 1, 71-81.

2.4. Intermediary conclusions

In a provocative essay entitled *Economics Owe Ecology an Apology*, David Zetland identifies two substantial defects that help explain why the economy repeatedly harms the environment: the human tendency to simplify the world, and the promotion by economists of theories that fail to include (or even recognize) the inherent complexity of the world.¹³⁸ This adequately summarises the findings in this chapter.

This chapter has sought to identify the rationale behind the current economic paradigm and its tendency to overlook the fundamental features and limits of the Earth system. The linear economic model whereby raw natural resources are taken, transformed for consumption purposes and eventually disposed of by putting them back in the environment has flourished in an era of excessive optimism. The correlation of population growth and economic growth that seemed to contradict the fear of steady state put forward by Malthus offered the promise of a future of economic well-being for all driven by continuous economic growth and technological progress.

The reality of environmental destruction quickly forced neoclassical economists to develop theories about the causes of and responses to the situation. The failure of the market prompted discussions about methods to deal with the symptoms rather than addressing their cause. Blind faith in the market was not fundamentally questioned, nor the need for exponential growth. In Chapter 3, I aim to present how the development of a new economic paradigm based on ecology takes the opposite approach by taking as its basis the laws of nature (including the two laws of thermodynamics) and addressing issues of economic scale.

¹³⁸ D. Zetland, 'Economists Owe Ecology an Apology', in S. Primot, M. R. van der Valk and P. Keenan (Eds.) *Green Growth and Water Allocation* (IHP-UNESCO, 2013), 131-52, 132.

Chapter 3. Ecology and circularity: The foundation of new (economic) thinking

“*Rien ne se perd, rien ne se crée, tout se transforme.*”¹

— Antoine Lavoisier

Traité Élémentaire de Chimie, 1789

“*But if your theory is found to be against the Second Law of Thermodynamics I can give you no hope; there is nothing for it to collapse in deepest humiliation.*”

— Sir Arthur Eddington

The Nature of the Physical World, 1928

3.1. Introductory remarks

This chapter discusses efforts to move to a paradigm, which, contrary to the previous one, may be able to provide a ‘safe operating space for humanity’.² I discuss this from two main angles: the development of ecological economics and the concept of sufficiency,³ on the one hand, and ideas to pursue eco-efficiency⁴ by bending the current linear economic model.

Hence, in the first section (3.2), I introduce a new paradigm in economics based on ecology. Whereas *environmental* economics developed as a subfield of economics and evolved within the neoclassical paradigm, *ecological* economists began to re-think economics by integrating it into the ecological sciences. Under the ecological paradigm, the first and main concern of economists is the scale of the economy. It challenges the growth model of traditional economics, and ecological economists, who point out that natural resources are scarce and limited, argue for an absolute reduction in the use of resources – or sufficiency.

The second section (3.3) examines the basis for the policy framework pursued by the European Union (EU) to achieve the Circular Economy. From observing the functioning of nature, Kenneth Boulding found that the problems lay with trying to run an open and linear economy in a closed and circular Earth system. It followed the development of eco-efficiency strategies that sought to imitate nature’s recovery and regenerative capacity rather than producing products from raw materials and then discarding the post-consumption waste. The section first presents the main angles to this approach as developed by different ‘schools of thought’. Second, it identifies the shortcomings of this approach and discusses why, contrary to what seems to prevail in the EU, eco-efficiency measures cannot and should not be sufficient.

¹ “Nothing is lost, nothing is created, everything is transformed.” All translations are by the author.

² See 1.1.3 above.

³ Which demands an absolute reduction in production and consumption; T. Princen, *The Logic of Sufficiency* (Cambridge: MIT Press, 2005).

⁴ I.e. “producing and consuming more goods and services, while using fewer resources and creating less waste and pollution”; P. M. Boulanger, ‘Three Strategies for Sustainable Consumption’ (2010) 3 *S.A.P.I.EN.S* 2, 1-10, 5.

3.2. Ecological economics and the concept of sufficiency

3.2.1. Reconciling economics with ecology

In *The Entropy Law and the Economic Process*, Nicolas Georgescu-Roegen introduced the two physical laws of thermodynamics into economic thinking. He argued that nothing is created nor destroyed in the economic process, although everything is being transformed.⁵ Neoclassical economics, he argued, failed to recognize this reality, and its consequences: the economic process is not a self-sustained process and cumulative alterations of the environment will in turn necessarily affect the economy.⁶ Moreover, because of entropy, the transformation of matter and energy for human purposes eventually degrades that matter and energy and makes them useless. Hence, the scarcity of these elements steadily increases.⁷

Without going deeper into his remarkable work at this point, Georgescu-Roegen's contribution provided a new perspective on economic thinking. Several economists began inquiring in his wake into the interdependence between the natural ecosystems and human economies. From seeing the economy as an isolated system largely detached from environmental constraints, a new vision developed where the economy is viewed as a subsystem of the larger earth system.⁸ Passet illustrated the integration of the economy into the Earth system and the resulting dependency of the first on the latter.⁹ While suggesting that human society also comprised economic activities, it existed beyond such activities (see Figure 4).

Figure 4. The economic, the human and the biological spheres¹⁰

The idea of a spherical shape that comprises the economy, the limits of which are defined by the natural environment also forms the core of Raworth's proposed reform of economics. The economy, she posited in *Doughnut Economics* can evolve within two limits illustrated by a doughnut shape.¹¹ The inner ring of the doughnut is the *social foundation*: it sets out the basics

⁵ N. Georgescu-Roegen, *The Entropy Law and the Economic Process* (Cambridge: Harvard University Press, 1971).

⁶ N. Georgescu-Roegen, 'Energy and Economic Myths' (1975) 41 *Southern Economic Journal* 3, 347-381, 348.

⁷ N. Georgescu-Roegen, 'The Entropy Law and the Economic Process in Retrospect' (1986) XII *Eastern Economic* 1, 3-25, 8.

⁸ H. E. Daly, 'Steady-State Economics: A new paradigm' (1993) 24 *New Literary History* 4, 811-816, 814.

⁹ R. Passet, *L'économie et le Vivant*, 2nd edn (Paris: Economica, 1996).

¹⁰ Inspired by Ibid, 4.

¹¹ K. Raworth, *Doughnut Economics: Seven ways to Think Like a 21st century economist* (London: Random House Business Books, 2017).

of life that shall be guaranteed to all, such as access to sufficient food, decent housing and minimum income.¹² The outer ring is the *ecological ceiling*, the natural limits of the planet: she refers to the nine planetary boundaries to determine the ceiling.¹³ The economy can only proceed within the social foundation and the ecological ceiling. This ‘in-between’ state is to be the new goal of the economy and of economists, as opposed to today’s economic growth objective or, in Raworth’s words:

The goal of the 21st century economy should be to meet the needs of all within the means of the planet.

In the new paradigm, in order to ensure a ‘safe space for humanity’ in the words of Rockström et al.,¹⁴ the economy must develop between the upper ecological ceiling and the lower social foundation.

3.2.2. Pessimistic economics

The paradigm of ecological economics is fundamentally pessimistic and in complete opposition to the neoclassical approach. Costanza described economists as ‘technological optimists’ for whom the development and deployment of new technology allow the economy to continue growing at a high and stable pace.¹⁵ In his view, the underlying assumption of neoclassical economic theory that continuing and unlimited growth is possible and desirable explains the gap between economic thinking and the reality of environmental constraints:

This assumption allows problems of intergenerational, intragenerational, and interspecies equity and sustainability to be ignored (or at least postponed), since they are seen to be most easily solved by additional growth.¹⁶

From the opposite side, ecologists are referred to as ‘technological pessimists’: technology cannot respond to the fundamental ecological constraints.¹⁷ From the point of view of ecologists, only stable ecosystems are healthy, while unlimited growth is a sign of cancer.¹⁸ Ecologists see the supply of exhaustible natural resources as a fixed stock that diminishes with use, while the demand is a variable flow that continues over time.¹⁹ The fixed stock is therefore bound to exhaust and a world economy that is based on the supply of those goods will collapse.

Interestingly, Costanza uses a traditional game theory figure to illustrate the choices offered by this optimist/pessimist dichotomy.²⁰ The payoff matrix shown in Table 1 suggests that if we pursue a technological optimist policy, the gains will be ‘high’ if the optimists happen to be right, but the result will be ‘disastrous’ if pessimistic views on the state of the world materialize.

¹² Ibid, 45.

¹³ Ibid, 46-47.

¹⁴ J. Rockström et al., ‘A Safe Operating Space for Humanity’ (2009) *Nature* 461, 472-475; see also 1.1.3 above.

¹⁵ R. Costanza, ‘What is Ecological Economics?’ (1989) 1 *Ecological Economics* 1, 1-7, 2.

¹⁶ Ibid, 2.

¹⁷ Ibid, 3.

¹⁸ Ibid, 2.

¹⁹ J. E. Tilton, ‘Exhaustible Resources and Sustainable Development’ (1996) 22 *Resources Policy* 1/2, 91-97.

²⁰ Costanza (1989), 4.

If, on the other hand, we pursue a pessimistic policy, the payoff is ‘moderate’ if optimists are right, and ‘tolerable’ if pessimists are right.

		Real State of the World	
		Optimists Are Right	Pessimists Are Right
Type of policy	Technological Optimist	HIGH GAINS	DISASTER
	Technological Pessimist	MODERATE GAINS	TOLERABLE HARM

Table 1. Payoff matrix for technological optimism vs. pessimism.²¹

In the absence of definite knowledge about what the real state of the world actually is, it appears from Costanza’s matrix that a technological optimistic policy cannot be pursued as the risk associated with it (‘disaster’) is far too great. On the other hand, if ‘tolerable’ is the worst possible result of a technological pessimistic policy, pessimism should undoubtedly prevail.

In effect, the two sciences – economics and ecology – have developed radically diverging views on both the state of the world and the type of policies that must be put in place. In other words, they operate under different *paradigms*.²² Ecological economics aims to reconcile the two disciplines and develop economic theories and instruments in line with the ecological sciences.²³

Ecological economics is based on the assumption that the economy is embedded in the environmental system and that economic inputs come not from the mind, but from the biosphere. Whereas neoclassical economics focuses on goods and services produced by human industries (*human-made capital*), ecological economics takes a much broader view of what constitutes human well-being than human-made stuff. This includes notably the value of goods and services provided by nature (*natural capital*), the sum of health, education and personal development (*human capital*), and the positive benefits of interpersonal relationships (*social capital*).^{24, 25} Mainstream economists are mainly concerned with maximizing personal utility and believe it is achieved primarily through market equilibrium and economic growth. Ecological economists, on the other hand, pursue three quite different goals, namely sustainable scale, just distribution, and efficient allocation.²⁶ Personal well-being encompasses more than

²¹ Adapted from Costanza (1989), 4.

²² Ibid, 2.

²³ Ibid, 1.

²⁴ K. Mulder, R. Costanza and J. Erickson, ‘The Contribution of Built, Human, Social and Natural Capital to Quality of Life in Intentional and Unintentional Communities’ (2006) 59 *Ecological Economics* 1, 13-23.

²⁵ There is a sixth form of capital, *financial capital*. See e.g. J. Gleeson-White, *Six Capitals: The revolution capitalism has to have – or can accountants save the planet?* (Sydney: Allen and Unwin, 2014).

²⁶ H. E. Daly and J. Farley, *Ecological Economics: Principles and applications*, 2nd edn (Washington: Island Press, 2011), 360.

material possessions, including also immaterial assets, so that the three goals benefit both humans and the environment.

3.2.3. Sufficiency or the revival of the steady state

The question of the size of the economy is essentially absent from conventional economics, but it is at the heart of ecological economics.²⁷ It relates to the need to limit human impacts within the planet's capacity that is *inter alia* the rate of natural resources extraction, of water and air emissions, of energy consumption and of waste production.

For Georgescu-Roegen, one of the main problem with neoclassical economists is that they wrongfully assume that technological innovations can always do away with scarcity.²⁸ Similarly, Daly wrote:

Technology is unable to rise above the basic laws of physics, so there is no question of ever 'inventing' a way to recycle energy.²⁹

Daly and other ecological economists highlight the need to move away from strategies that aim to reduce environmental harm by using resources more efficiently.³⁰ Rather, they argue, we must adopt policies that reduce consumption altogether.³¹ However, Galbraith was certainly one of the first to pose the question of the need for sufficiency. In an essay published in 1958, he wrote about our 'gargantuan and growing appetite' for materials as being the obvious yet mostly ignored point of departure for any discussion about environmental protection:³²

If we are concerned about our great appetite for materials, it is plausible to seek to increase the supply, to decrease waste, to make better use of the stocks that are available, and to develop substitutes. But what of the appetite itself? Surely this is the ultimate source of the problem. If it continues its geometric course, will it not one day have to be restrained? Yet in the literature of the resource problem, this is the forbidden question. Over it hangs a nearly total silence. It is as though, in the discussion of the chance of avoiding automobile accidents, we agree not to make any mention of speed.³³

²⁷ Daly and Farley (2011), 16-17.

²⁸ Georgescu-Roegen (1986), 11, citing H. Barnett and C. Morse, *Scarcity and Growth* (Baltimore: John Hopkins Press, 1963) as an example of economists rejecting scarcity.

²⁹ H. E. Daly, *Steady-State Economics*, 2nd edn (Washington, D.C.: Island Press, 1991), 23.

³⁰ See e.g. D. H. Meadows et al., *Limits to Growth: A report for the Club of Rome's project on the predicament of Mankind* (New York: New American Library, 1972), 164-171; E. F. Schumacher, *Small Is Beautiful* (New York: Harper and Row, 1973); H. E. Daly, 'The Steady-State Economy: Toward a political economy of biophysical equilibrium and moral growth', in H. E. Daly (Ed.), *Toward a Steady-State Economy* (San Francisco: W.H. Freeman & Company, 1973), 325-363; W. Johnson, *The Future Is Not What It Used to Be* (New York: Dodd, Mead, 1985); A. T. Durning, *How Much Is Enough?* (London: Earthscan, 1992); S. Hinchliffe, 'Missing Culture: energy efficiency and lost causes' (1995) 23 *Energy Policy* 1, 93-95; J. Lintott, 'Beyond the economics of more: The place of consumption in ecological economics' (1998) 25 *Ecological Economics* 3, 239-248.

³¹ In particular D. H. Meadows, D. L. Meadows and J. Randers, *Beyond the Limits* (London: Earthscan, 1992); B. Siebenhüner, 'Homo Sustinens: Towards a new conception of humans for the science of sustainability' (2000) 32 *Ecological Economics* 1, 15-25; P. M. Brown and L. D. Cameron, 'What Can be Done to Reduce Overconsumption?' (2000) 32 *Ecological Economics* 1, 27-41.

³² J. K. Galbraith, 'How Much Should a Country Consume?', in J. Henry (Ed.), *Perspectives on Conservation* (Baltimore: Resources for the Future/Johns Hopkins, 1958), 89-99, 91.

³³ Galbraith (1958), 92.

In reference to the dismal science defended by classical economists like Malthus, Daly proposed aiming for a steady-state economy defined notably by “constant stocks of physical wealth and a constant population”.³⁴ The first is to be maintained at a desirable level by a low rate of throughput that corresponds to the concept of sufficiency.³⁵

Others, like Jackson and Latouche, argue for a post-capitalist economy where economic growth and capitalistic accumulation are no longer the *raison d'être* of the society.³⁶ The idea of ‘degrowth’ or ‘*décroissance*’, put forward in particular by Latouche, not only challenges the prevailing pathways of technology and development,³⁷ but also asserts the need for downscaling of production and consumption and to foster “what we already have or have the potential to have.”³⁸

In essence, the idea of sufficiency is meant to reduce both production and consumption rates in absolute terms.³⁹ This requires changes in the functioning of the market, in the patterns of consumption as well as in the institutional context of the consumer society. Thus, consuming less requires not only an individual effort by every consumer, but also requires us to address the commoditization of the economy. Furthermore, sufficiency measures that would merely consist in an autonomous reduction in consumption (i.e. demand) of the wealthier consumers might in fact not lead to reduction in world aggregate consumption because it merely transferred the purchasing power to marginal consumers.⁴⁰ That is why sufficiency must look beyond consumption patterns and the foundations of the consumer society.

3.3. A circular model based on eco-efficiency

Various authors from different backgrounds – scientists, engineers, architects, entrepreneurs and philanthropists – have, since the 1970s, proposed moving away from the linear economic model and contributed to laying the foundations for the CE. Beyond criticizing the existing economic model, they proposed concrete ways to re-think and modify it. Rather than completely transforming the economy, however, they propose to bend it. The goal is eco-

³⁴ H. E. Daly, *From Uneconomic Growth to Steady-State Economy* (Cheltenham: Edward Elgar, 2014), 9.

³⁵ Ibid.

³⁶ K. Hobson and N. Lynch, ‘Diversifying and De-Growing the Circular Economy: Radical social transformation in a resource-scarce world’ (2016) 82 *Futures*, 15-25, 21; T. Jackson, *Prosperity without Growth: Economics for a finite planet* (London: Earthscan, 2009); S. Latouche, ‘Degrowth’ (2010) 18 *Journal of Cleaner Production* 6, 519–522.

³⁷ A. Escobar, ‘Degrowth, Postdevelopment, and Transitions: A preliminary conversation’ (2015) 10 *Sustainability Science* 3, 451-462.

³⁸ See Hobson and Lynch (2016), 21; Latouche (2010); and S. Latouche, *Le Pari de la Décroissance* (Paris: Fayard, 2006). See also Research and Degrowth (R&D), ‘Definition’ (2019) <www.degrowth.org/definition-2> accessed 25.03.2019.

³⁹ T. Princen, *The Logic of Sufficiency* (Cambridge: MIT Press, 2005).

⁴⁰ B. Alcott, ‘The Sufficiency Strategy: Would rich-world frugality lower environmental impact?’ (2008) 64 *Ecological Economics* 4, 770-786, 775. Moreover, the risk, mentioned by some authors, is that even if the rich reduce their consumption, the increasing consumption of the poor could be more environmentally damaging, see R. Goodland and H. E. Daly, ‘Environmental Sustainability: Universal and non-negotiable’ (1996) 6 *Ecological Applications* 4, 1002-1017, 1013; M. Binswanger, ‘Technological Progress and Sustainable Development: What about the rebound effect?’ (2001) 36 *Ecological Economics* 1, 119-132, 126.

efficiency that is “producing and consuming more goods and services, while using fewer resources and creating less waste and pollution.”⁴¹

3.3.1. Closing the loop

The first and main pillar of a circular economic model is to keep products and materials within the economy, hence avoiding excessive raw material extraction and waste production. An early account of the inadequacy of the existing economic model in light of the Earth’s actual limits is to be found in a short essay by Boulding under the provocative title, *The Spaceship Earth*. The Earth, he argued, is not an ‘illimitable plane’, but a ‘closed sphere’. The difference between an ‘open’ and a ‘closed’ system has great significance:

In a closed system, the outputs of all parts of the system are linked to the inputs of other parts. There are no inputs from outside and no outputs to the outside; indeed, there is no outside at all.⁴²

The closed economy – or ‘spaceman’ economy – Boulding argued, does not have “unlimited reservoirs of anything, either for extraction or for pollution”.⁴³ Therefore, a closed economy has to be capable of reproducing materials rather than continuously drawing on natural capital. Economists, in particular, he felt, had failed to understand the consequences of the Earth as a closed system. He was joined in that conclusion by Pearce and Turner who replaced the ‘open’ linear economy with the term ‘circular economy’, which they use to describe the real interaction between the environment and the economy.⁴⁴

Achieving sustainability requires, Meadows et al. put forward in the famous *Limits to Growth* report, notably that the industrial capital be maintained in used, repaired and recycled, and that the average lifetime of industrial capital be increased, i.e. through “better design for durability and repair and less discarding because of obsolescence.”⁴⁵ A few years later Stahel and Reday-Mulvey submitted a report to the EU entitled *Substituting Manpower for Energy*, in which they promoted similar ideas. They argued for putting in place an economy of loops for materials and products.⁴⁶ According to the authors, introducing new recycling and reconditioning loops, coupled with the substitution of labour for energy, would both create jobs and make energy savings.⁴⁷ This is because it takes more labour and fewer resources to refurbish a building or remanufacture a mobile phone than to build or produce new ones.⁴⁸

⁴¹ Boulanger (2010), 5. In EU official documents, this strategy is often referred to as ‘resource efficiency’; see e.g. Commission Communication, ‘Closing the loop - An EU action plan for the Circular Economy’, COM(2015) 614 final. The idea is essentially the same.

⁴² K. E. Boulding, ‘The Economics of the Coming Spaceship Earth’, in H. Jarrett (Ed.), *Environmental Quality in Growing Economy* (Baltimore: Resources for the Future/Johns Hopkins University Press, 1966), 3-14.

⁴³ Ibid.

⁴⁴ D. Pearce and R. K. Turner, *Economics of Natural Resources and the Environment* (Baltimore: Johns Hopkins University Press, 1990), 29ff.

⁴⁵ Meadows et al. (1972).

⁴⁶ W. R. Stahel and G. Reday-Mulvey, *Jobs for Tomorrow: The substitution of manpower for energy* (New York: Vantage Press, 1981), 70.

⁴⁷ Ibid.

⁴⁸ W. R. Stahel, ‘Circular Economy’ Comment (2016) 531 *Nature*, 435-438.

Following on from this work, Stahel published in 1982 a paper entitled *The Product-Life Factor* where he describes the loop economy as the ultimate sustainable business model.⁴⁹ He advances the idea of extending the use-life of goods by creating loops of reuse, repair, reconditioning and recycling, and insists on the business opportunities of such activities for the private sector. The economy has to shift from the traditional production-based model, Stahel argues, to a performance-based model. In order to help businesses to embrace this approach, he developed new metrics in the form of indicators of performance production, performance management and performance sales.⁵⁰ According to Stahel:

Circular-economy business models fall in two groups: those who foster reuse and extend service life through repair, remanufacture, upgrade and retrofits; and those that turn old goods into new resources by recycling the materials.⁵¹

The traditional approach of manufacturers towards used products has been to ignore them, allowing them to become an economic and environmental burden on society. There needs to be a change of attitude among companies towards used products, in the opinion of Thierry et al. They describe in a paper from 1995 the large opportunities that would arise from greening business policy and embracing product recovery.⁵² This undoubtedly requires a fundamental change of policy. To the basic linear supply chain diagram – from natural resource extraction to final sale – a whole set of recovery processes are to be added in a flow that originates from the users and moves essentially backwards to the various levels of production. The notion of a reverse supply chain was born.

Whereas a (*forward*) *supply chain* typically consists of a network of suppliers, factories, distributors and clients, a *reverse supply chain* is made up of users of used products, collection, sorting and reprocessing centres.⁵³ A reverse supply chain includes typically five key stages:⁵⁴

- 1) *product acquisition* – obtaining the used products from the end-users;
- 2) *reverse logistics* – transport from the collection point to inspection, sorting and disposition facilities;
- 3) *inspection and disposition* – returned products are inspected to determine the most attractive reprocessing action;

⁴⁹ W. R. Stahel, 'The Product-Life Factor', in S. G. Orr (Ed.), *An Inquiry Into the Nature of Sustainable Societies: The role of the private sector* (Houston: HARC, 1982), 72– 96.

⁵⁰ W. R. Stahel, 'The Performance Economy: Business models for the functional service economy', in K. B. Misra (Ed.), *Handbook of Performability Engineering* (London: Springer, 2008), 127-138, 128.

⁵¹ Stahel (2016), 435.

⁵² M. Thierry et al., 'Strategic Issues in Product Recovery Management' (1995) 37 *California Management Review* 2, 114-135, 115.

⁵³ R. Le Moigne, *L'économie Circulaire* (Paris: Dunod, 2014), 66.

⁵⁴ See V. D. R. Guide, T. Harrison and L. N. Van Wassenhove, 'The Challenge of Closed-Loop Supply Chains' (2003) 33 *Interfaces* 6, 3-6; see also J. D. Blackburn et al., 'Reverse Supply Chains for Commercial Returns' (2004) 46 *Harvard Business Review* 2, 6-22, 7-8; and also K. Govindan, H. Soleimani and D. Kannan, 'Reverse Logistics and Closed-Loop Supply Chain: A comprehensive review to explore the future' (2015) 240 *European Journal of Operational Research* 3, 603–626.

- 4) *recovery*⁵⁵ – creating slightly inferior products for second-hand markets (repair and reconditioning), returning the product to original specifications (remanufacturing), extracting raw materials or parts (recycling), or disposing of some parts; and
- 5) *remarketing and resale* – creation of markets for reprocessed products and materials.

The next natural step consists in connecting the forward supply chain to the reverse supply chain, to form a *closed-loop supply chain* as per Figure 5.

Figure 5. Closed-loop supply chain.

The open-source movement, *Blue Economy*, initiated by Gunter Pauli in 2004, complies with efforts to close the loop. It displayed innovations and designs for new business solutions that use resources available in cascading systems with waste of one product acting as input to another to create a new cash flow.⁵⁶ These solutions are to be determined by the ecological characteristics of the local environment. They also emphasise the use of gravity as the primary source of energy.

An eponymous report to the Club of Rome from 2010 presents 100 of these solutions.⁵⁷ One example concerns the use of carbon dioxide, a major source of air pollution, especially from transport and manufacturing, in the production of plastics. CO₂-based polymers could be used in a wide range of applications including thermoplastics, binders, electronics, coatings, surfactants and foams.⁵⁸ Other examples of making products differently feature biodegradable plastics derived from food waste, batteries from wood residues, or shoes from nettles and cocoons.⁵⁹

This is also the rationale of EMF, which focuses on creating value based on the four following propositions:

⁵⁵ For more detail definitions of the various recovery processes, see A. King et al., 'Reducing Waste: Repair, recondition, remanufacture or recycle?' (2006) 14 *Sustainable Development* 4, 257-267 and Thierry et al. (2016).

⁵⁶ See the manifesto of the Blue Economy movement, <www.theblueeconomy.org/> accessed 25.03.2019.

⁵⁷ G. A. Pauli, *The Blue Economy: 10 years, 100 innovations, 100 million jobs. Report to the Club of Rome* (Taos, New Mexico: Paradigm Publications, 2010).

⁵⁸ Pauli (2010), case 87.

⁵⁹ Ibid, cases 20, 63 and 92.

- 1) *power of the inner circle* according to which the tighter the circles, the larger the savings;
- 2) *power of circling longer* that requires materials to either go through more consecutive cycles or by spending more time within a cycle;
- 3) *power of cascaded use and inbound substitution* which consists in making use of discarded materials from one value chain to replace virgin material inflow in another;
- 4) *power of non-toxic and easy-to-separate elements* that are meant to avoid degradation at the post-consumer stage and increase high value recovery.⁶⁰

Closing the industrial loop is crucial. However, industries do not function in a vacuum, and many factors can affect the ideal vision of the closed-loop supply chain. In particular, one should keep in mind Georgescu-Roegen's warning about the implication of the entropy law for the economy: matter and energy tend towards degradation.⁶¹ A completely closed-loop economy is only possible in theory. In reality, there has to be output from, and hence input to, the natural environment. A system of loops does not, in itself, guarantee keeping within the planetary boundaries. A safe operating space is one in which both inputs and outputs do not exceed in volume or in toxicity nature's regenerative and assimilative capacity.

3.3.2. Redesigning design

Design is obviously a fundamental element of the CE. In 1996, Lyle published *Regenerative Design for Sustainable Development*⁶² in which he introduced the idea of a system that produces no waste, but where products constantly regenerate themselves and are used to create something new. Regenerative design places nature back at the core of every industrial process, whether by using directly its assets (preferring for example agricultural pests to chemical pesticides) or as a model (sewage treatment systems that mimic the assimilative process of natural wetlands).⁶³ Contrary to current technologies that tend to be large-scale, standardised and all-encompassing, "regenerative technologies are relatively small in scale and suited to specific applications under particular circumstances."⁶⁴ With regards to energy production, this is the difference between large fossil fuel or nuclear power plants that feature one-way flows from the producer to the consumers, and energy generated from renewable sources which may be installed next to the consumption point or by the consumers themselves (e.g. photovoltaic panels on the roof of private houses).⁶⁵

The current lack of understanding of the Earth system has led to absurd and overcomplicated technological solutions, such as the process of generating electricity from a nuclear reactor to

⁶⁰ The Ellen MacArthur Foundation (EMF), 'Towards the Circular Economy Vol. 1: An economic and business rationale for an accelerated transition' (2012) <www.ellenmacarthurfoundation.org/assets/downloads/publications/Ellen-MacArthur-Foundation-Towards-the-Circular-Economy-vol.1.pdf> accessed 25.03.2019, 30-32.

⁶¹ See 3.2.1 above.

⁶² J. T. Lyle, *Regenerative Design for Sustainable Development* (New York: Wiley & Sons, 1996). In chapter 3 (*Strategies for Regenerative Design*), Lyle lists 11 design strategies that exemplify what regenerative design is about. This section only reviews those that, in the author's opinion, are most representatives of the concept.

⁶³ EMF (2012), 38-39.

⁶⁴ Ibid, 42.

⁶⁵ Ibid, 42.

heat houses. In Lovins's words, this amounts to "cutting butter with a chainsaw."⁶⁶ Regenerative design must rethink and redefine the purpose and use of technology so that it fits both human needs and environmental limitations. It must develop technology that seeks optimum levels, rather than maximising one goal at the expense of others.⁶⁷

In the same vein, McDonough and Braungart challenged the way products are being made since the industrial revolution; that is with only their use in mind. As a result, these products, once consumed, become waste. Worldwide, waste is primarily disposed of in landfills or burnt. Recycling is becoming more and more frequent, but the recycling is usually synonymous to *downcycling* – i.e. turned into lower quality products than the original. The 'cradle-to-cradle' design, on the contrary, aims at making products with their afterlife the primary concern. It aims at *upcycling* – i.e. to create a product of higher quality or value than the original. For the authors of *Cradle-to-Cradle*, it should be possible to design away waste so that 'waste equals food'.⁶⁸ That is, every product is reused perpetually; biomaterials go back to the biosphere and regenerate, and technical products remain within the economy.

The idea that design can solve all problems is, however, disputable. Indeed, even though the theory seems very appealing, several flaws appear in reality. First, as discussed in 3.2.1 above, 100 per cent closed loop recycling does not appear to be thermodynamically practical. Moreover, closing cycles requires all materials to be recovered at the end of their life, requiring proper incentives for individual consumers, putting in place strong collection systems and avoiding waste scavenging. Addressing all these aspects requires more than a change in product design, and may even indirectly lead to greater environmental impacts during another phase of the product's life cycle. Llorach-Massana et al. write:

The full waste recovery would require an extraordinary increase of transport and management of goods that are associated with higher energy consumption. The energy requirements may result in a scenario where materials' management for closing nutrient cycles could represent a higher environmental impact than other waste management solutions.⁶⁹

Second, the idea that biological nutrients are necessarily 'healthy waste' seems problematic. Reijnders contends that natural substances can be hazardous to other organisms, and large discharges can even lead to ecological catastrophes.⁷⁰ The complexity of ecological systems does not match the sometimes-simple design responses. For example, Bagnart et al. put forward a design solution where an ice cream wrapper designed to contain seeds so that when it was thrown away, it would support the growth of plant life. The introduction of species into the natural environment is always a risk. Biotic invasions may occur and prove very adverse.

⁶⁶ B. Lovins, 'Energy Strategy: The road not taken?' (1976) *Foreign Affairs* October Issue, 65-96, 70.

⁶⁷ Lyle (1996), 40.

⁶⁸ W. McDonough and M. Braungart, *Cradle to Cradle: Remaking the way we make things* (New York: North Point Press, 2002), 92ff.

⁶⁹ P. Llorach-Massana, R. Farreny and J. Oliver-Solà, 'Are Cradle to Cradle Certified Products Environmentally Preferable? Analysis from an LCA approach' (2015) 93 *Journal of Cleaner Production*, 243-250, 245.

⁷⁰ L. Reijnders, 'Are Emissions or Wastes Consisting of Biological Nutrients Good or Healthy?' (2008) 16 *Journal of Cleaner Production* 10, 1138-1141.

Invaders can alter fundamental ecological properties, affect ecosystems' physical features, change nutrient cycling, and disturb plant productivity.⁷¹

Third, the cradle-to-cradle approach addresses production, and requires in particular designs facilitating sustainability. It does not, however, aim to change consumption habits. On the contrary, the cradle-to-cradle concept promotes infinite economic and production growth. McDonough and Braungart claim that proper design will allow the abundance society to live on.⁷² As the worldwide population keeps growing, even with 100 per cent closed material cycles, virgin natural resources would be required to meet the resulting demand for material consumption.

Finally, by focusing on production and the materials used to make products, the cradle-to-cradle approach seems to neglect some very important phases of a product's life cycle, transportation and use. Yet, for many goods, the use phase has the most impact on the environment.⁷³ From vehicles to white goods, the energy and water used during consumption are far from insignificant compared to that of the manufacturing and waste management phases.⁷⁴ Also, the current economic and societal paradigm leads to consumption behaviour that is incompatible with sustainability, even if the object of the consumption is designed for sustainability. Consumers do not form the homogeneous group of rational individuals on which economists have long based their models. The variation in motivations behind consumer choice depend on circumstances as important as financial resources, education, family circumstances, health or geographical location.⁷⁵

These criticisms might be usefully summarised as follows: design for sustainability is desirable as long as it takes into account the entire product life cycle, integrates the natural constraints and limitations, aims at reducing overall product and material consumption, and is integrated with measures that ensure the product can perform in accordance with its design objective.

3.3.3. Service as the new product

Achieving a circular economy is not only a product-related issue; it is also about services. Stahel was early to point out that a *performance economy* (or functional service economy) – characterised notably by selling services rather than products – creates wealth with less resource consumption, and internalises the costs of risk and of waste.⁷⁶ McDonough and Braungart also depict a scenario where, instead of having products being bought, owned, and disposed of by 'consumers', the service of those products is purchased by 'users' for a defined period of time

⁷¹ R. N. Mack et al., 'Biotic Invasions: Causes, epidemiology, global consequences, and control', 10 *Ecological applications* 3, 689-710.

⁷² M. Braungart, W. McDonough and A. Bollinger, 'Cradle-to-Cradle Design: Creating healthy emission – A strategy for eco-effective product and system design' (2007) 15 *Journal of Cleaner Production* 13-14, 1337-1348.

⁷³ Llorach-Massana, Farreny and Oliver-Solà (2015).

⁷⁴ C. Dalhammar, 'Promoting Energy and Resource Efficiency through the Ecodesign Directive' (2014) 59 *Scandinavian Studies In Law*, 147-179, 149.

⁷⁵ More about consumers in 5.5 below and ARTICLE 5.

⁷⁶ W. R. Stahel, *The Product Performance*, 2nd edn (London: Palgrave-MacMillan, 2010), 85.

at the end of which manufacturers – who retain ownership of the materials – recover them and use them to create new products.⁷⁷

In recent decades, manufacturers have been increasingly inclined to add services to their core offerings. This trend, often referred to as *servitisation*, consists in a transaction the value of which comes from a combination of products and services.⁷⁸ It goes from offering services around the purchased products, such as maintenance services or service support, to clients (e.g. system training), to selling the output of the product (e.g. light, a wash) instead of the product itself (light bulb, washing machine). Hence, replacing a product by a service would have the potential for delinking environmental pressure from economic growth.⁷⁹

There appears, however, to be no guaranteed correlation between the purchase of a service (rather than a product) and environmental benefits such as reduced energy and raw material use. A study from Tukker showed that some types of product-service systems (PSS)⁸⁰ (e.g. product lease) may increase the environmental impact as a result of less responsible user behaviour.⁸¹ Moreover, a PSS does not necessarily have positive waste effects just because it is product-oriented, use-oriented, or result-oriented. Other aspects, such as prevailing consumer behaviours and waste infrastructures for collection and processing, are key to ensuring the sustainable nature of PSSs.⁸²

3.3.4. The limits of the eco-efficiency strategy

From the above examination of various eco-efficiency strategies we can identify four main limitations. The first two are those put forward by Georgescu-Roegen and other ecological economists, i.e. the continuing pursuit of growth that goes against the rules of thermodynamics, and the excessive faith in technological innovation.⁸³ These issues will be discussed again in the context of the EU policy on the CE in Chapter 4 and Chapter 5.

A third shortcoming of the eco-efficiency approaches discussed above, which is rooted in the neoclassical paradigm, is the limited role of the state. One characteristic of the eco-efficiency strategy, Boulanger suggested, is the trust in market.⁸⁴ That is, the mainstream economic belief that, if markets function well, they will provide the best possible outcome. Hence, the role of the state is primarily that of an enabler. This does not mean that it is absent, on the contrary. Market-based, barrier-removing, incentive-providing regulations have flourished. Regulating techniques have, and this is a crucial point, become ‘smarter’: using instrument mixes, targeting

⁷⁷ The words ‘consumers’ and ‘customers’ are in quotation marks to highlight the difference between the ‘consumption’ and the ‘use’ of products. McDonough and Braungart (2002), 111.

⁷⁸ S. Vandermerwe and J. Rada, ‘Servitization of Business: Adding value by adding services’ (1998) 4 *European Management Journal* 6, 314–24.

⁷⁹ M. Goedkoop et al., ‘Product Service Systems, Ecological and Economic Basics’ (1999) Report No. 1999/36 submitted to the Dutch Ministries of Environment (VROM) and Economic Affairs (EZ), March, 22–25.

⁸⁰ A PSS is a marketable set of both products and services, which is offered with the aim of achieving environmental benefits.

⁸¹ A. Tukker, ‘Eight Types of Product–Service System: Eight ways to sustainability? Experiences from SusProNet’ (2004) 4 *Business Strategy and the Environment* 13, 246–260.

⁸² H. Corvellec and H. Stål, ‘Evidencing the Waste Effect of Product-Service Systems (PSSs)’ (2017) 145 *Journal of Cleaner Production*, 14–24.

⁸³ See 3.2 above.

⁸⁴ Boulanger (2010), 5.

the most effective way to achieve a goal, empowering third parties and aiming at encouraging businesses to go ‘beyond compliance’.⁸⁵ Some, like ecodesign requirements, have in fact been quite successful.⁸⁶ However, this type of governance remains one that aims to facilitate ‘competitiveness’ and ‘create new business opportunities’.⁸⁷ It does not fundamentally seek to break the cycle of ‘profits-investments-commodities-profits’ that generates economic growth and relies on the commoditization of the economy.⁸⁸

Finally, eco-efficiency strategies are hampered by unforeseen limits known as ‘rebound effects’.⁸⁹ Rebound effects account for the fact that eco-efficiency improvements do not necessarily lead to equivalent reductions in consumption of the resource concerned and can even trigger an increase in use.⁹⁰ For instance, outcomes not spent in fuelling cars due to increases in the energy efficiency of car engines (mileage per gallon) have led to higher mileage/car.⁹¹ In sum, even if eco-efficiency improvements can bring a relative decoupling of growth by minimizing environmental inputs per unit of GDP, they will not necessarily translate into ‘absolute decoupling’.

For all these reasons, eco-efficiency strategies cannot on their own achieve the goal of a ‘safe operating space for humanity’.

3.4. Intermediary conclusions

In this chapter, I introduced the two main features of the new paradigm: sufficiency and eco-efficiency. In breaking from traditional reasoning, ecological economists rooted their thinking in ecology and placed the two laws of thermodynamics at the core of their new theoretical framework. As a result in particular of the law of entropy (or second law of thermodynamics), ecological economics imbues objects with the rationale that the economy can grow exponentially and continuously. Policies based on the ecological paradigm must, first and foremost, aim at preventing the scale of the economy from exceeding the planetary boundaries. In the face of the current crisis, it is clear that maintaining the scale is not enough, but achieving an absolute reduction in energy and material throughput is essential. This, in essence, is the rationale of sufficiency.

The other important feature of the new paradigm is eco-efficiency. The point of departure here is Boulding’s image of the Earth as a spaceship. The mainstream understanding of the CE –

⁸⁵ N. Gunningham and D. Sinclair, ‘Designing Environmental Policy’, in N. Gunningham, P. Grabosky and D. Sinclair (Eds.), *Smart Regulation: Designing environmental policy* (Oxford: Oxford University Press, 1998), 375-454, 387.

⁸⁶ M. Jänicke, ‘Ecological Modernisation: New perspectives’ (2008) 16 *Journal of Cleaner Production* 5, 557-565, 560; see discussion at 5.4 below.

⁸⁷ See e.g. COM(2015) 614 final.

⁸⁸ Boulanger (2010), 8.

⁸⁹ H. Herring and S. Sorrell (Eds.), *Energy Efficiency and Sustainable Consumption: The rebound effect* (Basingstoke: Palgrave MacMillan, 2009).

⁹⁰ Boulanger (2010), 5.

⁹¹ R. Schettkat, ‘Analyzing Rebound Effects’ (2009) *Wuppertal Papers* 177, Wuppertal Institute for Climate, Environment and Energy; K. Small and K. Van Dender, ‘The Effect of Improved Fuel Economy on Vehicles Miles Traveled: Estimating the rebound effect using state data, 1966-2001’ (2005) *University of California Energy Institute’s (UCEI) Energy Policy and Economics*, Working Paper 014.

notably that of the EU – is clearly anchored in this second approach, which essentially aims to ‘do better with less’. Various approaches to achieving efficiency have been presented in this chapter as well as some of their shortcomings. The main problems with the eco-efficiency strategy are: 1) the lack of questioning of the growth model in spite of its manifest contradiction with the law of entropy; 2) an overconfidence in technological innovation and in markets to find solutions; 3) the role of the state is essentially limited to removing barriers to market efficiency; and 4) the rebound effect.

Chapter 4. Towards an ecological paradigm for EU law

“There is no single concept of nature; it embraces everything that is fluid, changing, and mysterious. Ultimately, however, to “know nature” on earth is to live within it and to revere it in every way.”

— Carolyn Merchant

*Autonomous Nature: Problems of Prediction and Control
from Ancient Times to the Scientific Revolution, 2015*

4.1. Introductory remarks

This chapter discusses the need to – and meaning of a – shift towards ecological law, not unlike the way in which ecological economics aims to transform traditional economic thinking.¹ Just as environmental economics has developed as part of the neoclassical economic tradition, environmental law has largely adhered to the anthropocentric and materialistic view of the society:

Environmental law is rooted in modern Western law with its origins in religious anthropocentrism, Cartesian dualism, philosophical individualism and ethical utilitarianism.²

In spite of the adoption of a plethora of environmental laws, humanity continues to degrade the environment. Environmental efforts in the legal field in the last fifty years have been crucial, but much remains to be done to change the paradigm altogether. Establishing an ecological law will require exposing the current paradigmatic shortcomings and ploughing new ground, as well as recognizing the value of existing legal measures and extracting them from the framework of the ‘dominant values of modernity’, like anthropocentrism, materialism, and short-termism.³

In 2015, the EU Commission put forward an Action Plan for the CE (hereafter ‘CE Action Plan’) that aimed to transform the economy and “develop a sustainable, low carbon, resource efficient and competitive economy”.⁴ In this chapter, I discuss two broad and related concepts – i.e. sustainability and integration – which, if taken seriously, would anchor a circular economic model within the ecological law paradigm, and I compare them with the EU’s vision of the CE. From this macro perspective, I move in Chapter 5 to a more micro level analysis of

¹ As per Chapter 2 (about traditional economic) and section 3.2 (about ecological economics).

² Oslo Manifesto for Ecological Law and Governance, ‘From Environmental Law to Ecological Law: A call for re-framing law and governance’ (2016) <www.elga.world/oslo-manifesto/> accessed 25.03.2019, III.

³ Ibid, VIII.

⁴ Commission Communication, ‘Closing the Loop - An EU action plan for the circular economy’, COM(2015) 614 final.

the holistic approach to product regulation of legal measures to promote eco-efficiency⁵ and sufficiency,⁶ and the need to regulate consumption.

After an introduction and general discussion of the two paradigms (4.2) the chapter explores the concept of sustainability, its meaning and the EU's approach to it (4.3). The section considers in particular the integration principle while arguing that proper integration requires the objective of remaining within the ecological ceiling to prevail over other considerations and form a *de minimis* rule. The following section (4.4) considers the CE Action Plan and how it fits within the ecological approach to sustainability. Finally, in light of the findings Chapter 3 and the current chapter, a definition of CE is put forward that is in line with the ecological paradigm, but varies notably from the way the EU describes it (4.5).

4.2. Towards a new legal paradigm for EU law

4.2.1. Shortcomings and evolution of EU environmental law

The EU was born on the ashes of the Second World War and flourished in the rapid economic expansion that followed. Peace and economic growth were the two goals that brought six, and eventually twenty-eight nation-states to share their resources and transfer part of their sovereignty to a supra-national entity. The origins of the European Community (EC) are intrinsically economic, as established by the founding Treaty of Rome in 1957:

The Community shall have as its task, by establishing a common market and progressively approximating the economic policies of Member States, to promote throughout the Community a harmonious development of economic activities, a continuous and balanced expansion, an increase in stability, an accelerated raising of the standard of living and closer relations between the States belonging to it.⁷

At the time, the Treaty did not contain any formal legal basis for environmental policy.⁸ The onset of a common environmental policy occurred in the context of the famous *Limits to Growth* report by the Club of Rome⁹ and the UN Conference on the Human Environment held in Stockholm in 1972.¹⁰ The adoption by the European Commission of the first Environmental Action Programme (EAP)¹¹ in 1973 was eventually followed by the inclusion of a formal legal basis for environmental policy in the 1986 Single European Act.¹²

⁵ I.e. producing and consuming more goods and services, while using fewer resources and creating less waste and pollution; see 3.3 above.

⁶ I.e. absolute reduction in production and consumptions; see 3.2 above.

⁷ Treaty establishing the European Economic Community, signed in Rome on 25 March 1957 and entered into force on 1 January 1958, Article 2.

⁸ I. von Homeyer, 'The Evolution of EU Environmental Governance', in J. Scott (Ed.), *Environmental Protection: European law and governance*, 1-26, 2.

⁹ Meadows D. H., D. L. Meadows, J. Randers and W. W. Behrens III, *Limits to Growth: A report for the Club of Rome's project on the predicament of Mankind* (New York: New American Library, 1972).

¹⁰ UN General Assembly, United Nations Conference on the Human Environment, 15 December 1972, A/RES/2994.

¹¹ Council Declaration of 22 November 1973 on the programme of action of the European Communities on the environment (hereafter 'First EAP'), OJ C 112, 20.12.1973, p. 1.

¹² Single European Act, OJ L 169, 29.6.1987, p. 1, Articles 130r-130t.

Initially, EU environmental law developed in response to industrial pollution in the form of air emissions, water discharges and waste dumping.¹³ Regulating point source pollution, that is pollution from a single, identifiable source, was a relatively straightforward enterprise. From neoclassical economic deliberations about the opportunity of governmental intervention to correct market failures of externalities,¹⁴ the law-and-economics literature went on to put forward different approaches to environmental regulation, in particular command-and-control and market-based approaches.¹⁵ The EU adopted the first approach to industrial emissions, imposing notably emission limit values and monitoring procedures.¹⁶ The second approach forms the basis of most of the EU's current waste legislation. The extended producer responsibility, anchored in the polluter-pays principle, requires producers to pay for the management of their waste products.¹⁷ In other words, they have to internalize what it costs to implement the environmental measures necessary to prevent damage from their products becoming waste. Other legal measures include waste targets whereby a certain percentage of waste (calculated by waste streams) should be recycled.¹⁸

The rise of non-point sources of pollution challenged traditional environmental responses.¹⁹ Products are a typical example of non-point source pollution. Product environmental damage is caused by a variety of activities, notably raw natural resources extraction, manufacturing processes, transport, use and disposal, that have no specific point of discharge. The breadth of possible damage goes from land use change and destruction of biodiversity, energy and water usage, to emissions discharge and waste generation. How does one then identify the polluter? Is it the manufacturer, the supplier, the consumer or the entity in charge of waste management, or is it all of them?

The EU resumed developing legislation on waste management and industrial emissions, and completed the legal framework with measures on emissions from transport vehicles,²⁰ on chemicals used in the manufacturing process,²¹ on harvesting of raw natural resources,²² and on the energy use related to consumption.²³ At the same time, the throwaway society prospered. A larger number of mass-produced, low quality, short-lived products, the large majority produced

¹³ First EAP.

¹⁴ See 2.3 above.

¹⁵ E. Maitre-Ekern, 'The Choice of Regulatory Instruments for the Circular Economy', in K. Mathis and B. Huber (Eds.), *Environmental Law and Economics* (Cham: Springer, 2017).

¹⁶ Directive 2010/75/EU of 24 November 2010 on industrial emissions (integrated pollution prevention and control), OJ L 334, 17.12.2010, p. 17.

¹⁷ Directive 2008/98/EC of 19 November 2008 on waste, OJ L 312, 22.11.2008, p. 3–30, Article 8.

¹⁸ Ibid, Article 11.

¹⁹ See 2.3 above; see also N. Campbell et al., *Diffuse Pollution: An introduction to the problems and solutions* (London: IWA Publishing, 2004), 6-7.

²⁰ E.g. Directive 98/70/EC of 13 October 1998 relating to the quality of petrol and diesel fuels, OJ L 350, 28.12.1998, p. 58.

²¹ E.g. Directive 2011/65/EU of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS), OJ L 174, 1.7.2011, p. 88; and Regulation (EC) 1907/2006 of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, OJ L 396, 30.12.2006, p. 1.

²² E.g. Regulation (EU) 995/2010 of 20 October 2010 laying down the obligations of operators who place timber and timber products on the market, OJ L 295, 12.11.2010, p. 23.

²³ Directive 2009/125/EC of 21 October 2009 on establishing a framework for the setting of ecodesign requirements for energy-related products (hereafter 'Ecodesign Directive'), OJ L 285, 31.10.2009, p. 10.

in countries, like China and India, with poor labour conditions, proceeded to flood the European market. The average European consumer acquired an ever larger number of items, in particular electronic products and clothes, which fashions and advertising quickly rendered obsolete prompting their rapid replacement by newer items. Repair shops slowly started disappearing because of lack of access to spare parts and information, low reparability of products, or low sale prices.²⁴

From adopting end-of-pipe sectoral measures to mitigate ‘direct’ sources of pollution – emissions, waste, energy production – the EU started considering the common source of damage – i.e. products – from a more comprehensive perspective.²⁵ Taking a life-cycle approach to products marked the beginning of a more holistic approach to environmental regulation, whereby any improvements made at one stage of a product’s life cycle must not create or increase damage at another stage. With the CE, the EU moved even further away from a traditional environmental paradigm, and addressed fundamental problems such as products’ durability and reparability.²⁶ However, EU’s environmental laws on products, although they have moved from being essentially reactive to preventive, are rarely precautionary.²⁷ Yet, in the face of both the grave danger facing humanity from environmental degradation and the uncertainty about the possibilities of living and flourishing within the planetary boundaries, precaution should be at the core of legal policy-making.

4.2.2. A legal paradigm based on ecology

As per Kate Raworth’s doughnut (see Figure 6), the ‘safe and just space for humanity’ allows the economy to operate within the upper and lower thresholds of respectively the ecological ceiling (i.e. the limits of the Earth’s assimilative and regenerative capacity) and the social foundation (which guarantees the basic conditions for human life).

²⁴ European Parliament, Committee on the Internal Market and Consumer Protection, Report of 9 June 2017 on a longer lifetime for products: benefits for consumers and companies (2016/2272(INI)), see Explanatory Statement.

²⁵ Commission Communication, ‘Integrated Product Policy – Building on environmental life-cycle thinking’, COM(2003) 302 final.

²⁶ See ARTICLE 3.

²⁷ Except for hazardous substances (see e.g. Directive 2011/65/EU of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (‘RoHS’), OJ L 174, 01.07.2011, p. 88; and Regulation (EC) 1907/2006 of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (‘REACH’), establishing a European Chemicals Agency, OJ L 396, 30.12.2006, p. 1.).

Figure 6. The Doughnut of social and planetary boundaries (Kate Raworth, 2017)

Within this framework, the role of the law is to organise that safe space and ensure its continuation. Ecological integrity is the predominant element, which constrains human and economic development. Law is not a discipline *sui generis*, but an extension of ecology.²⁸ A viable ‘human–Earth’ relationship requires law to aim primarily at “articulating the conditions for the integral functioning of the Earth process”.²⁹ Ecological law is to be rooted in ecological science and the laws of nature.³⁰ In the words of Johan Rockström et al., a “novel and adaptive governance approach” must reflect the biophysical processes of the Earth system and respect the planet’s ‘rules of the game’, because

The thresholds in key Earth System processes exist irrespective of peoples’ preferences, values, or compromises based on political and socioeconomic feasibility, such as expectations of technological breakthroughs and fluctuations in economic growth.³¹

For Cormac Cullinan, legal thinking needs to adopt an Earth-centred approach in contrast to the anthropocentric approach of mainstream legal thinking.³² His *Wild Law* is built on the premise that the law must reflect the functioning of the natural environment, which it intends to govern.³³ He adds:

Reforming the national legislation and entering into new international agreements will be insufficient unless those are done on the basis of a new understanding that the essential

²⁸ T. Berry, *The Great Work: Our way into the future* (New York: Bell Tower, 1999), 81.

²⁹ Ibid, 61.

³⁰ G. Garver, ‘The Rule of Ecological Law: The legal complement to degrowth economics’ (2013) 5 *Sustainability*, 316–337, 318; D. R. Boyd, ‘Sustainability Law: (R)Evolutionary directions for the future of environmental law’ (2004) 14 *Journal of Environmental Law and Practice* 14, 357–385.

³¹ J. Rockström et al., ‘Planetary Boundaries: Exploring the safe operating space for humanity’ (2009a) 14 *Ecology and society* 2, 32–65, 37.

³² C. Cullinan, *Wild Law*, 2nd edn (White River Junction: Chelsea Green Publishing, 2011), 28.

³³ Ibid, 29.

purpose of human governance systems should be to support people to play a mutually enhancing role within the community of life on Earth.³⁴ (*emphasis is original*)

The rules of thermodynamics are at the heart of ecological thinking.³⁵ As per the first rule, in the biosphere, nothing is created, and nothing disappears.³⁶ Everything that is made by humans comes from nature, and everything that is discarded returns to nature. In accordance with the second rule, the sum of all energy and matter available on Earth necessarily decreases over time due to entropy.³⁷ In short, this means that production processes necessarily include natural resources and that emissions and waste do not vanish. In addition, the more we produce using natural resources, the less resources will be available in total in the future.

Generally, environmental law has developed as a subfield of law. Environmental protection was the task of environmental authorities and focused on addressing environmental problems. Hence, environmental laws were essentially end-of-pipe and adopted after the damage made itself known.³⁸ The reality is, however, that every policy that regulates one or another activity involving the use of natural resources or of discarding matter or energy has an impact on the environment. Measures governing the import on the market of raw materials, components or finished products, regulating the purchasing of goods by public authorities, or ensuring the protection of consumers in the context of online purchasing, all have consequences on the environment. Those measures may aim to prevent economic discrimination and guarantee the cost-effective use of (public or private) financial resources or, on the other hand, may focus on ensuring that economic activities and transactions have as little environmental impact as possible.

In short, in the EU, environmental law has striven to introduce considerations for natural ecosystems into a legal framework that primarily seeks to ensure the proper functioning of the market and economic activities.³⁹ The aim of ecological law should be, however, to guarantee that human and economic activities develop within the ecological frame and for the purpose of establishing a safe operating space.⁴⁰ Put differently, whereas environmental law aims at *minimizing* harm to the environment, the essence of ecological law is about *maximizing* harmony between human endeavours and the natural environment.⁴¹ Above all, it aims to question the need for harm.

³⁴ Ibid.

³⁵ See 3.2.1 above.

³⁶ R. Costanza et al., *An Introduction to Ecological Economics*, 2nd ed (Boca Raton: CRC Press, 2015), 34.

³⁷ Ibid.

³⁸ N. de Sadeleer, *Environmental Principles: From political slogans to legal rules* (Oxford: Oxford University Press, 2002), 61.

³⁹ De Sadeleer (2002), li and 5.

⁴⁰ G. Garver, 'Moving From Environmental Law To Ecological Law: Frameworks, priorities and strategies', in L. Westra et al. (Eds.), *Ecological Integrity, Law and Governance* (New York: Routledge, 2018), 141-148.

⁴¹ Garver (2013), 318; Boyd (2004).

4.3. The EU and the concept of sustainable development

4.3.1. The various meanings of sustainability

The concept of sustainable development was first developed in the preparatory work for the 1972 UN Conference on the Human Environment. A World Commission on Environment and Development (WCED), led by the former Norwegian Prime Minister Gro Harlem Brundtland, proposed a unique and far-reaching definition of the concept:

1. Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts:
 - The concept of 'needs', in particular, the essential needs of the world's poor, to which overriding priority should be given; and
 - The idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs.⁴²

The concept evolved to become a universal principle.⁴³ However, its actual meaning and scope remain vague and ultimately vary from one jurisdiction to another,⁴⁴ and from one academic field to another.⁴⁵ At 4.3.2 below, I discuss the three-dimensional character of the EU's approach to sustainability and the issue of its integration. First, however, I want to give an account of the different views of sustainability and show how each approach makes assumptions that reflect the paradigm that underpins it.

Very weak sustainability is where sustainability is based on a belief that human-made capital is more important than natural capital,⁴⁶ in line with neoclassical welfare economic thinking.⁴⁷ Hence, in the long-term, human-made capital progressively replaces the natural capital.⁴⁸ Natural resources are considered to be limiting factors of production and technological changes as the way forward beyond nature's limits.⁴⁹ Moreover, this approach to sustainability links sustainable development to willingness to pay.⁵⁰

⁴² Report of the World Commission on Environment and Development, 'Our Common Future' (1987) A/42/427, chapter 2, para 1.

⁴³ According to Voigt, it has even become a general principle of law, but this remains disputed. C. Voigt, 'The Principle of Sustainable Development', in C. Voigt (Ed.), *Rule of Law for Nature: New dimensions and ideas in environmental law* (Cambridge: Cambridge University Press, 2013), 146-157, 154-155.

⁴⁴ E.g. international versus national; EU versus individual Member States.

⁴⁵ In particular between the neoclassical economic view (e.g. Solow, Hartwick and Pearce) and the ecological perspective (e.g. Daly; Raworth).

⁴⁶ See also Chapter 2; 'human-made' capital is defined as factories, machineries, roads, products. On the other hand, 'natural capital' is the totality of nature in three dimensions: critical, constant and tradable. See G. Davies, 'Appraising Weak and Strong Sustainability: Searching for a middle ground' (2013) 10 *Consilience: The Journal of Sustainable Development* 1, 111-124, 114; S. Barr, *Environment and Society: Sustainability, policy and the citizen* (Aldershot: Ashgate, 2008), 44.

⁴⁷ Davies (2013), 113.

⁴⁸ Barr (2008), 44.

⁴⁹ P. Mirowski, *More Heat than Light: Economics as social physics, physics as nature's economics* (New York: Cambridge University Press, 1989), 462.

⁵⁰ D. Gibbs, J. Longhurst and C. Braithwaite, 'Struggling with Sustainability': Weak and strong interpretations of sustainable development within local authority policy' (1998) 30 *Environment and Planning A* 8, 1351-1365, 1352.

Weak sustainability takes a more cautious approach to natural capital. Critical natural capital must be protected, as it cannot be restored,⁵¹ but constant and tradable natural capital is not essential in its own right and can be substituted for or replaced.⁵² Thus, total natural capital may decrease over time in favour of human-made capital. Sustainability is established through an assessment of costs and benefits which requires the monetization of immaterial natural values.⁵³ This approach remains fundamentally anthropocentric, viewing the environment in terms of its value to humans and relying largely on technology to reduce progressively environmental impacts.

Strong sustainability, on the other hand, recognises that not all ecosystem functions and services can be adequately valued economically.⁵⁴ Proponents of strong sustainability dispute the idea that natural capital may be substituted for and advocate for the adoption of minimum levels of environmental quality prior to considering other objectives.⁵⁵ The long-term vision of strong sustainability is that of the growth of total capital whereby natural capital remains constant, but human-made capital may expand.⁵⁶

If the strong sustainability theory begins to recognise the need to protect nature for its own sake, the *very strong sustainability* theory will break from the anthropogenic approach altogether and take instead an eco-centric view of the human–nature relationship.⁵⁷ Hence, the theory envisages nature as a system that includes humans rather than seeing humans as the core and centre of the system.⁵⁸ Based on ecology and the rule of nature, this approach pledges to abide by the limits and constraints established by the laws of thermodynamics. It takes the stand that matter and energy throughput must be minimised, because total capital cannot grow and natural capital must remain constant.⁵⁹ This version of sustainability forms the basis of the ecological paradigm.⁶⁰

4.3.2. Environmental integration in EU law

EU law did not adopt the Brundtland definition of sustainable development and rather embraced the watered-down vision laid out in the 2005 UN World Summit Outcome of sustainability that is composed of three “interdependent and mutually reinforcing pillars”,⁶¹ namely economic

⁵¹ D. Pearce, A. Markandya and E. Barbier, *Blueprint for a Green Economy* (London: Earthscan, 1989).

⁵² Davies (2013), 113; see also S. Baker, *Sustainable Development* (Abingdon: Routledge, 2006) and Barr (2008), 44.

⁵³ See e.g. Pearce and Turner (1990).

⁵⁴ Gibbs, Longhurst and Braithwaite (1998), 1353.

⁵⁵ Gibbs, Longhurst and Braithwaite (1998), 1352; R. K. Turner, ‘Sustainability: Principles and practice’, in R. K. Turner (Ed.), *Sustainable Environmental Economics and Management: Principles and practice* (London: Belhaven Press, 1993), 3-36, 7.

⁵⁶ Barr (2008), 44.

⁵⁷ E.g. H. E. Daly and J. Cobb, *For the Common Good: Redirecting the economy toward community, the environment and a sustainable future* (Boston: Beacon Press, 1993); this is in essence also the perspective taken by Benyus and her bio-mimicry or Pauli’s Blue Economy (see 3.3 above).

⁵⁸ Cullinan (2011), 29.

⁵⁹ Gibbs, Longhurst and Braithwaite (1998), 1353.

⁶⁰ Garver (2018).

⁶¹ UN General Assembly, Draft resolution referred to the High-level Plenary Meeting of the General Assembly by the General Assembly at its fifty-ninth session, 2005 World Summit Outcome (2005) A760/1.1.

development, social development and environmental protection. Article 3(3) Treaty on the EU (TEU)⁶² reads:

The Union shall ... shall work for the sustainable development of Europe based on balanced economic growth and price stability, a highly competitive social market economy, aiming at full employment and social progress, and a high level of protection and improvement of the quality of the environment. It shall promote scientific and technological advance.

With this formulation, the authors of the Treaties anchored EU law in a traditional sustainability approach where human-made capital is meant to continue growing despite the inherent limitations of the Earth system. From an environmental point of view, Article 191(1) Treaty on the Functioning of the EU (TFEU)⁶³ establishes broad policy objectives, i.e.

- preserving, protecting and improving the quality of the environment,
- protecting human health,
- prudent and rational utilisation of natural resources,
- promoting measures at international level to deal with regional or worldwide environmental problems, and in particular combating climate change.

This list provides a broad framework for the EU to protect the environment even from an eco-centric perspective. It remains, however, that Article 3(3) TEU requires accommodating competing social, economic and environmental interests.⁶⁴ Thus, a balancing exercise is likely to place the environment on an equal footing with the economy.⁶⁵ What does that entail? What happens in case of conflict? Article 11 TFEU, which establishes environmental protection as a transcending objective to be integrated in all EU policies, helps clarify the meaning and implications of balancing environmental interests with social and economic ones.

The integration principle was added to the Single European Act under the environmental chapter as a mere wish,⁶⁶ but the Maastricht Treaty strengthened the wording of the provision and turned the integration provision into a legal requirement.⁶⁷ In the words of Advocate General (AG) Jacobs, “Article [11] is not merely programmatic; it imposes legal obligations.”⁶⁸ With the Lisbon Treaty, the integration principle became an all-encompassing legal obligation. It abandoned the reference contained in the Treaty on the European Community (TEC) to the

⁶² Consolidated version of the Treaty on European Union (hereafter ‘TEU’) OJ C 326, 26.10.2012, p. 13.

⁶³ Consolidated version of the Treaty on the Functioning of the European Union (hereafter ‘TFEU’), OJ C 326, 26.10.2012, p. 47.

⁶⁴ N. de Sadeleer, ‘Sustainable Development in EU Law: Still a long way to go’ (2015) 6 *Jindal Global Law Review* 1, 39–60.

⁶⁵ G. van Calster and L. Reins, *EU Environmental Law* (Cheltenham: Edward Elgar Publishing, 2017), 24; D. Langlet and S. Mahmoudi, *EU Environmental Law and Policy* (New York: Oxford University Press, 2016), 43.

⁶⁶ Article 130r(1) Single European Act: “Environmental protection requirements shall be a component of the Community’s other policies.”

⁶⁷ I.e. from ‘shall be competent of’ to ‘must be integrated’; Article 130r(2) EEC Treaty: “Environmental protection requirements must be integrated into the definition and implementation of other Community policies.” J. Nowag, ‘The Sky is the Limit: On the drafting of Article 11 TFEU’s integration obligation and its intended reach’, in B. Sjöfjell and A. Wiesbrock (Eds.), *The Greening of European Business under EU Law: Taking article 11 seriously* (London: Routledge, 2015), 15–30, 20.

⁶⁸ Opinion AG Jacobs Case C-379/98 *Preussen Elektra* [2001] ECR I-2099, para 231.

catalogue of policies set out in ex-Article 3 TEC.⁶⁹ As a result, the integration principle applies regardless of the policy and the type of competence (exclusive, shared or supportive) the EU may have.⁷⁰ The Lisbon Treaty introduced other ‘integration clauses’, but none of them was given the mandatory nature of the environmental integration principle.⁷¹

Located under the title ‘Provisions having general applications’, Article 11 TFEU now reads:

Environmental protection requirements must be integrated into the definition and implementation of the Union’s policies and activities, in particular with a view to promoting sustainable development.

The integration principle is also contained in the EU Charter of Fundamental Rights, which is annexed to the Lisbon Treaty and has the same legal value as the Treaty itself.⁷² Article 37 mirrors the provision of the TFEU:

A high level of environmental protection and the improvement of the quality of the environment must be integrated into the policies of the Union and ensured in accordance with the principle of sustainable development.

The principle of environmental integration is a crucial piece of EU environmental law and its interpretation has given rise to a great deal of literature and jurisprudence, as well as controversies.⁷³ The meaning of the term ‘integration’ in particular is crucial yet unsettled. What does it mean to integrate environmental protection requirements into other policies? Ludwig Krämer notes that the language of the Treaties expresses the idea of a continuous process, a situation that is moving and requires constant efforts.⁷⁴ According to Nicolas de Sadeleer, integration may take the form of a fusion or convergence of policies.⁷⁵ A fusion, he argues, would expose environmental requirements to the risk of dilution in the other objectives,

⁶⁹ The Lisbon Treaty marked the end of the pillar structure and Article 3 TEC, which defined the policies contained in the first pillar, became obsolete.

⁷⁰ B. Sjøfjell, ‘The Very Basis of Our Existence: Labour and the neglected environmental dimension of sustainable development’, in T. Novitz and D. Mangan (Eds.), *The Role of Labour Standards in Development: From theory to sustainable practice* (Oxford: Oxford University Press, 2011), 125.

⁷¹ The other integration provisions use much weaker formulations such as ‘shall aim’ (gender equality, Article 8; non-discrimination, Article 10), ‘shall take into account’ (social objectives, Article 9; consumer protection, Article 12) or ‘shall pay full regard’ (animal welfare, Article 13).

⁷² Article 6(1) TEU.

⁷³ See e.g. J. Nowag ‘Article 11 TFEU and Environmental Rights’, in S. Bogojevic and R. Rayfuse (Eds.), *Environmental Rights in Europe and Beyond* (Oxford: Hart, 2018), 155-176; J. Nowag, *Environmental Integration in Competition and Free-movement Laws* (Oxford: Oxford University Press, 2016); B. Sjøfjell and A. Wiesbrock (Eds.), *The Greening of European Business under EU Law: Taking article 11 seriously* (London: Routledge, 2015); L. Krämer, ‘Giving a Voice to the Environment by Challenging the Practice of Integrating Environmental Requirement into other EU Policies’, in S. Kingston (Ed.), *European Perspectives on Environmental Law and Governance* (London: Routledge 2013); S. Kingston, *Greening EU Competition Law and Policy* (Cambridge: Cambridge University Press, 2012); J. Jans, ‘Stop the Integration Principle?’ (2011) 33 *Fordham International Law Journal* 5, 1533-1547, 1537; N. Dhondt, *Integration of Environmental Protection into other EC Policies: Legal theory and practices* (Groningen: Europa Law Publishing, 2003); A. Lenschow (Ed.), *Environmental Policy Integration: Greening sectoral policies in Europe* (London: Earthscan, 2002).

⁷⁴ Krämer (2013), 84.

⁷⁵ N. de Sadeleer, *Environnement et Marché Intérieur* (Commentaire J. Mégret, 2010), 24.

whereas convergence would maintain the integrity of the environmental concerns and guarantee a better result.

Suzanne Kingston put forward three possible integration approaches: a *weak* form of integration that merely requires taking environmental concerns into account; an *intermediate* form whereby environmental protection would be placed on an equal footing with the requirements of the other policies; and a *strong* form demanding that environmental requirements take precedence over conflicting requirements.⁷⁶ According to Julian Nowag, environmental protection has not been given lower or higher constitutional status that could justify anything other than the intermediate approach.⁷⁷ It is true that, by virtue of the wording in Articles 2 and 3 TEU, the authors of the Treaties appear to have wanted to place all goals on an equal footing. In de Sadeleer's view, Article 11 TFEU seeks to favour reconciliation over conflict.⁷⁸ In placing the three aspects of sustainable development on an equal footing, the authors of the Treaty aimed at establishing a balance between economic and environmental objectives that had so far been detrimental to the latter.⁷⁹

This formulation does not take, however, the principle beyond the traditional paradigm of the law. Balancing the economic, social and environmental interests implies that they are of equal value and importance. However, as Christina Voigt argues, in a world of ecological limits, some interests are more essential than others, and that giving equal weight to them all is not possible.⁸⁰ The environment is forgiving and allows for quite extensive human activities, but it does not negotiate its limits.⁸¹ If there must be a compromise between the various dimensions – such as, for instance, the use of raw natural resources to make products – it shall in any case ensure that the planetary boundaries remain unimpaired. And the sum of all compromises must nevertheless abide by the ecological ceiling.⁸²

4.3.3. Towards strong integration in EU law

The obligation to integrate environmental protection requirements set out in Article 11 TFEU is a fundamental aspect of the EU's commitment to pursuing sustainable development. Within the traditional paradigm, the integration principle is a remarkable achievement and the basis for recognizing that every single human activity has an impact on the environment. From an ecological law perspective, as currently interpreted, the principle does not go quite far enough since it does not clearly establish the primacy of ecological limits. A strong interpretation of the meaning of 'integration' in Article 11 TFEU would be a prerequisite to taking

⁷⁶ Kingston (2011).

⁷⁷ Nowag (2016), 27.

⁷⁸ In his Opinion on Case C-371/98 *First Corporate Shipping* [2000] ECR I-9235, AG Léger stressed that "the concept of "sustainable development" does not mean that the interests of the environment must necessarily and systematically prevail over the interests defended in the context of the other policies pursued by the Community... On the contrary, it emphasizes the necessary balance between various interests which sometimes clash, but which must be reconciled." (para 54). See also N. De Sadeleer, *EU Environmental Law and the Internal Market* (Oxford: Oxford University Press, 2014), 17.

⁷⁹ De Sadeleer (2015).

⁸⁰ Voigt (2013), 153.

⁸¹ Those limits are notably defined through the planetary boundary approach, see 1.1.3 above.

⁸² Voigt (2013), 153.

environmental protection seriously.⁸³ It shall, first and foremost, include the *de minimis* requirement that the ecological ceiling must be preserved.⁸⁴ Human activities must remain within the planetary limits, and generally abide by the laws of nature (in particular the laws of thermodynamics).

Remaining within the ecological ceiling requires taking a *holistic* approach to policy-making. In addition to the impact of human activities on the environment, it is essential to consider how one activity affects another, and eventually affects the environment. For instance, consumer protection policies may encourage manufacturing industries to produce more products (i.e. by providing little protection against defects) or, on the contrary, to improve product quality (i.e. with a robust legal guarantee scheme). Clearly, the environmental impact of the first policy will be much greater than the second. However, neither policy directly aims at environmental protection. A holistic approach is crucial from the perspective of establishing the CE for products, as discussed in Chapter 5.

4.4. Ecological shortcomings of the EU's vision for the CE

If EU law takes a rather weak approach to sustainability, the EU's approach to the CE – as laid out in the CE Action Plan – shows a slightly different picture (see also Table 2 in Chapter 5). The CE requires a transformation of the economy, but with a primary purpose of minimizing environmental damage by using less natural resources and producing less pollution:

The transition to a more circular economy, where the value of products, materials and resources is maintained in the economy for as long as possible, and the generation of waste minimised.⁸⁵

Moreover, the Commission clearly recognises the need to abide by the inherent limitations of the Earth's regenerative and assimilative capacity:

The circular economy ... will save energy and help avoid the irreversible damages caused by using up resources at a rate that exceeds the Earth's capacity to renew them in terms of climate and biodiversity, air, soil and water pollution.⁸⁶

The picture is not all bright, however. A discussion of the EU legal framework for the CE takes place in Chapter 5 and in the ARTICLES. Here, I want to put forward three main issues in the CE Action Plan that, in my view, fundamentally oppose the realization of an ecological-based CE. Firstly, as Kersty Hobson and Nicholas Lynch argue, “the CE's current framing as a pathway to large scale transformative change is far from radical as it fails to address the roots and origins of the issues it claims to remedy.”⁸⁷ It does not fundamentally disrupt the capitalistic

⁸³ Ibid, 45; Sjøfjell (2015), 53.

⁸⁴ Voigt (2013), 153.

⁸⁵ COM(2015) 614 final.

⁸⁶ Ibid, Intro.

⁸⁷ K. Hobson and N. Lynch, ‘Diversifying and De-Growing the Circular Economy: Radical social transformation in a resource-scarce world’ (2016) 82 *Futures*, 15-25, 17.

core, and, in particular, the pursuit of economic growth.⁸⁸ The CE promises to replace the linear economic model with the promise of abundance without (much) waste.⁸⁹ In other words, the economy can continue to grow while guaranteeing nonetheless the long-term preservation of the natural capital. However, as steady-state and degrowth thinkers have argued, although economic growth is not necessarily the same as GDP-based growth, the pursuit of ‘growth’ is a problem in itself.⁹⁰ Growth means “the process of increasing in size”, of becoming bigger.⁹¹ The CE Action Plan talks about the need to “unlock the growth and jobs potential of the CE”.⁹² It is true that the EU increasingly precedes the term with adjectives such as ‘sustainable’, ‘resilient’ or ‘inclusive’,⁹³ but in light of the laws of thermodynamics, *growth* is fundamentally undesirable.⁹⁴

Meeting the needs of growing populations and ensuring a social foundation for all cannot take place on the basis of a growing economy.⁹⁵ The ecological ceiling will not expand because humans might need it to. The pursuit of economic growth has already resulted in the overrunning of several planetary boundaries.⁹⁶ Continuing down this path to growth, even more moderately and even with best intentions in mind, cannot be in line with the ecological paradigm.⁹⁷ The mere possibility that sustainable growth might not be able to preserve the environment goes against a very strong form of sustainability.

A second point of concern is the heavy reliance on technology. The CE, as put forward by the EU (and other strong proponents such as the Ellen MacArthur Foundation (EMF)), aims to “overcome environmental crisis without leaving the path of modernization” through technological and policy innovation.⁹⁸ It is also geared at improving efficiency: the CE Action

⁸⁸ See e.g. J. G. Speth, *The Bridge at the Edge of the World: Capitalism, the environment, and crossing from crisis to sustainability* (Yale University Press, 2008).

⁸⁹ Hobson and Lynch (2016), 17.

⁹⁰ E.g. See e.g. H. E. Daly, *From Uneconomic Growth to Steady-State Economy* (Cheltenham: Edward Elgar, 2014) and Latouche (2006); see also 3.2 above.

⁹¹ English Oxford Living Dictionaries, ‘Definition of *growth* in English’ <<https://en.oxforddictionaries.com/definition/growth>> accessed 25.03.2019.

⁹² COM(2015) 614 final.

⁹³ See e.g. European Parliament Resolution of 22 October 2013 on local authorities and civil society: Europe’s engagement in support of sustainable development (2012/2288(INI)), OJ C 208, 10.6.2016, p. 25; Commission Communication, ‘Guidelines on non-financial reporting’ (Methodology for reporting non-financial information), OJ C 215, 5.7.2017, p. 1.

⁹⁴ Garver (2018).

⁹⁵ As argued notably by those who consider that growth-enhancing reforms are essential to reinforce the single market and address the disastrous social crisis in the EU (L. Balcerowicz et al., ‘Economic Growth in the European Union’ (2012) *Report for the Lisbon Council* <[lisboncouncil.net/growth/documents/LISBON_COUNCIL_Economic_Growth_in_the_EU%20\(1\).pdf](http://lisboncouncil.net/growth/documents/LISBON_COUNCIL_Economic_Growth_in_the_EU%20(1).pdf)> accessed 25.03.2019, 71). Similarly, the UN recently established ‘sustainable *economic growth*’ as one of the key Sustainable Development Goals (SDGs) and a prerequisite for achieving prosperity and full employment (UN General Assembly, ‘Transforming our World: The 2030 agenda for sustainable development’ (2015) Resolution A/RES/70/1, para. 27 and SDG 8.1.). Furthermore, the Brundtland Report asserted that economic growth was “absolutely essential to relieve great poverty”. It called, however, for “a new era of economic growth, one that must be based on policies that sustain and expand the environmental resource base” (Brundtland Report, para 3).

⁹⁶ See W. Steffen et al., ‘The Trajectory of the Anthropocene: The great acceleration’ (2015a) 2 *The Anthropocene Review* 1, 81-98.

⁹⁷ Daly (2014), 13.

⁹⁸ D. Gibbs, ‘Prospects for an Environmental Economic Geography: Linking ecological modernization and regulationist approaches’ (2006) 82 *Economic Geography* 2, 193-215, 196; Hobson and Lynch (2016), 17.

plan states that the EU is resolved to develop a ‘resource-efficient’ economy and create ‘more efficient ways of producing and consuming’.⁹⁹ Efficiency – or eco-efficiency – consists of creating products and services from fewer natural resources, or, in the words of the Commission, “creating more with less”.¹⁰⁰ Typically, the adoption of mandatory requirements under the Ecodesign Directive has primarily sought to enhance the energy efficiency of energy-related products.¹⁰¹ A European Resource Efficiency Knowledge Centre was established for the purpose of helping companies find new and better ways to be resource efficient.¹⁰² Waste management systems are also targeted as areas for possible efficiency improvements.¹⁰³ Furthermore, an Eco-innovation Action Plan is set out with a view to increasing “resource productivity, efficiency, competitiveness and [...] to safeguard the environment.”¹⁰⁴

The idea of increasing resource and energy intensity to reduce environmental impacts offers a prodigious perspective, in particular coming from the wasteful linear model. However, entropy law clearly rules out relying solely on technological improvements.¹⁰⁵ If there are technological advances, all the better, but the uncertainty of the project clashes with a very strong sustainability approach. Ecological law requires us to keep humble about the prospects of technology to solve complex ecological challenges, and to treat uncertainty with the highest degree of caution. The discussion resumes in Chapter 5, where I explore the precautionary principle.

Lastly, in Hobson and Lynch’s opinion, the current approach to establishing the CE consists in incremental steps rather than radical transformations – representative of a weak form of sustainability – in particular with regards to the continued reference to citizens primarily as consumers:¹⁰⁶

Indeed, the recent European Commission announcements on the CE place the citizen as inseparable from the consumer, whose role is to respond to correct labelling and price signals, produce less household waste, and participate in ‘[i]nnovative forms of consumption’.¹⁰⁷

The consumerist culture that underpins the European construction is largely missing from the Action Plan. Here, Hobson and Lynch add,

the norms of economic growth and sustained material throughputs remain unquestioned in the face of the promises of greater efficiencies and expectations placed on us all i.e. that

⁹⁹ COM(2015) 614 final.

¹⁰⁰ Commission Communication, ‘Roadmap to a Resource Efficient Europe’, COM(2011) 571 final.

¹⁰¹ See COM(2015) 614 final and Ecodesign Directive.

¹⁰² See European Resource Efficiency Knowledge Centre, ‘About’ (2018) <www.resourceefficient.eu/en/about> accessed 25.03.2019.

¹⁰³ COM(2015) 614 final, section 3.

¹⁰⁴ Commission Communication, ‘Innovation for a Sustainable Future - The eco-innovation action plan (Eco-AP)’, COM(2011) 899 final.

¹⁰⁵ See e.g. Costanza et al. (2015), 228; Daly (2014), 14, 77 and 145.

¹⁰⁶ Hobson and Lynch (2016), 18; see also L. Akenji, ‘Consumer Scapegoatism and Limits to Green Consumerism’ (2014) 63 *Journal of Cleaner Production*, 13-23.

¹⁰⁷ Hobson and Lynch (2016), 18; A. Tukker, ‘Product Services for a Resource-Efficient and Circular Economy: A review’ (2015) 97 *Journal of Cleaner Production*, 76-91.

we able and willing to become ‘green consumers’ ... via an unquestioned reliance upon, and uptake of, technologically-mediated forms of social engagement.¹⁰⁸

In sum, the EU’s vision of the CE does not reflect the ambition of establishing a legal framework in accordance with the ecological paradigm. The EU takes a more eco-centric view of the human–nature relationship, but does not commit to a complete transformation of the economy that would ensure remaining within planetary boundaries. That is in particular in view of the unflinching commitment to growth, the pursuit of efficiency at the omission of sufficiency¹⁰⁹ and the lack of questioning of consumerist culture.

4.5. A proposed definition of the Circular Economy in the new paradigm

There is no commonly agreed definition of what the Circular Economy is. The EMF characterises it as

an economy that is restorative and regenerative by design and aims to keep products, components, and materials at their highest utility and value at all times.¹¹⁰

In the same vein, the CE Action Plan asserts that a CE is

where the value of products, materials and resources is maintained in the economy for as long as possible, and the generation of waste minimised.¹¹¹

These two approaches focus on the need to manage resources more efficiently. According to Leonidas Milios, three essential ingredients may advance the CE in that context: 1) policies for reuse, repair and remanufacturing, which aim to retain the value of products for as long as possible and within short recovery loops; 2) green public procurement as a way of influencing the market; and 3) policies for improving the secondary materials markets.¹¹² This approach brings an element both EMF and the EU have largely neglected: consumption. Current policies, Milios argues, do not target resource efficiency related to consumption and use of products and services.¹¹³

The establishment of the CE in the EU is linked to some form of economic growth fostered through increased efficiency, but it has completely overlooked the need for sufficiency. At the same time, as the law of entropy dictates, it is clear that maintaining the full value of materials through recovery is impossible.¹¹⁴ Moreover, current material flows are not sufficient to fulfil the demand.¹¹⁵ Even though improvements to the recovery systems to reintroduce valuable

¹⁰⁸ Hobson and Lynch (2016), 18; referring to Akenji (2014) and D. A. Fuchs and S. Lorek, ‘Sustainable Consumption Governance: A history of promises and failures’ (2005) 28 *Journal of Consumer Policy* 3, 261-288.

¹⁰⁹ Which demands an absolute reduction in energy and material throughput.

¹¹⁰ The Ellen MacArthur Foundation (EMF), ‘Growth Within: A circular economy vision for a competitive Europe’ (2015) <www.ellenmacarthurfoundation.org/assets/downloads/publications/EllenMacArthurFoundation_Growth-Within_July15.pdf> accessed 25.03.2019, 12 and 46.

¹¹¹ COM(2015) 614 final.

¹¹² L. Milios, ‘Advancing to a Circular Economy: Three essential ingredients for a comprehensive policy mix’ (2017) 13 *Sustain Science* 3, 861-878.

¹¹³ Ibid.

¹¹⁴ Daly (2014).

¹¹⁵ Milios (2017).

materials into the economy it is unlikely to suffice to meet the needs of a growing consumer population. I pointed out already how the continuous pursuit of growth and sole reliance on efficiency are likely to threaten the core elements of the Earth system and hence the safe operating space for humanity. It is unclear whether and how technology will be able to respond to the very complex challenges ahead. Indeed, there is considerable uncertainty still about what ‘sustainable’ growth might entail. Hence, in advancing the CE, the pursuit of growth should be minimised and legal measures adopted that aim at an absolute reduction in energy and material throughput.¹¹⁶

Discarding the pursuit of growth does not mean, however, that the economy should not aim to evolve. Other pathways exist, as Herman Daly maintains, that can allow the economy to ‘develop’ – i.e. become more mature, advanced, or elaborate – without growing.¹¹⁷ In that sense, the 7th Environmental Action Programme of the EU is breaking new ground in describing the economic objective in terms of ‘prosperity’, which seems a much more appropriate term for the economic goal of an ecological paradigm.¹¹⁸ Moreover, it recognises explicitly the need for “an absolute decoupling of economic growth and environmental degradation.”¹¹⁹

The 7th EAP also adds another important dimension to the characterization of the concept of the CE, i.e., the inherent need to protect nature – although it links it to the need to improve human resilience:

a circular economy [is] where nothing is wasted and where natural resources are managed sustainably, and biodiversity is protected, valued and restored in ways that enhance our society’s resilience.¹²⁰

This eco-centric perspective, which is arguably present in other policies of the EU (such as biodiversity laws and water policy),¹²¹ is largely lacking in CE policies. The goal of the CE should be to allow not only society to prosper, but also the natural environment. The Earth system should be given the opportunity to regenerate and restore its biodiversity for its own sake as well as for the sake of ensuring a ‘safe operating space’ in which humanity (and indeed the economy) can develop in the long term.

In view of this, I propose the following definition of the CE:

¹¹⁶ See discussion in Chapter 5; see also R. Goodland and H. E. Daly, ‘Environmental Sustainability: Universal and non-negotiable’ (1996) 6 *Ecological Applications* 4, 1002-1017, 1013, T. Princen, *The Logic of Sufficiency* (Cambridge: MIT Press, 2005).

¹¹⁷ Daly (2014); the definition is from English Oxford Living Dictionaries, ‘Definition of *develop* in English’ <<https://en.oxforddictionaries.com/definition/develop>> accessed 25.03.2019.

¹¹⁸ Annex to the 7th EAP, para 10 and 17.

¹¹⁹ 7th EAP, preamble 18.

¹²⁰ Annex to the 7th EAP, para 1.

¹²¹ See in particular Directive 2009/147/EC of 30 November 2009 on the conservation of wild birds, OJ L 20, 26.1.2010, p. 7, Article 4(4); Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, OJ L 206, 22.7.1992, p. 7, Article 6(2); and Ecodesign Directive, Article 15(2); and Directive 2000/60/EC of 23 October 2000 establishing a framework for Community action in the field of water policy, OJ L 327, 22.12.2000, p. 1.

The Circular Economy is an economic model that is *precautionary* and allows the Earth system to regenerate and thrive, and to offer a safe operating space for humanity to prosper in the long term. It relies on renewable energy, aims to eliminate the use of hazardous substances, reduce resource and product consumption, and avoid final waste generation (notably through careful design for prolonged product lifetime and recovery), and focuses on social well-being.

This definition includes the term ‘precaution’, which is discussed further in Chapter 5. In short, precaution is deemed to encompass prevention, but also aims to go further. Here, the term is used to emphasize the need to be proactive in responding to this existential threat of exceeding the ecological ceiling, the uncertainty about the impact of current and new activities and the ability of technology to resolve the challenges. Pursuing precaution is meant to avoid risk before considering how to manage it once it appears. It asks “how little harm is possible?” rather than “how much harm is allowable?”.¹²²

4.6. Preliminary conclusions

In this chapter, I have laid out the basis for a paradigmatic shift in EU law from traditional environmental legislation to ecological legal thinking. I show that the role of ecological law is to ensure a ‘safe operating space for humanity’, as defined in particular by Rockström et al. and Raworth,¹²³ that is within an ecological ceiling and a social foundation.

Then, I focused on what it means to abide by this ecological ceiling, which I compared to the EU’s approach to advancing the CE. As a first step, I examined the very widely recognised and utilised concept of *sustainability* in its different characterizations and established that a very strong mode of sustainability is the only mode that fits the ecological paradigm. I found that the EU does not meet the conditions of a radical transformation of what is required in particular in view of its unfailing commitment to growth, its pursuit of efficiency at the expense of sufficiency, and its failure to question consumerist culture. The picture is not all grim, however, as the proposed CE policies on maintenance and recovery do highlight the EU’s commitment to use the law to establish an economic model that abides by the functioning of the Earth system.

In a second section, I studied the way environmental concerns are *integrated* into the law. This time, I took EU primary law as the point of departure of my analysis, and discussed what integration means in the sense of Article 11 TFEU. I found that EU law favours a moderate integration that aim at a reconciliation of the three pillars of sustainable development, i.e. economic, social and environmental.¹²⁴ A strong integration, however, would need to prevail in the ecological paradigm. This would require recognising the primacy of environmental concerns and abiding by a *de minimis* rule that guarantees the integrity of the ecological ceiling.¹²⁵ It also requires taking a holistic approach to law-making whereby all human activities

¹²² N. Kuraj, ‘REACHing an Environmental Regulation for Nanotechnology: An analysis of REACH as an instrument for preventing and reducing the environmental impacts of nanomaterials’, PhD Thesis, University of Oslo (2017), 295.

¹²³ Rockström et al. (2009); Raworth (2017).

¹²⁴ Nowag (2016); De Sadeleer (2015).

¹²⁵ Voigt (2013); Sjøfjell (2015).

are considered in view of their overall environmental impacts as well as indirect effects resulting from one policy's influence on another.

Finally, in view of the findings in both Chapter 3 and Chapter 4, I put forward my own definition of the CE that reflects the essential features of the new paradigm:

- The necessity of adopting a precautionary approach to environmental damage;
- The recognition of the need to protect the environment for its own sake;
- The goal of ensuring a safe space for humanity to prosper;
- The need to end our reliance on all non-renewable forms of energy;
- The urgency to eliminate the use of hazardous substances;
- The pursuit of sufficiency through an absolute reduction in amount of production and consumption;
- The need to increase eco-efficiency and avoid pollution through extended lifespans and better recovery of products and materials;
- The objective of establishing a social foundation for all.

In Chapter 5, I discuss the holistic approach to regulating the CE, and I consider the implication of taking seriously the pursuit of eco-efficiency and sufficiency in a precautionary manner.

Chapter 5. Ecological law for the EU's Circular Economy

“[I]f ‘old environmentalism’ was about putting limits on the excesses of our old path to prosperity, the job of new environmentalists is to show that there is a possible new path to prosperity and well-being through a sustainable model of economy and society.”

— Janez Potočnik

New Environmentalism,

Speech to the Scottish Parliament, 2013

5.1. Introductory remarks

This chapter discusses the establishment of the CE within the ecological paradigm. In this new paradigm, I propose to define the CE as per the definition put forward in section 4.5 above. The definition is not identical to the EU's approach to the CE, which fits more within the existing paradigm. However, the EU has clearly moved beyond the most traditional approach to environmental regulation and the EU policy on the CE includes elements of the new paradigm. In Table 2, I summarize the main distinguishing features of a traditional product-related environmental law and of an ecological approach to products,¹ and show the status of EU law for the CE² in light of the two paradigms.

Features	Products and environmental law	EU law on the CE	The CE in ecological law
Approach to sustainability (Chapter 4)	<p><i>Weak sustainability</i></p> <p><i>Anthropocentric</i>: supremacy of humans over nature; the goal is to dominate and advance human control over nature</p> <ul style="list-style-type: none"> - Decline of natural capital over time <i>in favour of</i> human-made capital <p>Commitment to <i>economic growth</i></p> <p><i>Techno-centric</i>: reliance on human technologies to mitigate environmental problems (in line with the Environmental Kuznets</p>	<p><i>Weak to strong sustainability</i></p> <p><i>Anthropocentric+</i>: decrease human impact on nature while ensuring increasing economic wealth; consumption as key driver</p> <ul style="list-style-type: none"> - Natural capital remains constant <i>and</i> human-made capital grows <p>Pursuit of <i>sustainable economic growth</i></p> <p><i>Technology-driven</i>: confidence in technology</p> <ul style="list-style-type: none"> - Eco-efficiency: increasing output per unit of input to foster 	<p><i>Very strong sustainability</i></p> <p><i>Eco-centric</i>: humans are part of the nature; nature is protected in its own right; humanity shall develop within the planetary boundaries</p> <ul style="list-style-type: none"> - Natural capital can remain constant <i>only if</i> human-made capital does not grow <p>Support <i>economic development without growth</i></p> <p><i>Cautious</i>: technology cannot solve all complex ecological questions</p> <ul style="list-style-type: none"> - Sufficiency: need for an absolute reduction in

¹ Inspired by the table developed by G. Garver, ‘Moving from Environmental Law to Ecological Law: Frameworks, priorities and strategies’, in L. Westra et al. (Eds.), *Ecological Integrity, Law and Governance* (New York: Routledge, 2018), 141–148, 144. The column about ‘environmental law’ is not meant to reflect the state of EU environmental law or any existing legal regime, but to give a sense of the traditional paradigm.

² Based on Commission Communication, ‘Closing the Loop – An EU Action Plan for the Circular Economy’, COM (2015) 614 final.

Features	Products and environmental law	EU law on the CE	The CE in ecological law
	<p>curve)</p> <ul style="list-style-type: none"> - Eco-efficiency: faith in perpetual decoupling of energy and material throughput 	<p>decoupling; ‘create more with less’; growth within</p>	<p>production and consumption</p> <ul style="list-style-type: none"> - Eco-efficiency: improvements needed
Integration approach <i>(Chapter 4)</i>	<p><i>Weak integration:</i> towards a fusion of the three equal pillars (economic, social and environmental) of sustainable development</p>	<p><i>Moderate integration:</i> towards a convergence of three equal pillars (CE aims at boosting global competitiveness, generate new jobs, and avoid irreversible environmental damage), but prevalence of environmental interests in specific instances.</p>	<p><i>Strong integration:</i> primacy of ecological limits over social and economic interests</p> <p>Development of the economy between the ecological ceiling and the social foundation</p>
Approach to policy-making	<p><i>Reactive:</i> end-of-pipe control</p> <p>Standard proportionality</p> <p><i>Weak precaution:</i></p> <ul style="list-style-type: none"> - Risks to human health or proven threats of significant impacts on the environment; - Measures based on cost-benefit analysis; - Burden of proof on the legislator/society. <p>Monitoring of rules</p>	<p><i>Preventive:</i> risk management</p> <p>Standard proportionality</p> <p><i>Moderate precaution:</i></p> <ul style="list-style-type: none"> - Avoid “irreversible damages caused by using up natural resources at a rate that exceeds the Earth’s [regenerative and assimilative] capacity”; - Measures taken depend on the severity of the threat and level of uncertainty; - Reversed burden of proof for hazardous substances only. <p>Monitoring and sometimes prescribed revision³</p>	<p><i>Precautionary:</i> risk avoidance</p> <p>Eco-proportionality⁴</p> <p><i>Strong precaution:</i></p> <ul style="list-style-type: none"> - Avoid exceeding planetary boundaries and ensure a ‘safe operating space’; - Elimination or prohibition of potential risks; - Burden of proof is always on the proponent of an activity. <p>Adaptation mechanism</p>
Approach to regulating the market	<p><i>Sectoral:</i> focusing on point-source damage (e.g. industrial emissions, waste)</p> <p>Correction of market failure</p>	<p><i>Integrated:</i> life-cycle approach to products and ‘closing the loop’</p>	<p><i>Holistic:</i> re-think the entire legal framework including structure and governance</p> <p>Strong limits on market</p>

³ E.g. Directive 2009/125/EC of 21 October 2009 on establishing a framework for the setting of ecodesign requirements for energy-related products (hereafter ‘Ecodesign Directive’), OJ L 285, 31.10.2009, p. 10, Annex VII: “the implementing measures must specify, in particular: [...] 9. the date for the evaluation and possible revision of the implementing measure, taking into account the speed of technological progress.”

⁴ See G. Winter, ‘Ecological Proportionality: An emerging principle of law for nature?’, in C. Voigt (Ed.), *The Rule of Law for Nature* (Cambridge: Cambridge University Press, 2013), 111–129, 114.

Features	Products and environmental law	EU law on the CE	The CE in ecological law
	(environmental externalities; lack of and asymmetric information; public and common goods) Market-based instruments (MBI), incentives and voluntary measures <i>Polluter-pays principle</i> (PPP) Cost-benefit analysis and monetization of environmental impacts Info?	Mix of techniques Mandatory requirements with flexibility, e.g.: - Ecodesign Directive (2009/125): conditions to enter the market (mandatory requirements or self-regulation) - REACH: conditions to enter the market; substitution; prohibition <i>Extended producer responsibility</i> (waste law) Cost-effectiveness: e.g. life-cycle costing in public procurement Stand-alone information requirements: energy labelling and ecolabels	mechanisms Mandatory requirements; Command-and-control (CAC) regulation <i>Duty of care</i> Multi-criteria valuation involving incommensurate values Information requirements with ensuing obligations

Table 2. The status of EU law on the CE in view of the environmental law versus ecological law paradigms

My interpretation of EU law in the context of product regulation is that it no longer completely abides by the traditional paradigm of environmental law, but has not yet accomplished a full transformation towards the ecological paradigm. I argue that some of the remaining shortcomings are linked to some fundamental aspects of legal thinking and policy-making. Hence, in this chapter, I examine four main aspects of the definition and how they relate directly to the ARTICLES that form part of this dissertation:

- I start with a discussion on the need for and meaning of a *holistic approach* to product regulation (5.2). This relates closely to ARTICLE 1 where I discuss how the principle of integration (Article 11 TFEU) has evolved in the early phase of the development of a comprehensive approach to products through life-cycle thinking, and ARTICLE 2, which concerns the circular approach put forward in the CE Action Plan;
- Second, I examine the preventive approach pursued by EU law on product and discuss the implications of transitioning to a more ecological paradigm (5.3). I also introduce ARTICLE 3, which pertains to regulating the durability and reparability of products, and ARTICLE 4 in which I investigate some of the shortcomings of EU waste law and put forward proposals to re-think the legal framework;
- Third, I consider how the *precautionary* approach that is a key feature of the new paradigm could contribute towards promoting a more radical pursuit of *sufficiency*⁵(5.4);

⁵ As put forward in particular by ecological economists (see 3.2.3 above).

- Finally, following on from the discussion about precaution, I discuss a significant but unduly neglected perspective of the CE – that is, consumption – and introduce the need to address consumerist culture to achieve sufficiency (5.5). ARTICLE 5, which focuses on the regulation of consumption patterns, prolongs the examination.

5.2. Products and the holistic perspective

5.2.1. Introduction

In this section, I examine the meaning of taking a holistic approach to regulating the CE. I begin by discussing what the EU has done in the field, starting from the integrated approach based on life-cycle thinking to a Circular Economy aimed at resource efficiency and waste reduction. The section ends with some reflections about what *holistic* really means in the ecological paradigm, and what might be missing in the EU policy to make it truly holistic.

5.2.2. An integrated policy based on product life cycle

At the EU level, the idea of a broad approach to product policy emerged for the first time in the 5th Environmental Action Plan (1993–2000),⁶ but it was a study from Ernst & Young and SPRU to the Commission, entitled ‘Integrated Product Policy’, that marked the beginning of a new approach to product regulation. The study recommended moving away from a traditional focus on production processes and instead looking at the product more holistically.⁷ In short, this meant that policies had to consider the entire life cycle of a product and aim at achieving improvements not just at one stage of the life cycle, but throughout it.

A product’s life cycle is composed of different stages, from the extraction of natural resources through to production and supply, to the use and the product’s end-of-life. Since every stage gives rise to environmental impacts, a life-cycle approach is meant to provide an overall view of a product’s impact on the environment.⁸ The aim is to achieve net environmental benefits and avoid a situation in which measures seeking to reduce environmental harms at one stage of the life cycle actually increase the negative consequences at another stage.⁹ Similarly, pollution shall not be transferred from one media (water, soil, air) to another, or from one country to another (whether inside or outside the EU).

Producers were pioneers in using a life-cycle approach to develop their businesses and contributed greatly to promoting this technique,¹⁰ as did the ‘Limits to Growth’ report of the

⁶ Commission Communication, ‘Towards Sustainability: A European Community programme of policy and action in relation to the environment and sustainable development’, COM(92) 32 final, p. 68.

⁷ Ernst & Young and SPRU, ‘Integrated Product Policy’, IPP Study for the European Commission (1998), 9.

⁸ See C. Dalhammar, ‘The Application of “Life Cycle Thinking” in European Environmental Law: Theory and practice’ (2014a) 12 *Journal for European Environmental and Planning Law* 2, 97-127; C. Hendrickson et al., ‘Economic Input-Output Models for Environmental Life-Cycle Assessment’ (1998) 32 *Environmental Science Technology* 7, 184–191; E. Heiskanen, ‘The Institutional Logic of Life Cycle Thinking’ (2002) 10 *Journal of Cleaner Production*, 427–437, 428.

⁹ European Environmental Agency (EEA), *The European Environment: State and outlook 2015. Synthesis Report* (Copenhagen: EEA, 2015), 151.

¹⁰ R. G. Hunt and W. E. Franklin, ‘LCA – How it Came About, Personal Reflections on the Origin and LCA in the USA’ (1996) 1 *International Journal of Life Cycle Assessment* 1, 4–7; W. Köpffer, ‘The Role of SETAC in the Development of LCA’ (2006) 1 *International Journal of Life Cycle Assessment Special Issue*, 116–122.

Club of Rome.¹¹ Quantitative methods of assessing a product life cycle flourished to calculate the impact of products from ‘cradle-to-grave’ and assist private and public decision-makers.¹² ‘Life-cycle assessment’ (LCA) is notably criticized for its quite linear approach,¹³ imprecise results¹⁴ and lack of flexibility towards integrating the complexity and inherent uncertainty of the results.¹⁵ Moreover, quantitative calculations that echo neoclassical theories cannot provide a correct account of all environmental impacts released from a product or throughout a production process.¹⁶ Moreover, the publicly available data is often too generic for the purpose of conducting the assessment.¹⁷ Bras-Klapwijk also points out that the apparent objectivity of LCA results gives them too much authority and neglects the often-narrow scope of each particular study, allowing the studies to be used as political tools.¹⁸

In a 2001 Green Paper, the Commission called for a ‘new growth paradigm’ that would seek to reduce the entire life-cycle impacts of products, notably from two significant but yet unregulated phases – design and consumption.¹⁹ The subsequent EU Integrated Product policy (IPP) formally introduced the life-cycle approach, and describes it as follows:

Life-Cycle Thinking – it considers a product’s life-cycle and aims for a reduction of its cumulative environmental impacts – from the “cradle to the grave”. In so doing it also aims to prevent individual parts of the life-cycle from being addressed in a way that just results in the environmental burden being shifted to another part. By looking at the whole of a product’s life-cycle in an integrated way, IPP also promotes policy coherence. It encourages measures to reduce environmental impacts at the point in the life-cycle where they are likely to be most effective in reducing environmental impact and saving costs for business and society.²⁰

¹¹ D. H. Meadows et al., *Limits to Growth: A report for the Club of Rome’s project on the predicament of Mankind* (New York: New American Library, 1972).

¹² C. Dalhammar, ‘An Emerging Product Approach in Environmental Law’, PhD Thesis, IIIIEE, University of Lund (2007), 55; B. Frostell, ‘Life Cycle Thinking for Improved Resource Management: LCA or?’, in J. Kauffman and Kun-Mo Lee (Eds.), *Handbook of Sustainable Engineering* (Dordrecht: Springer Netherlands, 2013), 837–857, 842 and 845.

¹³ T. Grand and F. MacDonald, ‘Life Cycle Assessment as Decision Support: A systemic critique’, in R. Horne, T. Grand and K. Verghese (Eds.), *Life Cycle ASSESSMENT: Principles, practices and prospects* (Collingwood Victoria: CSIRO, 2009), 33–42, 35.

¹⁴ S. Schaltegger, ‘Economics of Life Cycle Assessment: Inefficiency of the present approach’ (1997) 6 *Business Strategy and the Environment*, 1–8, 3.

¹⁵ For a good discussion of LCA and other quantitative methods, see C. Dalhammar, ‘Industry Attitudes towards Ecodesign Standards for Improved Resource Efficiency’ (2016) 123 *Journal of Cleaner Production*, 155–166.

¹⁶ A. Tukker, ‘Risk Analysis, Life Cycle Assessment: The common challenge of dealing with the precautionary frame’ (2002) 22 *Risk Analysis* 5, 821–832.

¹⁷ E. Heiskanen, ‘Every Product Casts a Shadow: But can we see it, and can we act on it?’ (1999) 2 *Environmental Science & Policy*, 61–74, 67.

¹⁸ R. M. Bras-Klapwijk, ‘Are Life Cycle Assessments a Threat to Sound Public Policy Making?’ (1998) 3 *International Journal of Life Cycle Assessment* 6, 333–342, 340. In his article, Bras-Klapwijk uses two examples of LCA of PVC in the Netherlands and Sweden. These cases showed that political actors suppressed or denied qualifications when the results were in line with their view, or emphasized uncertainty of those results when they disagreed with them.

¹⁹ Commission Green Paper, ‘Integrated Product Policy’, COM(2001) 86 final, 3 and 5.

²⁰ Commission Communication, ‘Integrated Product Policy – Building on environmental life-cycle thinking’, COM(2003) 302 final, point 3.

Under this broad policy, the Commission notably proposed the development of eco-design and standardization measures accompanied by eco-labels, and green public procurement guidelines, as well as to reinforce existing waste management rules.²¹

In this context, Marteen Jans et al. define the term *integrated* as being composed of three aspects:

- an analytical approach based on life cycle;
- an implementation strategy that consists in a co-ordinated use of all available policy instruments, exchange of information and allocation of responsibility; and
- a cross-sectoral dimension of strategies to achieve sustainable development.²²

The IPP Communication stated that “[i]ts primary aim is to reduce the environmental impacts from products throughout their life-cycle, harnessing, where possible, a market driven approach, within which competitiveness concerns are integrated.”²³

In light of its stated goal, the IPP was to make a significant contribution to minimizing the overall negative impacts of products on the environment and transform the way we approach product policy and law making. The result was much more nuanced as the IPP lacked both flesh and teeth to bring about the necessary transformation.²⁴ As if to compensate for the expanding reach of EU law over many aspects of economic activity,²⁵ the IPP proposed a quite flexible framework for action. It favoured the adoption of non-binding instruments, such as voluntary measures and self-regulation, and urged the different stakeholders “to act on their sphere of influence”. Public authorities were to refrain from directly intervening to establish the IPP approach, but instead pursue its enablement.²⁶ Although it does not rule out the use of mandatory legal measures, this gives the legislator a strong signal that its duty to act in the environmental field is, if not redundant, at least secondary.²⁷

The involvement of non-state actors is clearly significant in this area, particularly in view of their ability to influence production and consumption patterns. This should not result, however, in relieving public actors (in particular the EU and national governments) from their responsibility, not least since voluntary and market-driven approaches are not proving to be very effective in stimulating change.²⁸ The emphasis toward non-binding measures in the IPP has had a clear impact on following activities at EU level, which consisted in the most part of

²¹ COM(2003) 302 final.

²² Although it completely ignored the social dimension of sustainable development, M. Jans et al., *The Role of Public Authorities in Integrated Product Policy: Regulators or coordinators?* (Brussels: Scientific Support Plan for Sustainable Development Policy (SPSDII), 2006), 13–15.

²³ COM(2003) 302 final, point 4.

²⁴ L. Krämer, *EU Environmental Law*, 6th edn (London: Sweet and Maxwell, 2011), 6-02.

²⁵ N. de Sadeleer, *EU Environmental Law and the Internal Market* (Oxford: Oxford University Press, 2014), 217.

²⁶ COM(2003) 302 final.

²⁷ See also C. van Rossem, B. Kogg and O. Mont, ‘Throwing the Baby Out With the Bathwater? A critical review of the EU-Communication on IPP’ (2004) 19 *Ökologisches Wirtschaften* 3–4, 12.

²⁸ Dalhammar (2007), 65; A Nilsson et al., ‘An Integrated Product Policy in the EU: Some EC legal conditions’, (2003) Report 5338 to The Swedish Environmental Protection Agency, 9.

developing policy statements and voluntary initiatives.²⁹ Even the most important piece of legislation adopted following the IPP, the Ecodesign Directive, carries the mark of this ‘soft’ approach. Self-regulation (such as voluntary agreements) is expressly presented as an alternative to mandatory requirements by the Commission in view of the placement of specific products on the market, provided they clearly comply with ‘added value’ and ‘sustainability’ criteria.³⁰

In ARTICLE 1, I examine how the life-cycle approach has influenced three key EU policies on products that are ecodesign, public procurement and waste management. The article also explored what it would entail to promote environmental considerations through an integrated approach to product policy at the EU (legislative development) and national (implementation) level, and thus ‘take Article 11 TFEU seriously’.

5.2.3. The circular model of the EU

A comprehensive approach based on product life cycles marked a significant shift from the previously rather sectoral environmental policies, which were targeted almost exclusively at large sources of pollution, such as industrial emissions and waste. To the IPP, which primarily aimed to reduce overall (life-cycle) environmental impacts without shifting the burden from one part of the life cycle to another, the CE Action Plan added the layer relating to closing the loop. Whereas the IPP made no mention of issues of durability, extended lifetime and repair, the Action Plan puts these issues at the forefront, although several propositions remained at the stage of early assessment.³¹ Furthermore, a section entitled ‘From waste to resources’ formed a unique addition to product policy by focusing specifically on reintroducing materials “back into the economy as new raw materials thus increasing the security of supply.”³²

In ARTICLE 2, I analyze the CE Action Plan and review some of the key features of the CE in light of the Commission’s policy proposals and existing legislation. The article contributed to developing understanding of the scope of the CE and the meaning of the EU strategy in terms of specific policies, namely waste, ecodesign, servitization, labelling and public procurement. The article sheds light on some issues that the EU legislators must tackle, some of which are discussed in more details in other ARTICLES of this thesis. Establishing the CE requires a broad policy mix. It is argued in ARTICLE 2 that, in order to avoid it turning into a regulatory mess, policymakers must adopt a holistic, integrated perspective to developing CE policies.

5.2.4. Considerations about a holistic approach in ecological law

A paradigm shift entails inquiring beyond the regulation of specific stages of the product’s life cycle. It requires notably also to adopt policies that ensure a circular flow of materials. An

²⁹ See e.g. the Commission Communication, ‘Roadmap to a Resource Efficient Europe’, COM(2011) 571 final; Regulation (EC) No 66/2010 of 25 November 2009 on the EU Ecolabel, OJ L 27, 30.1.2010, p. 1; and Regulation (EC) No 1221/2009 of 25 November 2009 on the voluntary participation by organisations in a Community eco-management and audit scheme (EMAS), OJ L 342, 22.12.2009, p. 1.

³⁰ Ecodesign Directive, Article 15(1) and Annex IV.

³¹ Such as the proposal to *analyse the possibility to propose* horizontal requirements on repair information provision in the context of ecodesign; or to *assess of the possibility of* an independent testing programme on planned obsolescence, see Annex to the COM(2015) 614 final.

³² COM(2015) 614 final, section 4.

ecological legal framework for the CE requires investigating and – if necessary – re-thinking the very purpose and objective of the law. Clearly, the EU’s CE strategy aims at enhancing competitiveness, developing new business models and ensuring growth, but in a different form – ‘growth within’ or ‘sustainable growth’.³³ If the law is expected to enable economic prosperity, the goal must be not the establishment of a well-functioning economy, but the realization of a safe operating space in which the economy participates in creating social welfare. In other words, legal measures must not be developed solely for the purpose of removing barriers to the market, but for the purpose of changing the very functioning of the market.

This approach may require reconsidering *inter alia* the institutional structures in place, the division of competences, the flow of knowledge and expertise within the governing branches, and the methods for implementing and enforcing decisions. For instance, a discussion about adaptive governance³⁴ might prove relevant as part of future research on bringing the CE into the ecological paradigm.

In the following sections, I propose different ways of taking that extra step: from imposing a duty of care on producers (5.3) to reducing the volume of production (5.4) and changing patterns of consumption (5.5).

5.3. Reviewing prevention to promote an ecological based CE

5.3.1. Introduction

The prevention principle underpinned the adoption of the ecodesign scheme: It was established as the first priority for waste management legislation, and it inspired the EU’s Green Public Procurement (GPP) approach. In this section, I start with exploring the meaning of prevention in EU environmental law and product regulation as part of the CE. Then I discuss how the adoption of preventive measures is conditioned by the proportionality principle and what it implies. Finally, I reflect on how EU product law could evolve to promote the CE in the ecological paradigm.

5.3.2. Preventive approach in EU product law

The prevention principle is an undisputed tenet of international law and is included in several international agreements and treaties.³⁵ It is also at the heart of EU environmental law.³⁶ Preventive measures aim to avoid harm or reduce the risk of harm.³⁷ The prevention principle

³³ COM(2015) 614 final.

³⁴ See e.g. D. DeCaro et al., ‘Theory and Research to Study the Legal and Institutional Foundations of Adaptive Governance’, in B. Cosens and L. Gunderson (Eds.), *Practical Panarchy for Adaptive Water Governance* (Springer, 2018), 269–288; C. Arnold and L. Gunderson, ‘Adaptive Law and Resilience’ (2013) 43 *Environmental Law Reporter*, 10426-10443.

³⁵ E.g. Principle 21 of the Declaration of the United Nations Conference on the Human Environment (Stockholm Declaration), 16 June 1972, 11 ILM 1416, or the Convention on Biological Diversity (CBD), 5 June 1992, 31 ILM 818; G. Van Calster and L. Reins, *EU Environmental Law* (Cheltenham: Edward Elgar Publishing, 2017), 33.

³⁶ Article 191(2) of the Consolidated version of the Treaty on the Functioning of the European Union (hereafter ‘TFEU’), OJ C 326, 26.10.2012, p. 47.

³⁷ N. de Sadeleer, *Environmental Principles: From political slogans to legal rules* (Oxford: Oxford University Press, 2002), 72.

does not address potential risks, but risks that are known or likely to occur.³⁸ Prevention measures may target both pollution *sources* (adopting product norms or regulating production processes) and *points of impact* (such as quality standards for the receiving environment and maximum amounts of allowed pollution).³⁹ The latter measures focus on limiting the symptoms of pollution, whereas the former aim at eliminating the cause. For instance, exposure standards, such as those provided by the Air Quality Directives,⁴⁰ intend to limit the amounts of pollution that affect humans and the environment, not to alter its source.⁴¹ On the contrary, the restriction on the use of certain hazardous substances for electronic equipment mandated by the RoHS Directive removes the source of pollution, hence preventing the damage from occurring altogether.⁴² Preventive measures may range from soft law to a ban. However, removing the source of pollution altogether is an extreme measure that the EU has used with caution, preferring instead to regulate the polluting activity so as to mitigate resulting pollution to what the environment can assimilate.⁴³

EU environmental law developed initially in reaction to the occurrence of damage. In the seventies, industrial emissions and pollution from waste dumps run by municipalities became blatant threats to human health and the environment that needed mitigating.⁴⁴ EU legislators were not dealing with the anticipation of a risk; they were rather aiming to repair losses and prevent future injury.⁴⁵ The legislative response to those problems reflected that attitude. Early waste legislation aimed to ensure better collection and management of waste to reduce harm.⁴⁶ These were end-of-pipe measures. The polluter-pays principle (PPP) – which primarily has a curative function in that it assigns costs – underpinned much of the early industrial emission and waste legislation.⁴⁷ For instance, instead of the cost of waste management being borne by the taxpayers, producers were made to pay for the collection and processing of their waste products even if others, such as municipalities, effectively continued to perform the tasks.⁴⁸

The function of the PPP is not, however, purely curative; it is also preventive.⁴⁹ In fact, the PPP, re-qualified as the ‘Extended Producer Responsibility’ (EPR) in EU waste law, forced

³⁸ Van Calster and Reins (2017), 34; L. Krämer, ‘The Genesis of EC Environmental Principles’, in R. Macrory (Ed.), *Principles of European Environmental Law* (Groningen: Europa Law Publishing, 2004), 31-47, 39.

³⁹ De Sadeleer (2002), 72–73.

⁴⁰ Directive 2008/50/EC of 21 May 2008 on ambient air quality and cleaner air for Europe, OJ L 152, 11.6.2008, p. 1; and Directive 2004/107/EC of 15 December 2004 relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air, OJ L 023, 26.1.2005, p. 3.

⁴¹ De Sadeleer (2002), 76–77.

⁴² G. Van Calster, *EU Waste Law*, 2nd edn (Oxford: Oxford University Press, 2015), 1.206; Directive 2011/65/EU of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS), OJ L 174, 01.07.2011, p. 88.

⁴³ De Sadeleer (2002), 78.

⁴⁴ M. Reese, ‘The Legal Framework for Waste Management: Unresolved problems and future perspectives’, in R. Macrory (Ed.), *Reflections on 30 Years of EU Environmental Law: A high level of protection* (Groningen: Europa Law Publishing, 2006), 289–305, 290.

⁴⁵ De Sadeleer (2002), 74.

⁴⁶ Reese (2006), 291.

⁴⁷ De Sadeleer (2002), 29.

⁴⁸ Van Calster (2015), 1.309.

⁴⁹ H. C. Bugge, ‘The Polluter Pays Principle: Dilemmas of justice in national and international contexts’, in J. Ebbesson and P. Okowa (Eds.), *Environmental Law and Justice in Context* (Cambridge: Cambridge University Press, 2009), 411–428, 414.

producers to internalize the costs of end-of-life. When the State finances pollution control, there is no dissuasive value to pursuing polluting activities.⁵⁰ When the polluter has to pay, there is a clear incentive to reduce pollution. That is at least as long as the costs are greater than the anticipated benefits from continuing the activities in question.⁵¹ In ARTICLE 3, I discuss the shortcomings of relying on the PPP for waste prevention. For some products, in particular complex and expensive products such as electronic equipment, financial incentives proved insufficient in the face of the overall production costs and sales benefits.

De Sadeleer notes that prevention at source tends to be most effective.⁵² Thus, EU law prompts to prioritize rectification of environmental damage at source as provided in Article 191 TFEU. It is not necessarily evident, however, what the ‘source’ of pollution is. Is it the most direct source or is it the root cause? Is it the discarding of products or is it their purchase? Is it the management of waste or the manufacture of products? Is it the extraction of raw natural resources or the demand for new products? The choice of regulating one source or another is likely to come down to how effective the measures are in mitigating pollution, the cost of the intervention, its technical feasibility and political acceptance.⁵³

For a long time EU legislation has focussed on waste, and the main goal of waste law is prevention.⁵⁴ The EU has been very successful in mitigating the damage from waste management; waste prevention, however, is not a question of waste, but of products. This dichotomy between the objective of the law and the source of the damage forms the core of the discussion in ARTICLE 3: what is waste prevention really about? Why has waste legislation become the centrepiece of the legal framework on products? Should waste law be gradually made less prominent in the CE in order to pursue the objective of closing the loop?

The rise of life-cycle thinking prompted the EU to address the product from angles other than emissions from manufacturing and pollution from waste management. One stage of the product’s life cycle – i.e. consumption – had been particularly neglected, and rising concern about climate change brought the issue of energy use to the forefront.⁵⁵ Developed in the context of the EU’s integrated product policy (IPP), the Ecodesign Directive was set out to increase energy efficiency of products during consumption, hence reducing greenhouse gas emissions and energy demand.⁵⁶ More interesting is the rationale that the most effective and not least most cost-effective way to address energy efficiency is the design stage.⁵⁷ The Preamble of the Ecodesign Directive states that:

⁵⁰ De Sadeleer (2002), 36.

⁵¹ Ibid, 37.

⁵² De Sadeleer (2002), 76.

⁵³ See e.g. Article 191(3) TFEU.

⁵⁴ Directive 2008/98/EC of 19 November 2008 on waste, OJ L 312, 22.11.2008, p. 3, Article 4(1).

⁵⁵ Ecodesign Directive, Preamble (3) and (6).

⁵⁶ Ibid, Preamble (6) states that “[e]nergy efficiency improvement — with one of the available options being more efficient end use of electricity — is regarded as contributing substantially to the achievement of greenhouse gas emission targets in the Community.” Moreover, “[e]nergy saving is the most cost-effective way to increase security of supply and reduce import dependency.”

⁵⁷ C. Dalhammar, ‘Promoting Energy and Resource Efficiency through the Ecodesign Directive’ (2014b) 59 *Scandinavian Studies in Law*, 147–179, 150.

Action should be taken during the design phase of energy-related products, since it appears that the pollution caused during a product's life cycle is determined at that stage, and most of the costs involved are committed then.⁵⁸

The approach that consists not just in pinpointing the source of the damage – i.e. products in use – but also in identifying the source of the threat – i.e. poor design – was quite innovative. The ecodesign scheme also represented a new approach to EU environmental regulation. Traditionally, preventive measures would take the form of binding administrative instruments ('command-and-control') or provide incentives, namely through fiscal measures ('economic instruments').⁵⁹ The Ecodesign Directive revived a command-and-control approach that had become increasingly criticized for being inflexible, arbitrary, stifling innovation and creating enforcement difficulties.⁶⁰ In short, it eliminates the worst performers from the market and levels the playing field in favour of producers that develop less damaging products.⁶¹ Moreover, by coupling it with the Energy Labelling Directive, the EU legislator developed a 'smart' regulatory mix⁶² whereby labels shall encourage producers to innovate and hasten the process of strengthening the ecodesign requirements.⁶³

5.3.3. The significance of assessment methods for adopting preventive measures

An important aspect of pursuing prevention is one of threshold. Under EU law, the proportionality principle constrains the adopting of any such measure. The Treaty on the EU (TEU) prescribes that

the content and form of Union action shall not exceed what is necessary to achieve the objectives of the Treaties.⁶⁴

For the environmental policy of the EU, the proportionality principle means that preventive measures may not aim to remove all harm at any cost.⁶⁵ The EU legislator must verify the degree and probability of risk posed by a polluting activity.⁶⁶ A 'significant risk' of

⁵⁸ Ecodesign Directive, Preamble (7).

⁵⁹ De Sadeleer (2002), 73.

⁶⁰ See e.g. E. W. Orts, 'A Reflexive Model of Environmental Regulation' (1995) 5 *Business Ethics Quarterly* 4, 779–794, 781; C. R. Sunstein, 'Paradoxes of the Regulatory State' (1990) 57 *The University of Chicago Law Review* 2, 407–441.

⁶¹ E. Maitre-Ekern, 'The Choice of Instruments for the Circular Economy', in K. Mathis and B. R. Huber (Eds.), *Environmental Law and Economics* (Springer, 2017), 318.

⁶² The term 'smart' regulation is used in reference notably to Gunningham N. and D. Sinclair, 'Designing Environmental Policy' in N. Gunningham, P. Grabosky and D. Sinclair (Eds.) *Smart Regulation: Designing environmental policy* (Oxford: Oxford University Press, 1998), 375–454; see also 3.3.4 above.

⁶³ Dalhammar (2014b), 158; C. Dalhammar and M. G. Faure, 'Principles for the Design of a Policy Framework to Address Product Life Cycle Impacts', in E. Maitre-Ekern, C. Dalhammar and H. C. Bugge (Eds.), *Preventing Environmental Damage from Products: An analysis of the policy and regulatory framework in Europe* (Cambridge: Cambridge University Press, 2018), 57–86, 64.

⁶⁴ Article 5(4) TEU.

⁶⁵ De Sadeleer (2002), 80.

⁶⁶ Ibid.

environmental harm will require intervention⁶⁷ even if there is a low probability that it will occur.⁶⁸ A high risk of negligible damage, on the other hand, is likely to remain unregulated.⁶⁹

The principle has emerged as a means of checking the discretion of authorities as they restrict power within human society.⁷⁰ It is not at the outset a mechanism to ensure the sustainability of decisions, but to ‘rationalize’ the decision-making process.⁷¹ At the heart of the principle is the idea of balancing interests, i.e. that of the general public versus that of an individual. In the EU, the most general approach to assess the proportionality of a policy or a measure takes the form of a four-step analysis, which is meant to determine whether the policy/measure:

- (1) is *legitimate* in that it pursues a justifiable objective;
- (2) is *effective* in pursuing the stated objective;
- (3) is *necessary* and cannot be replaced by another less intrusive measure; and
- (4) is *balanced* so that the interferences is not excessive in view of the objective pursued.⁷²

An interesting idea to re-think the principle of proportionality in view of a stronger sustainability approach, proposed by Geert Winter, consists in extending the current concept of proportionality, which focuses on the relation between state (power) and society, to the relation between the above two to nature.⁷³ The proposed ‘eco-proportionality’ principle entails a fourfold test similar to the traditional approach, whereby,

If an activity encroaches on natural resources:

- the actor must pursue a justifiable societal objective (1); and
- the activity shall prospectively be
 - o effective, i.e., capable of serving the objective (2);
 - o necessary, i.e., not replaceable by an alternative that is less intrusive on natural resources (3); and
 - o balanced, i.e., not excessively intrusive on natural resources in view of the importance of the societal objective (4).⁷⁴

Such ‘eco-balancing’, he argues, already exists to some extent in EU legislation, but is not broadly and consistently applied.⁷⁵ The ecological version of the proportionality principle appears to give a better basis for protection and tends to recognize the inherent value of natural

⁶⁷ See e.g. Directive 2009/147/EC of 30 November 2009 on the conservation of wild birds, OJ L 20, 26.1.2010, p. 7, Article 4(4); Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, OJ L 206, 22.7.1992, p. 7, Article 6(2); and Ecodesign Directive, Article 15(2).

⁶⁸ E.g. nuclear accidents.

⁶⁹ De Sadeleer (2002), 81.

⁷⁰ Winter (2013), 112–113.

⁷¹ T. I. Harbo, ‘The Function of the Proportionality Principle in EU Law’ (2010) 16 *European Law Journal* 2, 158–185, 160.

⁷² Winter (2013), 112; W. Sauter, ‘Proportionality in EU Law: A balancing act’ (2013) 15 *Cambridge Yearbook of European Legal Studies*, 439–466, 448; see also e.g. Case C-331/88 *Fedesa and Others* [1990] ECR I-4023, para 13, and Joined Cases C-133/93, C-300/93 and C-362/93 *Crispoltoni and Others* [1994] ECR I-4863, para 41; Case C-189/01 *Jippes and Others* [2001] ECR I-5689, para 81; Case C-2/10 *Agro-Zootecnica Franchini and Eolica di Altamura* [2011] EU:C:2011:502, para 73.

⁷³ Winter (2013), 114.

⁷⁴ *Ibid*, 115.

⁷⁵ *Ibid*, 118ff.

resources. It remains the case, however, that a balancing exercise, whether to protect the interests of society or that of the environment, appears necessarily connected to a cost-benefit analysis.⁷⁶

EU primary law uniquely endorses an examination of costs and benefits when it comes to regulating in environmental policy.⁷⁷ It is also the view held by the CJEU, notably in *Pfizer*:

[A] cost/benefit analysis is a particular expression of the principle of proportionality in cases involving risk management. It therefore considers it appropriate to examine the merits of the arguments relating to that analysis together with those concerning breach of the principle of proportionality.⁷⁸

Furthermore, in its ‘Better regulation’ initiative, the Commission asserted that better regulation means that EU policies and laws “achieve their objectives at minimum cost”.⁷⁹ In light of the inherent shortcomings of monetizing ecosystems and account for the future discussed in 2.3.2 above, the endorsement of the cost-benefit analysis in assessing the opportunity and content of a preventive measure cannot be satisfactory. It anchors the legal framework in a weak sustainability approach that is in opposition to the ecological paradigm.⁸⁰

The preventive approach of EU environmental law focuses mainly on risk management.⁸¹ Thus, the adoption of preventive measures will eventually rest on a balancing of the environmental risk of a polluting activity against the economic and social benefits of that activity (i.e. the fourth step of the proportionality test).⁸² Hence, it comes down to what ‘excessive’ means. Is it excessive to prevent smartphones that are not designed for repair from entering the market? Is it excessive to impose high sales taxes on computers that contain a too-high percentage of raw natural resources? Is it excessive to ban advertising aimed at children? Introducing an economic valuation in the discussion might make it appear more ‘objective’ or politically ‘safe’. The question is: does it make it more sustainable?

Moving towards a CE requires some radical changes, notably for business models, but also with regards to infrastructures (e.g. waste collection and recovery facilities), that may represent high upfront costs.⁸³ Some businesses may have to shut down completely. Jobs in industrial sectors of the linear model (e.g. extraction of raw material; production of low-quality products) may be lost.⁸⁴ The rise in sales prices of more durable and efficient goods may reduce consumer purchasing power. Is that ‘excessive’?

⁷⁶ Ibid, 129.

⁷⁷ See Article 191(3) TFEU.

⁷⁸ Case T-13/99 *Pfizer Animal Health SA v Council* [2002] ECT 11-3305, para 410.

⁷⁹ Commission Staff Working Document, ‘Better Regulation Guidelines’, SWD(2017) 350, 4.

⁸⁰ See 4.2.1 above.

⁸¹ De Sadeleer (2002), 80.

⁸² S. Rose-Ackerman, ‘Precaution, Proportionality, and Cost/Benefit Analysis: False analogies’ (2013) 4 *European Journal of Risk Regulation*, 281–288, 283; see also P. Craig, *EU Administrative Law* (Oxford: Oxford University Press, 2007), see chapter 17 for a broader overview; G. Garver, ‘The Rule of Ecological Law: The legal complement to degrowth economics’ (2013) 5 *Sustainability*, 316–337, 321.

⁸³ EEA, ‘Circular Economy in Europe: Developing the knowledge base’ (2016) *EEA Report No 2/2016*, 12.

⁸⁴ Ibid, 14.

5.3.4. Renewed prevention for the CE

Preventive measures for the CE must innovate and indeed push the boundaries of what might seem to entail ‘excessive’ costs or require ‘excessive’ transformation of current practices. The goal, after all, is not prosperity for the sake of the economy, but prosperity for humanity and the environment through successful economic activities.

ARTICLES 3, 4 and 5 all examine ways of transitioning to a new paradigm by questioning the current legal approach and considering how to move towards a truly preventive and sustainable framework. ARTICLE 5, which relates to consumption, proposes to establish a hierarchy of consumption behaviour and explores ways to translate it into law. The article is discussed further in section 5.5 below.

ARTICLE 3 presents some of the mechanisms used to reduce the durability (and to some extent the reparability) of products. Such a systematic overview of the means of ‘obsolescence’ constituted one of the original features of this article. The other was the examination of ways to promote durability and reparability through very different regulatory frameworks. At the time of writing, the two French measures – criminalization of planned obsolescence, and information about spare parts availability – were new and largely absent from existing literature. On the contrary, the Norwegian rule on legal guarantees had long been around, but the potential of such rules to promote both durability and reparability was under-researched. Although each of those measures may appear somewhat narrow and certainly had shortcomings,⁸⁵ over time they can contribute to changing the paradigm.

ARTICLE 4, on the other hand, pertains to waste prevention and the role of producers. In that article, I investigate the dichotomy between the aim of waste law and the objectives of the CE, notably in light of their historical context. Instead of following the literature trend on waste and extended producer responsibility (EPR) that consists in examining how to ‘fix’ the existing framework,⁸⁶ I question the adequacy of the rule to the objective. Thus, I put forward the need to extend the responsibility of producers to the pre-consumer stage. This is in line with Lindhqvist, the father of EPR in Europe, had originally in mind; that producers should be responsible for their product’s entire life cycle, not just for their end-of-life.⁸⁷ In other words, I propose to reinforce the legal framework on products with general obligations to producers to care for what they put on the market and to contribute to extend their product’s lifetime.

⁸⁵ See notably in ARTICLE 5

⁸⁶ See e.g. A. Atasu, ‘Operation Perspectives on Extended Producer Responsibility’ (2018) *Journal of Industrial Ecology*, 1–7; X. N. Huang, A. Atasu and L. B. Toktay, ‘Design Implications of Extended Producer Responsibility for Durable Products’ (2018) <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3043985> accessed 25.03.2019; H. Wilst, N. von Gries and B. Bahn-Walkowiak, ‘From Waste Management to Resource Efficiency- The Need for Policy Mixes’ (2016) 8 *Sustainability* 7, 622–638.

⁸⁷ T. Lindhqvist, ‘Extended Producer Responsibility in Cleaner Production: Policy Principle to Promote Environmental Improvements of Product Systems’ PhD Thesis, IIIIEE, Lund University (2000), 37.

5.4. A precautionary pursuit of sufficiency?

5.4.1. Introduction

This section discusses the meaning of pursuing sufficiency through the law. The rationale for the sufficiency approach has been discussed in section 3.2 above and essentially lies in the laws of thermodynamics. Following the proposed ecological definition of the CE, the economic model is to be *precautionary*.⁸⁸ Hence, in this section, I investigate what ‘precaution’ means and how it could contribute to adopting sufficiency measures in the legal framework for the CE.

It may seem far-fetched to argue for the adoption of precautionary measures when the framework for prevention is much easier to navigate. Arguably, sufficiency measures could be adopted on the basis of the EU’s prevention principle discussed in the previous section. If they are, all the better. The fact is that the prevention principle has supported the adoption of quite far-reaching regulation.

However, if precaution is deemed to encompass prevention, the opposite is not true. Whereas the prevention principle is meant to respond to the risk of environmental harm, precaution goes further to regulate the situations where the risk of harm (or its cause) is uncertain at the moment of adoption of such regulations.⁸⁹ Hence, precaution involves an anticipation of the risk that is not required from a preventive approach. In fact, the need for a certain degree of certainty signifies that preventive measures often intervene in response to environmental harm that has already materialized. Precaution shall aim to avoid the occurrence of the harm.

The precautionary principle is one of the cornerstones of EU environmental law, but the EU’s approach to the principle is cautious. The adoption of precautionary measures is usually linked to the existence of a high risk of potential harm, such as hazardous substances.⁹⁰ However, this chapter does not aim to take the EU’s precautionary principle as point of departure for the analysis, but rather to consider what a precautionary principle could become in an ecological paradigm. It is argued that a strong definition of and approach to the precautionary principle could prompt the adoption of more proactive and forceful measures, and introduce the much-needed sufficiency dimension to the EU’s CE. Indeed, exceeding the ecological ceiling poses an existential threat to humanity and the Earth system, and there remains a high degree of uncertainty about the environment impact of existing and new activities, and about the ability of technology to resolve the challenges. Hence, pursuing precaution is meant to avoid risk before considering how to manage it. It aims to ask “how little harm is possible” rather than “how much harm is allowable”.⁹¹

⁸⁸ See section 4.5 above.

⁸⁹ De Sadeleer (2002), 91–92.

⁹⁰ For an overview of the application of the precautionary principle in EU law, see K. Garnett and D. Parsons, ‘Multi-Case Review of the Application of the Precautionary Principle in European Union Law and Case Law’ (2017) 37 *Risk Analysis* 3, 502–516.

⁹¹ N. Kuraj, ‘REACHing an Environmental Regulation for Nanotechnology: An analysis of REACH as an instrument for preventing and reducing the environmental impacts of nanomaterials’, PhD Thesis, University of Oslo (2017), 295.

Another important difference between the prevention and the precautionary principles lies in their status: the first is value-neutral, whereas the second is political.⁹² The ‘neutrality’ of preventive measures is significant; however, the political feature of precaution might also be necessary. If it is true that the decision-makers have been hesitant to adopt measures that challenge the *status quo* of the economic foundation of society, the mood has already begun to turn. The EU’s level of ambition to transition to a CE shows that there is political willingness to change. Moreover, discussions at the international level about an environmental pact and pressure from trial and protests testify to a momentum that could encourage political boldness. My argument is that precaution could offer a legal framework for that.

In sum, in this section I begin with exploring the content and various possible meanings of the precautionary principle. I will examine why precaution is relevant in this context and how the EU should pursue sufficiency in the CE. In this section, I focus on measures aimed at production. In section 5.5, I investigate sufficiency along with other issues related to consumption.

5.4.2. Precaution to regulate uncertainty

A variety of definitions of the precautionary principle have flourished in international and national law, such that its contours are difficult to determine in a clear and uniform way. Moreover, in light of its roots, precaution contains various elements that are given variable degrees of weight in the different characterizations of the principle. For the purpose of this thesis, it is important to apprehend the breadth of the possible definitions of the precautionary principle, and the different features that may hide under a single expression. This will form the basis for determining what a ‘strong’ precaution encompasses and why it ought to be pursued under an ecological paradigm.⁹³

The precautionary principle emerged during the 1970s as the German *Vorsorgeprinzip*.⁹⁴ At the core of precaution is hence the word *Vorsorge*, which means ‘foresight’ and conveys the idea of caring for the future.⁹⁵ In English, the word ‘care’ in its dual meaning – that is, worry and diligence – should be central. The first meaning rests on the premise of ‘threats of serious or irreversible damage’, whereas the second reflects the idea of adopting measures to prevent damage in spite of a ‘lack of full scientific certainty’.⁹⁶

The precautionary principle has four main dimensions that are common to all definitions of the principle, i.e. threat, uncertainty, action, and command.⁹⁷ It is the interpretation of these various dimensions that really influences the substance and scope of the principle. The *threat* dimension

⁹² According to the Commission, “[j]udging what is an “acceptable” level of risk for society is an eminently political responsibility.” COM(2000) 1 final.

⁹³ E.g. Garver (2018), 144.

⁹⁴ S. Boehmer-Christiansen, ‘The Precautionary Principle in Germany – Enabling government’, in T. O’Riordan and J. Cameron (Eds.), *Interpreting the Precautionary Principle* (New York: Earthscan, 1994), 31–60, 31.

⁹⁵ T. O’Riordan and A. Jordan, ‘The Precautionary Principle in Contemporary Environmental Politics’ (1995) 4 *Environmental Values* 3, 191–212, 193.

⁹⁶ Kuraj (2017), 312; See also the text of the Rio Declaration, principle 15.

⁹⁷ P. Sandin, ‘Dimensions of the Precautionary Principle’ (1999) 5 *Human and Ecological Risk Assessment: An International Journal* 5, 889–907, 890–1.

may be determined on the basis of a high threshold as per the Rio declaration (i.e. the threat of serious or irreversible damage)⁹⁸ or on a low one as per the Wingspread definition (i.e. threat to the environment or human health).⁹⁹ In other words, a threat may be identified only if highly toxic components in products risk leaking into the environment or, on the contrary, simply from the fact that low-quality and non-reparable products risk ending up in landfill or polluting the ocean. A low threshold triggers a much broader scope of application of the precautionary principle than a high threshold.

Uncertainty is the very reason for taking precaution (otherwise, we would talk about ‘prevention’). The precautionary principle generally holds that the uncertainty is an issue of scientific uncertainty.¹⁰⁰ The reason why science is uncertain may come from a lack of data. Typically, the issue here is one of monitoring and the difficulty of recording the overall and long-term impacts of, say, land degradation from mining of minerals used in manufacturing processes.¹⁰¹ Overcoming this uncertainty would require intensified monitoring and upgraded taxonomy. Hence, precautionary measures may be required when awaiting improvements in scientific knowledge. Uncertainty may also come from ignorance – that is, the difficulty in predicting and forming hypotheses about environmental impacts.¹⁰² Ecosystems are unique and react differently even to the same type of degradation.¹⁰³ The effects of mining on underground or surface waters, on local biodiversity and on other interrelated ecosystems can vary greatly from one geographical area to another. In this case, O’Riordan and Jordan argue that it does not make sense to make precautionary decisions dependent on the scientific community, and that the responsibility for establishing the vulnerability or resilience of natural processes should rather fall on other groups such as lawyers, policymakers and civil society.¹⁰⁴ Finally, the inherent complexity of the system, of its interrelationships and of possible multiplier effects, may turn scientific modelling into a lottery.¹⁰⁵ For instance, the challenges of determining the effects of urbanization and urban patterns on the water, carbon, aerosols and nitrogen cycles, and more generally on regional and global climate, remain extensive.¹⁰⁶ This type of uncertainty is particularly grave and the increasing use of scientific innovations (such as GMOs or

⁹⁸ Principle 5 of the Rio Declaration states: “Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.”

⁹⁹ The Wingspread Statement on the precautionary principle stipulates that: “When an activity raises threats to the environment or human health, precautionary measures should be taken, even if some cause-and-effect relationships are not fully established scientifically.” N. Ashford et al., ‘The Wingspread Statement on the Precautionary Principle’, Wisconsin, 1998, Reproduced in C. Raffensperger and J. Tickner (Eds.), *Protecting Public Health and the Environment: Implementing the precautionary principle* (Washington: Island Press, 1999), 353–355.

¹⁰⁰ Sandin (1999), 893.

¹⁰¹ O’Riordan and Jordan (1995), 199.

¹⁰² Ibid.

¹⁰³ J. Nagle and J. B. Ruhl, *The Law of Biodiversity and Ecosystem Management* (New York: Foundation Press, 2002), 306.

¹⁰⁴ O’Riordan and Jordan (1995), 199.

¹⁰⁵ Ibid, 200.

¹⁰⁶ See e.g. K. C. Seto and J. M. Shepherd, ‘Global Urban Land-Use Trends and Climate Impacts’ (2009) 1 *Current Opinion in Environmental Sustainability* 1, 89–95.

nanotechnology) in consumer products¹⁰⁷ adds to the difficulty of predicting the repercussions on natural processes.

The degree of a threat's uncertainty varies from one definition of the precautionary principle to another, and with it the threshold to trigger precautionary measures. In its Communication on the Precautionary Principle, the Commission does not provide a clear definition of the principle, but mentions the existence of "reasonable grounds for concern" in light of "preliminary objective scientific evaluation".¹⁰⁸ This indicates a particularly low uncertainty threshold.

In dealing with both dimensions of threat and uncertainty, the most controversial aspect remains the issue of the *burden of proof*. Who should be responsible to provide evidence: the one who claims precaution, or the one who carries the potentially harmful activity? In traditional environmental law, the burden of proof usually lies with those who aim to oppose potentially harmful activities.¹⁰⁹ However, the severity and unpredictability of human activities on the environment has prompted claims of shifting the burden and placing it on those who aim to carry out a potentially damaging activity.¹¹⁰ Following EU rules on chemicals, prior approval is required before placing on the market "substances deemed 'a priori' hazardous or which are potentially hazardous at a certain level of absorption".¹¹¹ In other words, the responsibility of producers¹¹² of potentially hazardous substances is to produce scientific evidence that the substance is not harmful.¹¹³ For other cases, it will usually be "for the user of a product, a private individual, a consumer association, citizens or the public authorities to demonstrate the nature of a danger and the level of risk posed by a product or process."¹¹⁴ This means that the producer that wants to place products on the EU market that fall below the hazardous threshold of chemical legislation would be able to do so unrestricted and notwithstanding the risk that those products might trigger indulgent consumption, leading to the premature replacement of the products in use, or generating otherwise avoidable waste.¹¹⁵ In the following section, I look into how EU rules on ecodesign of energy-related products opened a new era for an application of the precautionary principle based on a reversal of the burden of proof.

The third dimension concerns the type of response provided to the threat. What kind of *action* may be appropriate? Should the precautionary measures aim to manage the risk or avoid it? Must the measures be cost-effective? Weaker forms of precaution would take a risk-management approach in line with a typical preventive approach. A strong application of the

¹⁰⁷ See e.g. N. Vance et al., 'Nanotechnology in the Real World: Redeveloping the nanomaterial consumer products inventory' (2015) *Beilstein Journal of Nanotechnology* 6, 1769–1780.

¹⁰⁸ Commission Communication on the Precautionary Principle, COM(2000) 1 final, 3.

¹⁰⁹ A. Trouwborst, *Precautionary Rights and Duties of States* (Leiden/Boston, MartinusNijhoff Publishers, 2006), 193.

¹¹⁰ B. Dickson, 'Fairness and the Costs and Benefits of Precautionary Action', in R. Cooney and B. Dickson (Eds.), *Biodiversity & the Precautionary Principle: Risk and uncertainty in conversation and sustainable use* (London: Earthscan, 2007), 275.

¹¹¹ COM(2000) 1 final, 6.4; Kuraj (2017), chapter 5 about the precautionary approach in REACH Regulation.

¹¹² Here, the term is used very generally and includes notably the manufacturer, importer and supplier.

¹¹³ COM(2000) 1 final, 6.4.

¹¹⁴ *Ibid.*

¹¹⁵ Indulgent consumption refers in particular to consumption of inessential products and overconsumption; premature replacement corresponds to the discarding of products before the end of their lifetime; finally, waste generation may be avoided by a product being durable, repairable and recoverable.

precautionary principle, on the other hand, tends toward risk prevention.¹¹⁶ Hence, the idea is that uncertainty about an activity may necessitate stringent actions, such as prohibition, requiring proponents to prove that their activity is safe.¹¹⁷

Similarly to the prevention approach discussed above at 5.3.3, EU law subordinates the adoption of precautionary measures to the proportionality principle. The Commission, discussing the precautionary principle, established the need to assess the proportionality of a measure to the pursued aim *and* to examine “the potential benefits and costs of action or lack of action (including, where appropriate and feasible, an economic cost/benefit analysis)”.¹¹⁸ General problems with an examination of costs and benefits have been discussed on several occasions in this dissertation. Still, the application of a cost-benefit analysis to the adoption of precautionary measure is deemed to give especially poor results. Indeed, the more precautionary a measure is, the more likely it will generate costs that will exceed the benefits of regulation.¹¹⁹

Finally, the last dimension pertains to the *status* of the action – that is, whether the action is allowable, justified, recommended, or mandatory.¹²⁰ A weak precautionary approach will typically leave great flexibility when it comes to the decision to take action, while the stronger version will require public intervention.

Overall, the application of the precautionary principle in policy varies from a weak to a moderate and a strong approach whereby, in each approach, the various dimensions carry a similar intensity.¹²¹ In sum, the three main precautionary approaches – weak, moderate and strong – would usually have the following characteristics:

- A *weak* precautionary approach considers that “uncertainty does not justify inaction”. Policymakers may (but do not have to) act in case of uncertain threat of ‘serious and irreversible damage’.¹²² Assessing the need for action would typically require an examination of costs and benefits. The burden of proof is usually rests on those who claim the need for precaution. A ban is very rare;
- A *moderate* precautionary approach believes that “uncertainty justifies action”. Precautionary action shall be taken to avoid ‘potentially dangerous effects’ as per preliminary scientific evaluation.¹²³ Action is proportional, often based on best available

¹¹⁶ Garnett and Parsons (2017), 505.

¹¹⁷ Ibid.

¹¹⁸ COM(2000) 1 final.

¹¹⁹ R. Precival, ‘Who’s Afraid of the Precautionary Principle?’ (2005) *University of Maryland School of Law Research Paper* No. 2005-62, 16.

¹²⁰ Sandin (1999), 894–895.

¹²¹ Sandin points out that weakening any one of those dimensions amounts to weakening the precautionary principle as a whole, but policies tend to be consistent in their approach so that a *high threshold for the threat* is usually accompanied by a *high threshold for uncertainty*, and merely *opens the possibility* for the adoption of *cost-effective measures*; Sandin (1999), 895–9.

¹²² Rio declaration, principle 15.

¹²³ COM(2000) 1 final.

techniques, and aimed at risk management. The burden of proof might be reversed for specific types of risks (e.g. chemicals).¹²⁴ A ban is the last resort;

- A *strong* precautionary approach takes the stand that “uncertainty justifies shifting the burden and standard of proof”. The ‘threats of harm’ shall be eliminated.¹²⁵ It is for the proponent of an activity to prove that it is safe even if the cause and effect relationship is not scientifically determined. The burden of proof falls on the proponent of a potentially harmful activity.¹²⁶ A ban is likely to be justified to avoid the risk.

Generally, the EU has taken a moderate view of the precautionary principle resulting in the adoption of sometimes far-reaching regulation for severe and urgent threats to the environment or human health caused by (potentially) hazardous substances.¹²⁷ However, it follows from this interpretation that no precautionary measures have even been envisaged for the less immediate but grave threat to the ‘safe operating space’ of large quantities of (low-quality) products flooding the European market. The moderate approach is also more open to accommodating economic concerns and hence weakening the effectiveness of the precautionary measures.

5.4.3. Is there uncertainty?

Here, I want to examine briefly the limits of preventive measures. I make the argument that the two key features of precaution – i.e. threat and uncertainty – are present, using as the starting point of my analysis what is arguably the most innovative and successful EU legislation on products: the Ecodesign Directive.

The adoption of the Ecodesign Directive was justified based on the affirmation that “the pollution caused during a product’s life cycle is determined at [the design] stage”.¹²⁸ Hence, preventing damage at the source required conditioning the placing on the EU market of products in compliance with ecodesign standards.¹²⁹ A first issue is that the core rationale behind the ecodesign scheme is not necessarily valid. If it is true that design may play an important role in minimizing environmental damage throughout product life cycles, it is not the case to the same degree for all products, nor is it in general the only relevant aspect.

In ARTICLE 3, which discusses various approaches to regulating durability and reparability, it is clearly established that the cause of product damage is not only the result of poor design, but also largely the result of the growth-driven throwaway society. Indeed, the techniques to ensure the premature replacement of products with new ones lie as much in technical features (in-built

¹²⁴ E.g. REACH.

¹²⁵ Wingspread Statement on the precautionary principle, see Ashford et al. (1998).

¹²⁶ The Wingspread Statement specifies that it is for “the proponent of an activity, rather than the public, [to] bear the burden of proof.” Ashford et al. (1998).

¹²⁷ E.g. Directive 2001/18/EC of 12 March 2001 on the deliberate release into the environment of genetically modified organisms, OJ L 106, 17.04.2001, p. 1–39, Directive 2009/127/EC of 21 October 2009 on machinery for pesticide application, OJ L 310, 25.11.2009, p. 29–33 or Directive 2011/65/EU of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical equipment, OJ L 174, 01.07.2011, p. 88–110; see Garnett and Parsons (2017), 510.

¹²⁸ Ecodesign Directive, Preamble (7).

¹²⁹ For a complete overview of the Ecodesign Directive, see Dalhammar (2007) and Dalhammar (2014b).

premature failure; technological advancement¹³⁰) as more ‘psychological’ ones. Consumer tastes and choices are shaped so as to encourage quick replacement of products. A study indicates that consumer electronics are replaced more and more frequently, and one of the main reasons for this appears to be consumer preferences.¹³¹ Hence, even though a product might be designed to have a long lifetime, to be disassembled, with spare parts made available to ensure its reparability, that product may still have a short effective lifespan.

In addition, although design measures may plan for the end-of-life and recovery of materials and products, it is fundamentally uncertain whether and how this will take place. Firstly, the product may not be disposed of properly because it has been dumped in nature, placed in the wrong recycling container, exported illegally outside of the EU,¹³² or because materials are not separated from one another. Secondly, the product received by the recovery facility may not be handled as it should in order to preserve its value. The product may have been damaged,¹³³ valuable parts may have been stolen prior to the arrival at the recovery site,¹³⁴ or the recovery may not be conducted in compliance with EU rules or in line with the designer’s aim due to a lack of capacity or information. Finally, even if a product can be recovered in good condition, it is not certain that it will be able to re-access the market due to evolving chemical regulations.¹³⁵

Consequently, the product itself – independent of its design – constitutes a threat to the environment because it may result in uncontrolled or excessive waste generation, and because it contributes towards reducing the available stock of natural resources. The uncertainty as to how and when the threat will materialize also results from the mere existence of the product.

Ecodesign requirements clearly form a fundamental aspect of the legal framework for the CE, in particular now that it is progressively extending from regulating solely the energy performance of products to imposing requirements for resource efficiency, durability and reparability.¹³⁶ So do measures to ensure better collection and recover of discarded products.

¹³⁰ For example, in the case of information and communication technology (ICT), as consumers often need to match hardware and software, with periodical software updates, making functioning hardware impossible to use in practice. Cf. D. Basulto, ‘Welcome to the New Planned Obsolescence’, Washington Post, 9 November 2012 <www.washingtonpost.com/blogs/innovations/post/welcome-to-the-new-planned-obsolescence/2012/11/09/6d6188f4-2901-11e2-aaa5-ac786110c486_blog.html?noredirect=on&utm_term=.5205cff887a4> accessed 25.03.2019.

¹³¹ S. Prakash et al., ‘Einfluss der Nutzungsdauer von Produkten auf ihre Umweltwirkung: Schaffung einer Informationsgrundlage und Entwicklung von Strategien gegen „Obsoleszenz“’ [‘Influence of the useful life of products on their environmental impact: Creation of an information basis and development of strategies against “obsolescence”’] (2016) *Umweltforschungsplan des Bundesministeriums für Umwelt, Naturschutz, Bau undmweltbundesamt Reaktorsicherheit*, Texte 11/2016.

¹³² This can be done in good faith by a private person or result from illegal trafficking activities.

¹³³ For instance, as a result of misuse.

¹³⁴ Here the term ‘scavenging’ is used in the sense of theft. See e.g. J. Huisman et al., ‘Countering WEEE Illegal Trade (CWIT) Summary Report, Market Assessment, Legal Analysis, Crime Analysis and Recommendations Roadmap’ (2015) <www.cwitproject.eu/wp-content/uploads/2015/09/CWIT-Final-Report.pdf> accessed 25.03.2019.

¹³⁵ Commission Communication on the implementation of the circular economy package: options to address the interface between chemical, product and waste legislation, COM(2018) 32 final.

¹³⁶ See ARTICLE 3; J. L. Richter et al. ‘Optimal Durability in Least Life Cycle Cost Methods: The case of LED lamps’ (2019) 12 *Energy Efficiency* 1, 107–121; P. Tecchio et al., ‘Ecodesign of Personal Computers: An analysis of the potentials of material efficiency options’ (2018) 69 *Procedia CIRP*, 716–721.

However, in view of the inherent uncertainty attached to the existence of a product and notably to its use and disposal, strong precaution could arguably justify the adoption of far-reaching sufficiency measures that aim to avoid or minimize the mere production of (some) products.

5.4.4. Translating sufficiency in regulation

Reducing volume of production is quite a sensitive and complex area to regulate. In short, the idea is that lesser quantities of products must find their way into the European market. The ‘simplest’ way to go about this is to introduce a ban. It is clear-cut and quite straightforward to manage, but it is also an extreme measure. Bans are not uncommon in EU law, but mainly concern hazardous substances.¹³⁷ In May 2018, the Commission proposed the adoption of a directive that would prohibit the placing on the market of single-use plastic products.¹³⁸ The proposed ban is not a precautionary but a preventive measure, justified by the excessive human health and environmental damage caused by these products, in particular on the marine environment.¹³⁹ It is also linked to the limited efficiency improvements related to the very nature of these products.¹⁴⁰ A ‘single-use plastic product’ is considered a typically linear product and defined as

a product that is made wholly or partly from plastic and that is not conceived, designed or placed on the market to accomplish, within its life span, multiple trips or rotations by being returned to the producer for refill or re-used for the same purpose for which it was conceived¹⁴¹

The ban resulted from the collection of scientific data about the damage caused by plastics. In the time it took to gather this information,¹⁴² those plastics have entered the food chain of fish and other marine species, and eventually of humans as well, and have contributed to loss of biodiversity. The prevention principle did not allow for acting earlier. A strong precautionary principle would have done so, with the task on producers to disprove the potential harm.

Several sectors could arguably require similar measures: textiles and electronics are particularly large contributors to environmental harm throughout their life cycles.¹⁴³

Other types of measures, less intrusive but more complex to delimit and govern, could take the form of, for instance:

- a quota to enter the market whereby the quantity could be calculated in proportion of the relevant population;

¹³⁷ E.g. GMOs.

¹³⁸ Commission Proposal for a Directive on the reduction of the impact of certain plastic products on the environment, COM(2018) 340 final, Article 5.

¹³⁹ Ibid, Preamble (5).

¹⁴⁰ I.e. “due to ineffective separate collection systems and low participation in those systems by the consumers.” Ibid, Preamble (20).

¹⁴¹ COM(2018) 340 final, Article 3(2).

¹⁴² The Commission asserts that the “long lasting work undertaken under the Marine Strategy Framework Directive to monitor marine litter on European beaches constitutes the scientific base”, *ibid*, p. 4.

¹⁴³ For a comprehensive review of damage from textiles, see K. Slater, *Environmental Impact of Textiles: Production, processes and protection* (Abington: Woodhead Publishing Ltd, 2003); regarding electronics, see e.g. V. Bhakar, ‘Life Cycle Assessment of CRT, LCD and LED Monitors’ (2015) 29 *Procedia CIRP*, 432–437.

- a prohibition to place on the market an ‘updated’¹⁴⁴ version of an existing electronic item within two years of the release of the previous version.

The pursuit of sufficiency is, however, not just an issue of lowering production rate, but indeed, and very importantly so, about lowering consumption. This is the focus of the following section.

5.5. Consuming better means consuming less

5.5.1. Introduction

In ARTICLE 5, it is argued that the first priority of a CE strategy for consumption is avoidance; more specifically, to avoid the consumption of single use and unnecessary products. This priority is placed at the top of a ‘hierarchy of consumption behaviour’ put forward in the article, followed by repair and maintenance, sharing and leasing, buying second-hand, buying quality products, and recirculating. In other words, ARTICLE 5 opens the discussion to establishing the legal framework and concrete measures that may contribute to moving away from our materialistic lifestyles. This legal perspective on the issues makes for a unique contribution to the literature and hopefully to the EU’s policy making in the matter. The article does not aim to blame consumers, but rather to empower them to make more sustainable choices while constraining their ability to make environmentally detrimental ones.

In this section, I aim to shed a different light on some issues raised in ARTICLE 5 as well as to introduce aspects that are beyond the scope of the article. I start by challenging the typical assertion of traditional economics that informed consumers act rationally, and then make suggestions about how to make information a more powerful tool. Next, I consider one of the key problems of the consumerist culture, namely advertising, and point out the role of the law in addressing this issue. Third, I recognize the potential in new ways of ‘consumption’ (such as sharing, renting and repairing), but insist on acknowledging and tackling their shortcomings, notably rebound effects and increasing energy consumption from reliance on ICT. Finally, I introduce one of the ecological economists’ main arguments about just (re)distribution of resources and point to taxation as a means towards more sustainable lifestyles.

5.5.2. There is no *homo economicus*...

What motivates people to behave in a certain way? Since environmental destruction is the result of human behaviour, do people pollute because they lack the morality to refrain from damaging the environment? This might hold some truth. In recent decades, we have seen that the mobilization of various actors from the worlds of politics, science and civil society to warn against the environmental damages caused by human activities has led to unprecedented public awareness¹⁴⁵; an awareness that is influencing an increasing proportion of the population to make morally derived decisions (buying ecological products in spite of their higher price; using public transport instead of the car, etc.). However, it is certainly too simplistic to rely on moral enlightenment to combat environmental harm: firstly, because some people’s decisions will never be swayed by moral arguments, in particular when it comes to business decisions.

¹⁴⁴ ‘Updated’ could be defined in terms of improved design, technological adjustments, etc.

¹⁴⁵ O. Montel-Dumont, ‘Penser Economie Verte, Les Problèmes d’environnement: Quelle place pour l’économiste?’ (2010) *Cahiers français* n° 355, 3–7, 3.

Secondly, even morally outraged people may have to make environmentally harmful decisions as a result of their situation and the balancing of other social goals, such as health, housing and education. The extent and rate of the current destruction of our environment is not so much caused by a morally lax population than by the economic system that drives their lives.¹⁴⁶

In the traditional economic view, people make rational decisions. Furthermore, their decisions, although based on self-interest, tend to improve societal welfare¹⁴⁷ – that is, if the market is transparent and they have access to proper information. Incomplete or asymmetrical information prevents consumers from making choices matched to their preferences.¹⁴⁸ Rectify that failure and the market will deliver. The reality is, clearly, far more complex. Providing information to consumers is not always sufficient as they do not necessarily act as expected in theory, and misleading or excessive information may even prove damaging.¹⁴⁹ Findings from behavioural economics indicate, however, that consumers do not always act in the way presumed by traditional information economics.¹⁵⁰ Moreover, the mere idea that people are rational is put into question by empirical research.¹⁵¹

This does not mean that measures aimed at improving access to and the quality information are unnecessary; on the contrary. However, the provision of crucial information about product durability and reparability, access to spare parts, and means of recovery¹⁵² remains dependant on the producer's goodwill.¹⁵³ ARTICLE 5 recommends the adoption of clear mandatory rules to ensure that individual consumers as well as consumer and environmental associations can usefully compare and make choices that are more enlightened. In addition, it is argued that it is quintessential to reinforce the impact of the information with accompanying rules, such as extended consumer rights¹⁵⁴ on the one hand, and limits to consumer choice on the other.¹⁵⁵

5.5.3. ...but there is a *homo consumericus*

In the pursuit of sufficiency, some see a strategy that merely targets the consumer – that is, the person who buys – and incites her to consume less.¹⁵⁶ However, it is also – and very importantly so – about changing the institutional context in which “an excessive proportion of individual activity is channelled through the market so that the commercialized sector of our lives is unduly large”.¹⁵⁷ Today, consumers are continuously encouraged to indulge in consumption,

¹⁴⁶ B. C. Field and M. K. Field, *Environmental Economics: An introduction*, 6th edn (New York: McGraw-Hill, 2012), 4.

¹⁴⁷ D. W. Pearce and R. K. Turner, *Economics of Natural Resources and the Environment* (Baltimore: Johns Hopkins University Press, 1990), 10.

¹⁴⁸ M. Kotchen, ‘Voluntary- and Information-Based Approaches to Environmental Management: A public economics perspective’ (2013) 2 *Review of Environmental Economics and Policy* 7, 276–295, 278.

¹⁴⁹ Ibid.

¹⁵⁰ M. Faure and H. Luth, ‘Behavioural Economics in Unfair Contract Terms: Cautions and considerations’ (2011) 34 *Journal of Consumer Policy* 3, 337–358.

¹⁵¹ Ibid.

¹⁵² E.g. whether the product can be disassembled and recycled in a way that preserves the quality of its components.

¹⁵³ France has imposed a requirement for the seller to inform the consumer about the availability of spare parts, but only if the manufacturer has made that information available in the first place; see ARTICLE 3.

¹⁵⁴ E.g. extended consumer guarantees; right to demand repair.

¹⁵⁵ E.g. obligation to accept repair or refurbished items as remedy for default rather than replacement by new.

¹⁵⁶ P. M. Boulanger, ‘Three Strategies for Sustainable Consumption’ (2010) 3 *S.A.P.I.E.N.S* 2, 1–10, 6.

¹⁵⁷ F. Hirsch, *Social Limits to Growth* (London and Henley: Routledge and Kegan, 1976), 84.

and in particular of cheap, brand-new, short-lived products not least through constant advertising. One cannot surf the internet, watch TV, take public transportation or simply walk in the streets without being assailed by some form of publicity: advertising inserts and boards, commercial spots, or the distribution of promotional materials. Several studies show that the impact of advertising on consumers is immense and may lead to overwhelming consumption impulses.¹⁵⁸ The phenomenon known as ‘compulsive buying’, which refers to “a consumer’s tendency to be preoccupied with buying that is revealed through repetitive buying and a lack of impulse control”¹⁵⁹ is growing and will affect approximately one in 20 individuals at some point in their lives.¹⁶⁰ Moreover, the colossal amount of data generated and collected from individuals both actively (by filling out a form) and passively as a by-product of other activities (e.g. web browsing)¹⁶¹ is increasingly used to profile individuals and develop targeted advertisement to stimulate materialistic needs and trigger indulgent consumption.¹⁶²

Hence, an important aspect of sufficiency strategy should target advertising. This exists to some extent already when it comes to advertising towards children, which is particularly problematic given the extreme vulnerability of the targets.¹⁶³ The Nordic countries have been at the forefront of adopting restrictions on marketing, notably tobacco and alcohol for safety reasons.¹⁶⁴ Sweden bans TV advertising to children under the age of 12. This also includes the use of characters related to children’s TV programs in commercials,¹⁶⁵ and the courts have interpreted rules on advertising to children stringently.¹⁶⁶ The effect of advertising on consumption behaviour is otherwise largely absent from policy decisions and public debates.

The new General Data Protection Regulation (GDPR), which entered into force in May 2018, requires companies collecting personal data on EU citizens to obtain explicit and informed

¹⁵⁸ See e.g. D. Moore and S. Lee, ‘How Advertising Influences Consumption Impulses’ (2012) 3 *Journal of Advertising* 41, 107–120; P. Hultén and V. Vansyushyn, ‘Promotion and Shoppers’ Impulse Purchases: The example of clothes’ (2014) 2 *Journal of consumer marketing* 31, 94–102.

¹⁵⁹ N. M. Ridgway, M. Kukar-Kinney and K. B. Monroe, ‘An Expanded Conceptualization and a New Measure of Compulsive Buying’ (2008) 35 *Journal of Consumer Research* 4, 622–639; M. Neuner, G. Raab and L. A. Reisch, ‘Compulsive Buying in Maturing Consumer Societies: An empirical re-inquiry’ (2005) 26 *Journal of Economic Psychology* 4, 509–522; T. C. O’Guinn and R. J. Faber, ‘Compulsive Buying: A phenomenological exploration’ (1989) 16 *Journal of Consumer Research*, 147–157.

¹⁶⁰ A. Maraz, M. D. Griffiths and Z. Demetrovics, ‘The Prevalence of Compulsive Buying: A meta-analysis addiction’ (2016) 111 *Addiction* 3, 408–419; another study shows that the prevalence of compulsive buyers in China might 29,1% of the general population, H. He, M. Kukar-Kinney and N. M. Ridgway, ‘Compulsive Buying in China: Measurement, prevalence, and online drivers’ (2018) 91 *Journal of Business Research*, 28–39.

¹⁶¹ World Economic Forum (WEF), ‘Unlocking the Value of Personal Data: From collection to usage’ (2013) <www3.weforum.org/docs/WEF_IT_UnlockingValuePersonalData_CollectionUsage_Report_2013.pdf> accessed 25.03.2019.

¹⁶² R. W. Reczek, C. Summers and R. Smith, ‘Targeted Ads Don’t Just Make You More Likely to Buy – They Can Change How You Think About Yourself’ (2016) *Harvard Business Review* <<https://hbr.org/2016/04/targeted-ads-dont-just-make-you-more-likely-to-buy-they-can-change-how-you-think-about-yourself>> accessed 25.03.2019.

¹⁶³ Studies have notably shown the correlation between food advertising and children obesity. T. Andreyeva, I. R. Kelly and J. L. Harris, ‘Exposure to Food Advertising on Television: Associations with children’s fast food and soft drink consumption and obesity’ (2011) 3 *Economics & Human Biology* 9, 221–233.

¹⁶⁴ O. Mont and C. Dalhammar, ‘Sustainable Consumption: At the cross-road of environmental and consumer policies’ (2005) 8 *International Journal of Sustainable Development* 4, 258–279.

¹⁶⁵ Cf. Radio- och TV-lagen (2010:696), Chapter 8, §§ 7–8 (sections).

¹⁶⁶ For example, in a recent case a fine of SEK 500 000 (Euro 50 000) was charged a company who sent out direct marketing materials to 16-year-olds without consent from their parents; Patent- och marknadsöverdomstolen mål nr PMT 10485-16, of 21 June 2017.

consent from each individual and make the withdrawal of that consent possible at any time and without difficulty.¹⁶⁷ Furthermore, the GDPR gives a number of rights to individuals ('data subject'), and in particular the right of access to their own data, the right to rectification and the right to erasure ('right to be forgotten').¹⁶⁸ This is a unique and far-reaching piece of legislation, which, however, does not touch upon the issue of the use of data to foster the culture of overconsumption.

5.5.4. New (un)sustainable models of consumption

The rise of the internet era has enabled new forms of consumption and changed the way consumers make economic transactions. It has allowed users to share content and connect with each other, and thereby enter into economic transactions with strangers.¹⁶⁹ Before the arrival of digital platforms, selling and lending would take place within a limited circle of trusted people, usually family and friends.¹⁷⁰ The internet has enabled economic relations between people who do not have any relations of trust by rendering those transactions less risky and more appealing.¹⁷¹ The rapid expansion of smartphones and broadband cellular network technology as well as elaborate apps and GPS-mapping in real time further facilitated peer-to-peer transactions.¹⁷²

New forms of consumption as part of the sharing economy – i.e. “peer-to-peer-based activit[ies] of obtaining, giving, or sharing the access to goods and services, coordinated through community-based online services”¹⁷³ – may contribute to the objectives of the CE.¹⁷⁴ It shows notably significant potential in achieving resource savings activities of collaborative consumption and consumption such as sharing tools (e.g. within a residential area), bike kitchens,¹⁷⁵ and other workshops for repairs, where people can engage in repairing their broken

¹⁶⁷ Regulation (EU) 2016/679 of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data (hereafter 'GDPR'), OJ L 119, 4.5.2016, p. 1, Article 7.

¹⁶⁸ GDPR, Articles 13–17.

¹⁶⁹ R. Belk, 'You Are What You Can Access: Sharing and collaborative consumption online' (2014) 8 *Journal of Business Research* 67, 1595–1600.

¹⁷⁰ K. Frenken and J. Schor, 'Putting the Sharing Economy Into Perspective' (2017) 23 *Environmental Innovation and Societal Transitions*, 3–10, 6.

¹⁷¹ First, it decreased the transaction costs, i.e. the costs and trouble of making economic transactions, between people who do not know each other nor share any social links. In particular, the internet reduced the costs of searching and arranging contracts, securing payments using standardized contracts and online payment systems. Moreover, the use of ratings and reputations makes information on users, notably their past behaviour and therefore trustworthiness, easily available, although there is a growing body of evidence demonstrating that ratings are not very accurate and tend both to overstate quality (J. Overgoor, E. Wulczyn and C. Potts, 'Trust Propagation With Mixed-Effects Models', in J. G. Breslin et al. (Eds.), *Proceedings of the 6th International AAAI Conference on Weblogs and Social Media* (The AAAI Press, 2012), 535–538) and reproduce gender, class and racial biases (B. G. Edelman and M. Luca, 'Digital Discrimination: The case of Airbnb.com' (2014) *Harvard Business School Working Paper* No. 14-054 <<http://hbswk.hbs.edu/item/digital-discrimination-the-case-of-airbnb-com>> accessed 25.03.2019).

¹⁷² V. Hatzopoulos and S. Roma, 'Caring for Sharing? The collaborative economy under EU law' (2017) 54 *Common Market Law Review* 1, 81–127.

¹⁷³ J. Hamari, M. Sjöklint and A. Ukkonen, 'The Sharing Economy: Why people participate in collaborative consumption' (2016) 67 *Journal of the Association for Information Science and Technology* 9, 2047–2059.

¹⁷⁴ See e.g. O. Mont and C. Dalhammar, 'Public Policy for Sustainable Consumption', in S. J. Evans (Ed.), *Public Policy Issues Research Trends* (New York: NOVA Science Publishers, 2008), 211–239.

¹⁷⁵ Or bicycle cooperatives, i.e. assisted-service bicycle repair shop where people can learn repair skills, and which often sell new and used bike spare parts as well as refurbished bikes.

items. Exchanges and leases between individuals have clear direct environmental benefits: secondary markets reduce demand for new goods.¹⁷⁶

ARTICLE 5 contains a warning about taking the sustainability of these new models of consumption for granted, in particular because they often appear to trigger indulgent consumption even from the most ‘responsible’ consumers.¹⁷⁷ The EU will eventually have to overcome its timidity on the matter¹⁷⁸ and confront the enthusiasm of a dynamic and promising economic sector in the reality of a world bound by ecological limits.

Moreover, the rapid proliferation of connected devices and the rise to the ‘Internet of Things’ (IoT) require a lot of energy to function.¹⁷⁹ Energy efficiency improvements may contribute towards limiting the growth in energy demand, but the volume of devices and data stored, processed and transmitted will increase in coming years. The law is bound to take on these sustainability issues, and consider how to optimize – and ultimately reduce – energy consumption for ICT purposes.

5.5.5. (Re)distributive justice and careless consumption

Neoclassical economics tends to resolve difficult issues of distributive inequality (such as poverty) by scale expansion – that is, economic growth. In an ecological paradigm where the initial postulate is a limited economic scale, growth cannot solve inequality questions. Very strong sustainability generally rejects the possibility of substituting natural capital with human-made capital, requiring matter and energy throughput to be minimized.¹⁸⁰ Hence, ecological economists have to deal with the difficult but crucial issues of broader and more just (re)distribution of resources that mainstream economists have long avoided.¹⁸¹

Ecological economics are also particularly interested in issues of distributive justice, Daly and Farley maintain, because environmental preservation is especially threatened by both extreme poverty and excessive wealth: poor people tend not to care about sustainability so that they misuse natural resources or tolerate excessive pollution, while the wealthy are inclined to carelessly consume excessive amounts of finite natural resources.¹⁸² Hence, allowing the richest few to overconsume simply because economically they can afford it, appears not only unjust, but also dangerous. At the same time, the carelessness of the poorest is not the result of intrinsic weakness or lack of education, but indeed of their situation.¹⁸³

¹⁷⁶ J. Schor, ‘Debating the Sharing Economy: Great transition initiative’ (2014) <www.greattransition.org/publication/debating-the-sharing-economy> accessed 25.03.2019.

¹⁷⁷ ‘Responsible’ here refers to consumers who aim to consume less or privilege environmentally friendly options.

¹⁷⁸ The Commission Communication on the collaborative economy does not touch upon these questions and simply points out the positive potential for consumption; Commission Communication, ‘A European Agenda for the Collaborative Economy’, COM(2016) 356 final.

¹⁷⁹ International Energy Agency (IEA), ‘Digitalization and Energy’ (2017) <www.iea.org/publications/freepublications/publication/DigitalizationandEnergy3.pdf> accessed 25.03.2019.

¹⁸⁰ Gibbs et al. (1998), 1353; see also 4.3.1 above.

¹⁸¹ H. E. Daly and J. Farley, *Ecological Economics: Principles and applications*, 2nd edn (Washington: Island Press, 2011), 422.

¹⁸² Ibid.

¹⁸³ Studies show that the psychological stress of living in poverty reduces mental capacity and notably the capacity to project oneself in the future. R. Bregman, *Utopia for the Realists: And how we can get there* (London:

Hence, the ‘elimination’ of the two groups deemed to instigate most environmental impacts might be necessary, not only to promote justice and equality, but also to ensure a safe operating space for humanity. Many have proposed that confronting the problem of poverty requires the provision of a universal basic income.¹⁸⁴ Others call for a broader ownership of capital, arguing that the fact that today capital is owned by a very few, who then benefit from all the returns, is inherently unjust.¹⁸⁵ Some also argue in favour of high tax rates on the wealthiest.¹⁸⁶ Generally, taxation could be used to reduce overconsumption.¹⁸⁷ This dissertation does not aim to promote or even review the value of any such propositions. The purpose of this section is merely to show how far-reaching the paradigm shift has to be, and point out that there are important opportunities for the law to contribute to the ecological paradigm outside the usual realm of the traditional ‘environmental’ legislative framework.

5.6. Intermediary conclusions

This chapter reviewed some of the main elements of a legal framework for the CE based on the ecological paradigm while also contextualizing the different ARTICLES attached to this thesis. Generally, the argument in this chapter is that EU law for the CE is no longer anchored solely in the traditional paradigm in which environmental law developed. Yet, it does not fulfil the main characteristics of the ecological paradigm either. The first element that was scrutinized is the holistic approach to product regulation. EU law has come a long way from taking the end-of-pipe approach that addresses the pollution generated by a product’s production¹⁸⁸ and end-of-life management¹⁸⁹ to considering a product’s entire life cycle¹⁹⁰ and minimizing damage by closing the loop.¹⁹¹ It was noted that the main purpose of the law is to remove barriers to sustainable markets or address market failures, not to change the very functioning of the market.

The main aspect of the development of the concept of the CE – i.e. closing the loop through improved eco-efficiency¹⁹² – forms the core legislative response at the EU level, notably through the adoption of innovative schemes such as ecodesign. Prevention is at the heart of product-related legislation. Prevention is not absolute, however, and can take a variety of

Bloomsbury, 2017), 56–62; See also S. Mullainathan and E. Shafir, *Scarcity: Why having so little means so much* (London: Allen Lane, 2013) in which the authors explain how scarcity in either time or money affects human behaviour and leads to the diminishing of intelligence (even just “feeling poor” lowers IQ by the same amount as a night without sleep).

¹⁸⁴ This goes back to Thomas More and his book *Utopia* from 1516, and has subsequently been advocated by many economists and philosophers, such as John Stuart Mill, Bertrand Russel, Friedrich Hayek and Milton Friedman, see Bregman (2017), 33–34; see also P. Van Parijs, ‘Basic Income: A simple and powerful idea for the twenty-first century’ (2004) 32 *Politics and Society* 1, 7–39; P. Van Parijs (Ed.) *Arguing for Basic Income: Ethical foundations for a radical reform* (London: Verso, 1992).

¹⁸⁵ Daly and Farley (2014), 395; see also T. Piketty, *Le capital au XXI^e siècle* (Paris: Seuil, 2013).

¹⁸⁶ E.g. W. Buffet, ‘Stop Coddling the Super-Rich’ (2011) *New York Times* <www.nytimes.com/2011/08/15/opinion/stop-coddling-the-super-rich.html> accessed 25.03.2019; see also L. Elliot, “‘This is About Saving Capitalism’: The Dutch historian who saved Davos elite’ (2019) *The Guardian* <www.theguardian.com/business/2019/feb/01/rutger-bregman-world-economic-forum-davos-speech-tax-billionaires-capitalism> accessed 25.03.2019.

¹⁸⁷ E.g. by increasing the price of short-lived, low-quality, unrecoverable, polluting goods.

¹⁸⁸ I.e. industrial emissions.

¹⁸⁹ Directive 2008/98/EC and daughter directives.

¹⁹⁰ COM(2003) 302 final.

¹⁹¹ COM(2015) 614 final.

¹⁹² See 3.3 above.

different forms. In this chapter, I reflected on the meaning of prevention and introduced two of my articles – ARTICLES 3 and 4 – that propose new ways of promoting an ecologically based CE through preventive measures.

Thirdly, I argued that the CE has to be based on precaution, which necessarily includes and implies prevention, but also goes further than that. I proposed that the ecological paradigm demands more than prevention; it demands anticipation. It demands the aim of avoiding a risk rather than of managing it. It demands bold, radical measures to promote sufficiency. Indeed, without absolute reduction in production and consumption, the safe operating space will remain an ideal, not a target. In light of the uncertainty attached to the existence of a product and the ability of technology to provide solutions, it is not just for scientists to lay out the legal measures of the ecological paradigm; it is also for policymakers to take courageous decisions to establish the path towards a sustainable future.

The same courage must prevail in the context of consumption. Today, a quite traditional approach remains predominant. Legal measures attempt to correct imbalance of power (protecting the weaker party in a trade deal) and market failures (in particular the lack of (appropriate) information) and trust the market to deliver appropriate results. EU law is lacking strong mandatory requirements that limit the market and change the consumption paradigm that remains strongly in place. Consuming is a right; even more, it is a duty in order to keep the economy growing. The right of consumers to consume remains so sacred that one faces essentially no limitations with regard to what and how much one consumes; except, perhaps, that of one's personal and financial situation.¹⁹³

¹⁹³ Still, consumer credit schemes are in place to compensate for the lack of financial resources.

Chapter 6. Summary of the main arguments and further reflections

“Ablation. Abrasion. Mountain of accumulation. Aeolian deposits. Afforestation. Testimonies. Over and over we examine what was said of us. Over and over we testify. The lies. The conspiracy of appearances. There are fissures. There are cracks in the surface. We realize suddenly we are weeping.”

— Susan Griffin

Woman and Nature: The Roaring Inside Her, 1974

In Part I, it has been argued that the aim behind the establishment of a CE has to be to achieve a ‘safe operating space for humanity’ in line with the definition by Rockström et al.¹ This space is the only one that we know can provide good living conditions for humanity. Exceeding planetary boundaries may lead the Earth system to shift towards a state where such living conditions might be extremely difficult, or even impossible. At present, we are already exceeding at least four of those boundaries.² This means that not only do we need to reduce the current level of harm inflicted onto the environment, but also to allow the environment to recover from past destruction and pollution.

The dissertation purposefully took on many issues. In that sense, it mirrors the wide scope of the legal framework for products and the extensive reach of the CE. Given that we are still at the beginning of EU’s efforts to establish a CE, such a broad approach seemed not only useful, it also felt necessary. Before rushing headlong onto this circular path, we need to make sure that it is indeed the right one, that we know where we are going and how to get there. A change of paradigm, as the CE proposes enabling, requires questioning the very model that underpins the current paradigm and develop new theories and rules in line with the new one.

The level of ambition set out in Part I is high. It aimed to define the CE in the context of a paradigm shift that places ecology and the rules of nature at the front. In this context, the pursuit of eco-efficiency – that is, the core argument of the main proponents of the CE³ as well as the EU policy⁴ – cannot suffice. The complexity of nature systems does not allow us to rely on technology to solve all the issues of environmental protection.⁵ Moreover, the law of entropy clearly constrains today’s approach if it is to be a long-term one. All the energy and matter used today will eventually reduce the total energy and matter available in the future.

Hence, sufficiency in the sense of an absolute reduction in consumption must also be pursued. This implies a change in consumption patterns as well as at the very core of the economic model (in particular commodification) and governance. Not only is this a controversial argument, it is

¹ J. Rockström et al., ‘A Safe Operating Space for Humanity’ (2009b) *Nature* 461, 472-5.

² W. Steffen et al., ‘Planetary Boundaries: Guiding human development on a changing planet’ (2015b) 347 *Science* 6223, 1259855-1-10.

³ As presented in 3.3 above.

⁴ See Commission Communication, ‘Closing the Loop - An EU action plan for the circular economy’, COM(2015) 614 final.

⁵ H. E. Daly, *From Uneconomic Growth to Steady-State Economy* (Cheltenham: Edward Elgar, 2014), 14.

also a very complex aspect to regulate. In Part I, I provide some indications as to the how to pursue sufficiency. More importantly, I put forward a definition of the CE that comprises that aspect and conforms to the ecological paradigm:

The Circular Economy is an economic model that is *precautionary* and allows the Earth system to regenerate and thrive, and to offer a safe operating space for humanity to prosper in the long-term. It relies on renewable energy, aims to eliminate the use of hazardous substances, reduce resource and product consumption, and avoid final waste generation (notably through careful design for prolonged product lifetime and recovery), and focuses on social well-being.

It is, in my view, paramount that we consider and endeavour to establish the overarching goal of the CE – the safe operating space – and its essential characteristics (notably the pursuit of sufficiency) in spite of it seeming unrealistic and impractical. It is crucial that we recognize the inherent features and limitations of our planet, that we embrace the laws of thermodynamics, and that we make sure to walk the path of true sustainability. For the purpose of this dissertation it may have sufficed and indeed been a safe option to concentrate only on closing the loop. In line with the proponents of a critical legal discourse, I believe that the task of researchers should not be limited merely to examining the contours of the current paradigm, but indeed to challenging them and pointing out shortcomings, even if they appear intractable or that any alternatives seem politically doomed. In the words of Greta Thunberg, a 15-year-old climate activist,

Until you start focusing on what needs to be done rather than what is politically possible, there is no hope.⁶

In the ARTICLES that form the thesis, I take a more pragmatic and practical approach, however. I focus essentially on the existing legal framework and the commonly accepted eco-efficiency measures adopted by the CE. I discuss the development of a product policy in EU law in ARTICLES 1 and 2, including some of the legal instruments that underpin it – ecodesign, waste, public procurement. In ARTICLE 3 and 4, I put forward some ideas to modify or enhance the existing EU legal framework to prevent waste and promote durability. Finally, I push the boundaries slightly by pinpointing the role of consumers in the CE and critically examining EU consumer law in ARTICLE 5. The last three ARTICLES open a discussion about the future of specific areas of EU law regarding products.

The field is vast and much remains to be done to achieve a new paradigm. As I have pointed out throughout Part I, several issues require further research. Here I present a few that I find particularly pressing:

- 1) How can the law contribute to mainstreaming reparability? ARTICLES 4 and 5 put forward the importance of consumer guarantees and access to information, but what

⁶ E. Rigitano, ‘COP24, the Speech by 15-year-old Climate Activist Greta Thunberg Everyone Should Listen To’ (2018) *Lifegate* <www.lifegate.com/people/news/greta-thunberg-speech-cop24> accessed 25.03.2019.

about issues of intellectual property, of access to and cost of repair outside guarantee schemes, of incentives to repair borrowed products?⁷

- 2) How can the law address the issue of ensuring the (actual and perceived) safety of secondary components and materials? What mechanisms must be put in place?
- 3) What are the main hindrances to changing consumption patterns in consumer protection laws? ARTICLE 5 endeavoured to establish the main priorities for moving towards sustainable consumption, and looked more particularly into the issues of consumer guarantees. A more thorough examination of EU law and linkages to the establishment of the internal market is required.
- 4) Beyond legal measures, how does that legal framework need to adapt to the new paradigm? It was pointed out on a number of different occasions in Part I that changing the paradigm is not only about the underpinning principles, but also about governance. Further research is needed in this context, e.g. using upcoming literature about adaptive governance.⁸

⁷ See S. Svensson et al., (2018). The Emerging ‘Right to Repair’ Legislation in the EU and the U.S. Paper presented at Care Innovation, Vienna, Nov 2018.

⁸ See e.g. D. DeCaro et al., ‘Theory and Research to Study the Legal and Institutional Foundations of Adaptive Governance’, in B. Cosens and L. Gunderson (Eds.), *Practical Panarchy for Adaptive Water Governance* (Springer, 2018), 269–288; C. Arnold and L. Gunderson, ‘Adaptive Law and Resilience’ (2013) 43 *Environmental Law Reporter*, 10426-10443.

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PART II

ARTICLE 1 ‘Towards an integrated product regulatory framework based on life-cycle thinking’

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Abstract: Fragmentation of products’ regulatory framework in the European Union (EU) hinders environmental protection. Based on the principle of integration contained in Article 11 of the Treaty on the Functioning of the EU (TFEU), the Union put forward the need to adopt an approach encompassing the whole life cycle of a product in its EU Integrated Product Policy (IPP). An effective preservation of the environment against the harmful effects of products requires adopting such a comprehensive approach. The focus of this chapter is how an integrated or holistic approach may limit the inconsistencies arising from a fragmented EU product regulatory framework.

Article 11 TFEU has the potential of playing a key role in responding to the negative effects of fragmentation on environmental protection and, in this chapter, it is argued that it forms the basis of a more integrated approach for the EU product regulatory framework. This chapter begins with a general introduction of the principle of integration and evolution from its first appearance in the European Treaties. With regards to products, the need for more integration set out in Article 11 led to the development of the IPP, which embraced the thriving concept of Life-Cycle Thinking (LCT). The first section continues with an analysis of how the IPP and LCT may contribute to enhancing the coherence of the regulatory framework. In the following section, three specific examples representing different life cycle stages – i.e. EU ecodesign, public procurement and waste law – are used to show the influence (or lack thereof) that the integration principle, with a specific focus on LCT, has had on the EU regulatory framework for products and its fragmentation. A final section contains recommendations on how LCT could contribute to reducing the fragmentation of the regulatory framework, thereby limiting environmental damages caused by products.

8 Towards an integrated product regulatory framework based on life-cycle thinking

Eléonore Maitre Ekern

8.1 Introduction

Fragmentation of the product regulatory framework in the European Union hinders environmental protection. Based on the principle of integration contained in Article 11 of the Treaty on the Functioning of the EU (TFEU), the Union put forward the need to adopt an approach encompassing the whole life cycle of a product in its Integrated Product Policy (IPP). An effective preservation of the environment against the harmful effects of products requires adopting such a comprehensive approach. The focus of this chapter is on the way in which an integrated or holistic approach may limit the inconsistencies arising from a fragmented EU product regulatory framework.

Several factors contribute to this fragmentation, notably the variety of issues addressed in an isolated manner, the confrontation of objectives pursued by the legal bases used to adopt product legislation and the margin of discretion left for the implementation of an Act in 28 Member States.

At EU level, legislation regarding products may cover a wide range of issues, from design, manufacturing, placing on the market to purchasing conditions and waste management. Each topic is typically regulated with little attention to the impact it may have on the others. Yet, such effects are the result of the intersectional nature of the field, where, for example, the prohibition of the use of certain toxic materials in a product may affect its disposal, while obligations to recycle can impact design conditions, and so on. The lack of interconnection between these different areas has led to a regulatory framework that does not approach environmental challenges systematically.

Another factor of fragmentation comes from the fact that EU product laws are developed under legal bases¹ that do not necessarily pursue environmental protection as their primary aim and, in any case, must sometimes reconcile

1 Each legislative instrument must be adopted on a legal basis found in the TFEU. The choice of the legal basis is not left to the discretion of EU institutions but must be based on objective factors, in particular, the aim and content of the measure. See Ludwig Krämer, *EU Environmental Law* (7th edn, London: Sweet and Maxwell, 2011), 2-69; Cases C-155/91 *European Parliament v Council* [1993] ECR I-939; and C-164 and 165/98 *European Parliament v Council* [2006] ECR I-107 [1999] ECR I-1139.

diverging objectives. Article 192 TFEU is the legal basis for environmental protection legislation, as it provides for action that seeks to achieve the preservation, protection and improvement of the quality of the environment.² This environmental-focused legal base requires nonetheless that the European legislator takes into account other interests, such as the economic and social development of the Union.³ With regard to products, the use of Article 192 TFEU has hitherto been limited to waste, whereas even in this area a different legal base is sometimes chosen.⁴

At the same time, Article 114 TFEU allows for the approximation of laws that have as their object the establishment and functioning of the internal market. Its main purpose is to ensure the achievement of the internal market and the four freedoms⁵ but it also expressly requires that any proposal pursues a high level of protection of the environment.⁶ Several product laws have been adopted pursuant to this Treaty provision, some integrating environmental considerations,⁷ others overlooking them.⁸

Both Treaty provisions fall within the category of shared competences, which authorises both the EU and the Member States to adopt binding legislation.⁹ Member States may, however, only legislate insofar as the EU has not exercised its own competence. The legislative techniques set out in Articles 114 and 192 TFEU affect the remaining competences of the Member States.

Given that Article 114 TFEU is designed to address the risk that disparate national laws may have in the establishment and functioning of the internal market, the European legislator may, based on this provision, adopt legislation that regulates a specific issue exhaustively. As a result, Member States are generally not allowed to adopt any measures going beyond EU rules.¹⁰ An

2 See Article 191 TFEU.

3 Article 191(3) TFEU.

4 The Union adopted two sister directives, one on electronic and electrical waste: Directive 2012/19/EU of 4 July 2012 on waste electrical and electronic equipment (WEEE), OJ L 197, 24.7.2012, at 38, and the other on hazardous substances: Directive 2011/65/EU of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS), OJ L 174, 1.7.2011 at 88. The first was eventually based on Article 192, but Article 114 is the legal basis of the second.

5 Free movement of goods, persons, services and capitals; see Article 26 TFEU.

6 Article 114(2) TFEU.

7 See, e.g. Directive 2009/125/EC of 21 October 2009 establishing a framework of ecodesign requirements for energy-related products, OJ L 285, 31.10.2009, p.10 (Ecodesign Directive) analysis in Section 8.3 below; Regulation (EC) No 1907/2006 of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, OJ L 396, 30/12/2006, at 1.

8 For example, Directive 2014/24/EU of the European Parliament and of the Council of 26 February 2014 on public procurement and repealing Directive 2004/18/EC, OJ L 94, 28.03.2014, at 65 (Procurement Directive), see analysis in Section 8.3 below.

9 Article 4 TFEU.

10 Aaron Ezroj, 'Extended Producer Responsibility Programs in the European Union: In Search of the Optimal Legal Basis', (2009) 20 *Colorado Journal of International Environmental Law and Policy* 203.

exception is given under Article 114(4)-(8), permitting Member States to adopt or maintain measures on environmental protection grounds, albeit under limited national discretion. The procedure for adopting such measures is quite heavy as Member States must notify any such measure to the Commission, which has the power to approve or reject the national provisions within six months.

The aim of Article 192 TFEU, to the contrary, is not to achieve approximation but to enact minimum targets only.¹¹ This means that Member States generally retain substantial legislative powers. Moreover, they have the possibility, following Article 193, to maintain or introduce more stringent protective national measures and the procedure is less stringent than under Article 114, the measure notified to the Commission not being subjected to a right of veto.

The use of remaining competences may allow some Member States to ensure a better protection of the environment at the national level but it also affects the coherence of the regulatory framework at EU level, which, as a result of the potential cross-sectional impact of a measure, may be ultimately damaging for the environment.

Another possible factor of fragmentation is the use of directives,¹² which are binding as to the result to be achieved, but leaves to Member States the choice of form and methods.¹³ As a consequence of this flexibility, the transposition of directives and their implementation may vary from one Member State to another to the detriment of the coherence of the overall regulatory framework of products. The risk is particularly high where concepts are vague or provisions imprecise, as can be the result of conciliating 28 national interests.

Article 11 TFEU has the potential to play a key role in responding to the negative effects of fragmentation on environmental protection and, in this chapter, it is argued that it forms the basis of a more integrated approach for the EU product regulatory framework. This chapter begins with a general introduction to the principle of integration and evolution from its first appearance in the European Treaties. With regard to products, the need for more integration set out in Article 11 led to the development of the IPP, which embraced the thriving concept of life-cycle thinking. The next section continues with an analysis of how the IPP and life-cycle thinking may contribute to enhancing the coherence of the regulatory framework (Section 8.2). In the following section, three specific examples representing different life-cycle stages – EU ecodesign, public procurement and waste law – are used to show the influence (or lack thereof) that the integration principle, with a specific focus on life-cycle thinking, has had on the EU regulatory framework for products and its fragmentation (Section 8.3). A final section contains recommendations on how life-cycle thinking could contribute to reducing the fragmentation of the

11 Principle of minimum harmonisation; see e.g. Piet Jan Slot, *Harmonisation of Law*, 5 (1996) European Law Review 379.

12 In line with the principle of subsidiarity laid down in Article 5 of the Treaty on the European Union.

13 Article 288 TFEU.

regulatory framework, thereby limiting environmental damages caused by products (Section 8.4).

8.2 Integrating the EU's product policy

8.2.1 *The principle of integration in EU law*

The introduction of the integration principle dates back to the Single European Act.¹⁴ The idea that environmental considerations must be taken into account in policy making was further strengthened with the Maastricht Treaty¹⁵ but it was with the adoption of the Amsterdam Treaty that the rule found its way from the environmental chapter (current Title XX TFEU) to the first part of the EC Treaty on Principles.¹⁶ The Amsterdam Treaty also introduced an express reference to the principle of sustainable development, as defined in the Rio Declaration on Environment and Development in combination with a requirement to integrate environmental protection.¹⁷

Following the enactment of the Lisbon Treaty, the integration principle evolved into an all-encompassing principle that seeks to apply to all activities of the Union. Today, Article 11 TFEU reads: 'Environmental requirements must be integrated into the definition and implementation of the Union policies and activities, in particular with a view to promoting sustainable development'. Article 37 of the EU Charter of Fundamental Rights, annexed to the Lisbon Treaty, mirrors the provision of the TFEU: 'A high level of environmental protection and the improvement of the quality of the environment must be integrated into the policies of the Union and ensured in accordance with the principle of sustainable development'. Article 3(3) TEU requires that the Union aims at a 'high level of protection and improvement of the quality of the environment'. Moreover, environmental protection has been endorsed by the Court of Justice of the EU as a fundamental part of the general interest of the EU and one of its essential objectives.¹⁸

The aim of Article 11 TFEU is that the Union integrates environmental protection considerations into the shaping of its other policies.¹⁹ It imposes a

14 Article 130r(1) Single European Act: 'Environmental protection requirements shall be a component of the Community's other policies.'

15 Article 130r(2) EEC Treaty: 'Environmental protection requirements must be integrated into the definition and implementation of other Community policies'.

16 Article 6 EC Treaty: 'Environmental protection requirements must be integrated into the definition and implementation of the Community policies and activities referred to in Article 3, in particular with a view to promoting sustainable development'.

17 Principle 4 Rio Declaration: 'In order to achieve sustainable development, environmental protection shall constitute an integral part of the development process and cannot be considered in isolation from it'.

18 See Case 240/83 *Procureur de la République v Association de Défense des Brûleurs d'Huiles Usagées* [1985] ECR. 531, para 13; see also Krämer (2011) 3-01.

19 Ludwig Krämer, 'Giving a Voice to the Environment by Challenging the Practice of Integrating Environmental Requirement into other EU Policies', in Suzanne Kingston (ed), *European Perspectives on Environmental Law and Governance* (Abingdon: Routledge, 2013) 87.

legal obligation on EU institutions to actively work towards the promotion of environmental protection in all sectors of competence.²⁰ Yet, no definition of the term ‘integration’ is found in the Lisbon Treaty and the process for achieving this integration is not clearly identifiable.

Integration may take the form of fusion or convergence between policies. In the case of fusion, there is a risk of dilution of environmental requirements into broader policy objectives. If public authorities must satisfy a plurality of differentiated needs, the tendency is to give precedence to socio-economic policies to the detriment of the protection of the environment.²¹ On the other hand, the convergence of policies ensures that each policy conserves its own identity. This means that environmental protection requirements are concretely taken into consideration in the decision-making process of each policy.²² In practice, however, convergence is difficult to reach because of political pressure and lack of clarity as to how to reconcile different interests.

8.2.2 Integrated Product Policy

The development of the IPP is a direct application of the integration principle. The realisation that the traditional focus on production processes could not respond to growing concerns about the negative environmental impacts caused by products led to a shift of the EU’s approach towards products. From a purely internal market and economically based policy, the Commission developed the IPP, an approach to products based on their entire life cycle. The term ‘life cycle’ is used as one of the three key aims of a product policy approach in the study commissioned by the Commission, in 1998.²³ The final report of the IPP workshop organised by the Commission in the same year proposed a life-cycle perspective as the leading principle of a new EU product policy.²⁴

Looking at the life cycle of a product means considering all its impacts, in particular on the environment, and not only in one phase of the product’s life. This life cycle is composed of five main stages²⁵ – raw material extraction;

20 Beate Sjøfjell, ‘The Very Basis of Our Existence: Labour and the Neglected Environmental Dimension of Sustainable Development’, in Tonia Novitz and David Mangan (eds), *The Role of Labour Standards in Development: From Theory to Sustainable Practice* (Oxford: Oxford University Press, 2011) 125.

21 Nicolas de Sadeleer, *Environnement et Marché Intérieur*, Commentaire J Mégret (Brussels: Editions de l’Université de Bruxelles, 2010), 24.

22 Ibid.

23 Ernst & Young and Science Policy Research Unit, *European Commission: DGXI: Integrated Product Policy. A study analysing national and international developments with regard to Integrated Product Policy in the environment field and providing elements for an EC policy in this area* (London: Ernst & Young, March 1998), 9.

24 Commission Workshop on IPP, *Final Report* (1998), 6.

25 The number of stages varies from one source and one author to another but, overall, the issues are identical.

manufacturing of a product or parts of it; packaging and distribution; use and maintenance; end-of-life management – which are consecutive and closely interlinked. To each stage correspond various environmental impacts referred to as ‘inputs and outputs’.²⁶ The energy used during the production process or the use phase and the materials needed for making the product are examples of such inputs. Inputs are subsequently transformed and result in outputs that are emissions and waste.

In its Communication on IPP, the Commission encourages policy makers to integrate environmental considerations at each life-cycle stage. The aim is to combine ‘improving life styles and wellbeing – which are often directly influenced by products – with environmental protection’. In the past, product-related policies generally focused on large sources of pollution, such as industrial emissions or waste management issues. Although these policies remain essential, the IPP puts forward a broader approach that looks at the whole of the product’s life cycle, including the use phase.²⁷ An assessment of all inputs and outputs of a product provides for the opportunity of reducing its overall environmental impacts in the best and most cost-effective manner, without shifting the burden from one part of the life cycle to another.

Following the IPP Communication, the Commission published a Thematic Strategy on waste,²⁸ setting out guidelines for reducing negative environmental impacts of waste management. The role of life-cycle thinking is put forward in this context as an approach to identify more easily methods to maximise environmental benefits. Similar conclusions are reached in the Sustainable Consumption and Production and Sustainable Industrial Policy Action Plan,²⁹ adopted in 2008. The Commission pleads in favour of a more integrated approach of policy instruments, in particular those addressing specific aspects of a product’s life cycle. The ecodesign and labelling of products and regulatory incentives (such as public procurement) are particularly recommended actions.

8.2.3 Understanding life-cycle thinking

The idea behind introducing life-cycle thinking in product policy and regulation is to consider all environmental impacts of a product across its entire life cycle, to prevent and reduce them.³⁰ This means that actions taken

26 Chris Hendrickson, Arpad Horvath, Satish Joshi, and Lester Lave, ‘Economic Input-Output Models for Environmental Life-Cycle Assessment’, (1998) 32 *Environmental Science Technology* 184.

27 IPP Communication, 3.

28 Commission Communication, *Taking Sustainable Use of Resources Forward: A Thematic Strategy on the Prevention and Recycling of Waste*, COM(2005) 666 final.

29 Commission Communication on the *Sustainable Consumption and Production and Sustainable Industrial Policy Action Plan*, COM(2008) 397 final.

30 UNEP Life Cycle Initiative defines life-cycle thinking as ‘a way of thinking that includes the economic, environmental and social consequences of a product or process over its entire life cycle’. For the purpose of this chapter, I only look at environmental impacts of a product.

to minimise the impacts of a product at one stage of its life cycle must not merely shift the burden to a different stage or from one country to another but must achieve a net benefit for the environment.³¹

Life-cycle thinking is based on a scientific assessment, the so-called life-cycle assessment, which is defined by the International Organization for Standardization (ISO) as 'a technique for assessing the environmental aspects and potential impacts associated with a product system or service'.³² In other words, it consists in the exploration of the inputs and outputs occurring at each phase of a product's life cycle. Life-cycle assessment contributes to determining the environmental impacts of both inputs and outputs at each phase of product's life and across all types of media (air, water, soil).³³

Implementing life-cycle thinking generally consists of a number of stages of analysis, beginning with a definition of the goal and scope of the study.³⁴ As part of this first stage, a unit of use should be defined as a basis for comparing the functions that each product fulfils.³⁵ Then comes the inventory analysis, which seeks to list all environmental interventions occurring at all relevant levels of the process chain – manufacturing, use and waste management – associated with the product's function.³⁶ To combine the data collected in the inventory phase, the next step requires undertaking an impact assessment. The values of environmental interventions are interpreted on the basis of their potential contribution to environmental impact.³⁷ Finally, an analysis of opportunities to reduce the environmental impact of the product throughout its whole life cycle is performed.³⁸

Life-cycle thinking received a lot of attention in the early 1990s, with numerous publications dedicated to the subject, putting forward both its benefits and weaknesses.³⁹ Among the main benefits, avoiding shifting an environmental problem from one stage of the life cycle to another is particularly important. It also helps to identify where improvements can be made at

31 European Environmental Agency, *European Environmental Outlook 2010*.

32 ISO 14040.

33 Mary Ann Curran, 'The Status of Life-Cycle Assessment as an Environmental Management Tool, *Environmental Progress*', (2004) 23 *Environmental Progress* 277.

34 Arnold Tukker, 'Life Cycle Assessment as a Tool in Environmental Impact Assessment', (2000) 20 *Environmental Impact Assessment Review* 435.

35 Jeroen B Guinbe, Reinout Heijungs, Helias A Udo de Haes and Gjalte Huppes, 'Quantitative Life Cycle Assessment of Products, Part 2. Classification, Valuation and Improvement Analysis', (1993) 2 *Journal of Cleaner Production* 81.

36 Tukker, 'Life Cycle Assessment as a Tool in Environmental Impact Assessment'.

37 Jyri Seppälä, *Life Cycle Impact Assessment Based on Decision Analysis, Systems Analysis Laboratory Research Reports A86* (University of Helsinki, June 2003) 3.

38 Susan Svoboda, *Note on Life Cycle Analysis* (Ann Arbor, MI: National Pollution Prevention Center for Higher Education, March 1995) 2.

39 See Helias A Udo de Haes, 'Applications of Life Cycle Assessment: Expectations, Drawbacks and Perspectives', (1993) 1 *Journal of Cleaner Production* 131; and Gregory A Keoleian, 'The Application of Life Cycle Assessment to Design', (1993) 1 *Journal of Cleaner Production* 143.

lesser costs or with greater results. In some cases, using a life cycle can also improve market conditions and open new markets.⁴⁰ On the other hand, the time and costs linked to life-cycle thinking are usually put forward as its main weaknesses. Because product development is based on a short-term cost/benefit model, the reasoning based on an entire life cycle and cross-generation was not well received by the industry.⁴¹

Firstly introduced in IPP, life-cycle thinking quickly spread over to broader product-related policies and led to the adoption and revision of various legal acts. The three that are analysed below are selected because they address aspects identified as key by the above-mentioned policy documents: the design of products, which is a direct application of life-cycle thinking; public procurement, which contributes to green the use phase and incentivise the upstream⁴² level; and waste management, which addresses a remaining major products' output and aims at influencing both the upstream and consumer stages.

The Union has now established life-cycle thinking as a key tool for decision makers to create broader-based strategies for its product policy.⁴³ The Joint Research Centre, an in-house science service of the Commission, dedicates part of its activities to developing and improving the knowledge and use of life-cycle thinking throughout the Union.⁴⁴

8.3 Towards a life-cycle approach in EU law?

8.3.1 Ecodesign

Following the recommendation from the IPP, the Union adopted in 2005 the first Ecodesign Directive and in 2009 significantly enlarged its scope of application from energy-using products to energy-related products.⁴⁵ The

40 United Nations Environmental Programme/SETAC Life-Cycle Initiative, *Life Cycle Approaches – The Road from Analysis to Practice* (Paris: UNEP, 2005).

41 Environmental impacts of products may appear or last in the long term, hence affecting more than one generation; see H Kaebnick, S Kara and M Sun, 'Sustainable Product Development and Manufacturing by Considering Environmental Requirements', (2003) 19 *Robotics and Computer Integrated Manufacturing* 461; Y Asiedu and P Gu, 'Product Life Cycle Cost Analysis: State of The Art Review', (1998) 36 *International Journal of Production Research* 883.

42 The term 'upstream' is used to refer to all life-cycle stages intervening before the consumption stage.

43 Commission Communication of 18 June 2003, *IPP – Building on Environmental Life-Cycle Thinking*, COM(2003) 302 final.

44 The Institute for Environment and Sustainability in the European Commission Joint Research Centre has developed a set of guidelines documents aiming at helping decision makers and practitioners in introducing life-cycle thinking and costing into their activities. See European Commission Joint Research Centre, *European Platform on Life Cycle Assessment*, (2014). Available online at <http://eplca.jrc.ec.europa.eu> (accessed 8 July 2014).

45 Directive 2009/125/EC of 21 October 2009 establishing a framework of ecodesign requirements for energy-related products, OJ L 285, 31.10.2009, p.10 (Ecodesign Directive).

Directive defines ecodesign as the ‘integration of environmental aspects into product design with the aim of improving the environmental performance of the product throughout its whole life cycle’.⁴⁶

The legal basis of the Ecodesign Directive is Article 114 TFEU, although there were calls for a dual legal base (Articles 114 and 191 TFEU) to take into account equally internal market and environmental concerns. Considering that ‘pollution caused during a product’s life cycle is determined at [the design] stage, and most of the costs involved are committed then’,⁴⁷ the Directive aims to address this particular phase of the life cycle. This is a concrete application of the way in which a life-cycle approach to product regulation may reduce overall environmental impacts in a cost-benefiting manner.

The Ecodesign Directive does not, however, contain specific environmental standards but provides for the legal basis for the adoption of detailed requirements. The Commission is in charge of developing direct mandatory requirements for each product through implementing acts.⁴⁸ On those measures depends the actual success of the Directive. A number of quantitative and qualitative criteria limit the groups of products that may be regulated by implementing measures. Only products, which sales are higher than 200 000 units a year within the Union, may be concerned by such measures, excluding thereby most non-consumer products.⁴⁹ Those products will also have a significant impact on the environment. The 6th Environment Action Programme sets out the strategic priorities which should guide the Commission in determining the term ‘significant’ in this context.⁵⁰ Other criteria are that the implementing measures do not entail excessive costs,⁵¹ negatively affect the functionality of the product, its affordability or the competitiveness of the industry, nor impose excessive administrative burden on manufacturers.⁵² The lack of clarity of the second criterion and the difficulty of assessing the others may easily convince the Commission to use its prerogatives only to a very limited extent.⁵³

If the multiplication of economically oriented criteria for implementing measures threatens the coherence and effectiveness of the environmental purpose of the Directive, Article 15 also contains a requirement that fits the aim of the legislation. The Commission must consider the life cycle of the product that it seeks to regulate and all its significant environmental aspects. By referring to this concept, the legislator ensures that the delegation of

⁴⁶ Article 2(23) Ecodesign Directive.

⁴⁷ Preamble (4) and (7) Ecodesign Directive.

⁴⁸ Article 15 Ecodesign Directive. Implementing acts are measures aimed at ensuring uniform implementation across the EU following Article 291 TFEU.

⁴⁹ Article 15(2)(a) Ecodesign Directive.

⁵⁰ Article 15(2)(b) Ecodesign Directive.

⁵¹ Article 15(2)(c) Ecodesign Directive.

⁵² Article 15(5) Ecodesign Directive.

⁵³ Rosalind Malcolm, ‘Ecodesign Laws and the Environmental Impact of our Consumption of Products’, (2011) 23 *Journal of Environmental Law* 487.

powers takes place in line with the aim of the Directive and actually contributes to reducing the environmental impacts of the products.

The major problem with the Ecodesign Directive is the lack of incentive for producers to develop or use more environmentally sound technology than those set out in the law. The Directive aims to ensure that the least environmentally friendly products disappear from the market but it does not force the industry to strive towards the highest standards possible.

The average time for the Commission to adopt an implementing measure has so far been about three years. This is a long time in comparison with the rapid change in consumer products and habits. Article 16(2) identifies a list of eight product groups for the Commission to regulate between the transitional period from the adoption of the (first) Directive in 2005 and the adoption of the first Working Plan in 2009. The process was much slower than expected, the actual adoption of measures beginning in 2009. Twelve products were regulated during the extended period 2005 to 2011 but they represent only six of the identified product groups and less than half of the equipment discussed.⁵⁴

8.3.2 Public procurement and life-cycle costing

Any purchase of goods, works and services made by a governmental body above a certain monetary threshold falls under the framework of EU public procurement legislation. To ensure some control over how public money is spent, these rules constrain the behaviour of the purchasing authorities throughout the whole procurement procedure.⁵⁵ The pursuit of horizontal objectives, including environmental protection through purchasing, is normal market behaviour but the Commission has always shown reluctance to intervene in these choices. Based on the argument that EU competence in public procurement is limited to regulating 'how to buy', any considerations of sustainable purchasing have originally been kept out of the procurement directives.

The resulting uncertainty around what the EU rules allow led to national courts asking the Court of Justice of the EU (CJEU) in preliminary rulings about the validity of national measures imposing environmental standards of bidders to public procurement contracts. One of these cases, *Concordia Bus*, concerned the award phase of a contract for the operation of city bus services in Helsinki.⁵⁶ The purchasing authority included award criteria regarding the

54 Commission Staff Working Document, *Establishment of the Working Plan 2012–2014 under the Ecodesign Directive*, SWD(2012) 434 final.

55 For a discussion of the relevance of Article 11 TFEU for public procurement, see Anja Wiesbrock, 'An Obligation for Sustainable Procurement? Gauging the Potential Impact of Article 11 TFEU on Public Contracting in the EU' (2013) 2 *Legal Issues of Economic Integration* 105.

56 Case C-513/99 *Concordia Bus Finland Oy Ab v Helsingin Kaupunki and Hkl-Bussiliikenne* [2002] ECR I-7123.

level of nitrogen oxide emissions and noise of the bus fleet. The CJEU held that public procurement criteria could include environmental objectives as long as the authorities complied with general requirements of equal treatment and transparency.⁵⁷

As a response to the willingness of purchasing authorities to include environmental objectives in the bidding process, the Commission launched the Green Public Procurement (GPP) policy in 2008.⁵⁸ The GPP is a voluntary instrument that serves as guidance for public authorities to determine the extent to which they can purchase environmentally friendly goods, services and works. The Commission defines it as ‘a process whereby public authorities seek to procure goods, services and works with a reduced environmental impact *throughout their life cycle* when compared to goods, services and works with the same primary function that would otherwise be procured’.⁵⁹

One of the potential benefits of the GPP is the stimulation of markets for environmentally friendly products and innovation from the industry: ‘As ‘greener’ goods are *defined on a life cycle basis*, GPP will affect the whole supply chain and will also stimulate the use of green standards in private procurement’.⁶⁰

In February 2014, the EU adopted a new Directive on Public Procurement⁶¹ based on Article 114 TFEU. The most interesting aspect of the new Procurement Directive for this chapter is that it adopts a concept developed under the GPP for the award stage of the procurement procedure: life-cycle costing. The Procurement Directive gives a wide definition of ‘life cycle’, including research and development,⁶² and then lists the components of life-cycle costing in a specific provision under the contract award criteria subsection.

Following Article 68(1) of the Procurement Directive, the costs may include costs associated with acquisition (delivery and installation), use (energy consumption), maintenance and end-of-life (collection, recycling and disposal). These costs, referred in the Commission’s proposal as ‘internal costs’,⁶³ correspond to the ‘traditional’ life-cycle costing approach, which is

57 Ibid. para 64.

58 Commission Communication, *Public Procurement for a Better Environment*, COM(2008) 400 final.

59 Ibid. at 4 (emphasis added).

60 Ibid. at 2 (emphasis added).

61 Directive 2014/24/EU of the European Parliament and of the Council of 26 February 2014 on public procurement and repealing Directive 2004/18/EC, OJ L 94, 28.03.2014, at 65 (Procurement Directive).

62 Article 2(20) Procurement Directive: “‘life cycle’ means all consecutive and/or interlinked stages, including research and development to be carried out, production, trading and its conditions, transport, use and maintenance, throughout the existence of the product or the works or the provision of the service, from raw material acquisition or generation of resources to disposal, clearance and end of service or utilisation’.

63 Article 67(1) of the Commission Proposal for a Directive on public procurement, COM(2011) 896 final.

meant to uncover the costs of a product beyond its price but not environmental externalities.⁶⁴

However, in line with the GPP, the Procurement Directive includes 'costs imputed to environmental externalities linked to the product ... during its life cycle'.⁶⁵ These costs correspond with what society has to pay for the environmental impacts of products, such as greenhouse gases emissions, acidification and other pollution, as well as climate change mitigation.

The drawback of the broad scope of life-cycle costing is that Article 68(1)(b) imposes an important condition on a public authority that wishes to introduce environmental externalities into an assessment of life-cycle costing: their *monetary value* has to be determinable and verifiable. Debates within the European Parliament about the monetisation of externalities raised concerns about the difficulty of this exercise and the uncertainty for both bidders and purchasing authorities about the legality of those award criteria.⁶⁶

A significant change from the previous Procurement Directive is that public authorities may no longer use the price as the sole criterion. Article 67 of the new Procurement Directive requires identifying the 'most economically advantageous tender ... on the basis of the price or cost, using a cost-effectiveness approach', with life-cycle costing as one of the possible approaches.⁶⁷

There is no mention of life-cycle costing in other stages of the public procurement procedure but the Procurement Directive introduces other environmental protection considerations as technical specifications or as criteria for qualitative selection.⁶⁸

8.3.3 Producer responsibility and best overall environmental outcome

Based on the idea that the responsibility for waste management, which was traditionally assigned to public authorities, is to be shifted to the producers of

64 Pernilla Gluch and Henrikke Baumann, 'The Life Cycle Costing (LCC) Approach: A Conceptual Discussion of its Usefulness for Environmental Decision-Making', (2004) 39 *Building and Environment* 571.

65 Article 68(1)(b) Procurement Directive.

66 See justifications to Amendments 364-7 in Draft report of Marc Tarabella, PE483.468v01-00.

67 Article 67(2) Procurement Directive.

68 Examples of environmental concerns in the Procurement Directive: Article 42(3)(a) lays down that 'technical specifications shall be formulated ... in terms of performance or functional requirements, including environmental characteristics, provided that the parameters are sufficiently precise to allow tenderers to determine the subject-matter of the contract and to allow contracting authorities to award the contract'. Article 43 allows contracting authorities to require specific labels, including environmental labels. Contracting authorities may not to award a contract to the best bidder if he did not comply 'with obligations in the fields of environmental, social and labour law established by Union law, national law, collective agreements or by the international environmental, social and labour law provisions listed in Annex X'. (Article 18(2) as referred in Article 56(1)) or to exclude an economic operator from participating in a public contract if he is violating those obligations (Article 57(4)(a)).

the original products, the OECD developed a definition of the concept of extended producer responsibility (EPR): 'EPR is an environmental policy approach in which a producer's responsibility for a product is extended to the post-consumer stage of a product's life cycle'.⁶⁹

One of the main ideas behind EPR is that, by making the producers responsible for end-of-life management, they are given an incentive to reconsider the design of their products to minimise the nuisances occurring at the stage. Hence, instead of relying on end-of-pipe measures and focusing on reducing pollution at the end of the process streams, policy makers should prioritise preventative measures and the mitigation of damages at source. Although the goal of the producers might be solely to reduce their costs, the result is the mitigation of damages throughout the life cycle of the products.

In its Communication on IPP, the Commission endorsed an EPR approach in waste law where it appears to be the most effective way to reduce life-cycle environmental impacts.⁷⁰ The idea that producers must be responsible for the entire life cycle of their products is, however, not new; it had already emerged in Europe in the 1970s.⁷¹ Lindhqvist presented the term 'extended producer responsibility' and proposed its first formal definition in a 1990 report to the Swedish Ministry of Environment.⁷² Following that report and the enactment of EPR legislative acts in various Member States,⁷³ the Union adopted the Packaging and Packaging Waste Directive, which contains some features of producer responsibility.⁷⁴ Other directives establishing more advanced EPR schemes followed, each regulating a particular waste stream: end-of-life vehicles,⁷⁵ waste electronic and electrical equipment⁷⁶ and batteries.⁷⁷

In parallel with these vertical directives, the Union developed the Waste Framework Directive, an all-encompassing Act establishing common standards

69 OECD, *Extended Producer Responsibility. A Guidance Manual for Governments* (Paris: OECD, 2001), 18.

70 IPP, point 5.1.d).

71 For example, Sweden (1975), Germany (1986) and the Netherlands (1988); see Thomas Lindhqvist, *Extended Producer Responsibility in Cleaner Production: Policy Principle to Promote Environmental Improvements of Product Systems* (Doctoral Dissertation, Lund University, 2000) 30–34.

72 Thomas Lindhqvist and Karl Lidgren, *Modeller for Forlangt Producent-ansvar [Models for Extended Producer Responsibility]*, in Ministry of the Environment, *Fran Vaggan till Graven – sex studier av varors miljöpaverkan [From the Cradle to the Grave – six studies of the environmental impact of products]* (Stockholm, 1990): 'Extended producer responsibility is an environmental protection strategy to reach an environmental objective of a decreased total environmental impact from a product, by making the manufacturer of the product responsible for the entire life-cycle of the product'.

73 Germany adopted the Ordinance on the Avoidance of Packaging Waste (also known as 'Toepfer Decree') on 12 June 1991. France followed quickly with the enactment, on 1 April 1992, of the 'Lalonde Decree' (Decree No. 92-377).

74 Directive 94/62/EC on packaging and packaging waste.

75 Directive 2000/53/EC on end-of-life vehicles.

76 Directive 2002/96/EC on WEEE, recently replaced by Directive 2012/19/EU (not yet in force).

77 Directive 2006/66/EC on batteries.

for all waste streams.⁷⁸ Like the other waste directives, the Waste Framework Directive is based on an environmental legal basis and thus pursues environmental protection as its primary objective. The stated aim of the Directive is to protect the environment 'by preventing or reducing the adverse impacts of the generation and management of waste and by reducing overall impacts of resource use and improving the efficiency of such use'.⁷⁹

Since its recast in 2008, the Waste Framework Directive contains an express EPR provision which requires producers to accept returned products and waste from their products, to undertake subsequent waste management and to be held financially responsible for these activities.⁸⁰ In addition, Article 8 provides for an obligation to make certain information about products publicly available. The flow of information between the various actors in the product chain is one of the essential means to achieve environmental prevention at source.⁸¹ This particular issue is further discussed in the final section of this chapter.

By imposing obligations on the producer of the product,⁸² the Waste Framework Directive reaches beyond the scope of waste *strict sensu* and seeks to incentivise producers to green their production phase and reduce impacts at the end-of-life stage. The Preamble of the Directive confirms that the rule is anchored in life-cycle thinking:

The introduction of extended producer responsibility in this Directive is one of the means to support the design and production of goods which take into full account and facilitate the efficient use of resources *during their whole life-cycle* including their repair, re-use, disassembly and recycling without compromising the free circulation of goods on the internal market.⁸³

The 2008 Recast of the Directive also integrates life-cycle thinking from another angle. Under Article 4(2), life-cycle thinking may justify derogation from the hierarchy of waste management, whereby the prevention of waste should be the main priority, followed by re-use, recycling, energy recovery and disposal.⁸⁴ This hierarchy is an authoritative principle applicable to all types of waste, provided that other measures may not deliver the best overall environmental outcome. That outcome is determined for each specific waste stream on the basis of life-cycle thinking. If the conclusion is that the environment

78 Article 2 WFD contains a list of all exclusions.

79 Article 1 WFD.

80 Article 8 WFD.

81 Carl Dalhammar, 'Product and Life Cycle Issues in European Environmental Law: A Review of Recent Development', (2007) 7 *Yearbook of European Environmental Law* 76.

82 The Waste Framework Directive defines the producer as the 'person who professionally develops, manufactures, processes, treats, sells or imports products'.

83 Preamble (27) WFD (emphasis added).

84 Article 4(1) WFD.

would be better off with another measure than that provided by the hierarchy, national measures may derogate from the general rule.⁸⁵ In other words, the hierarchy is deemed to establish the best solution but a case-by-case analysis may provide the basis for a better alternative.⁸⁶

A significant weakness of this approach is the lack of indications on how to use life-cycle thinking in this context. The Directive does not provide for any definition of or guidance on this rule. The discretion left for the implementation of this derogation may weaken environmental protection if economic considerations take precedence over environmental concerns. An additional element of uncertainty comes from the third paragraph of Article 4(2), according to which arguments of technical feasibility and economic viability may put into question the strict application of the hierarchy.

A more general concern comes from the very nature of the Directive. Because it is based on the EU environmental legal basis, the it may only establish minimum requirements, in accordance with the principle of minimum harmonisation.⁸⁷ This means that Member States retain important competences and can, in any case, go beyond what the Union set out. For the EPR provision, this led to laying down a range of measures (legislative or not) that Member States may decide to implement nationally or, for some, locally.⁸⁸ However, the exercise of Member States' remaining powers is not framed by any requirements such as to take life-cycle considerations into account. The result may be a fragmented protection that does not respond to the environmental challenges of waste management.

8.4 Recommended approaches to further integrate EU product law

8.4.1 *A framework directive on the environmental impacts of products*

There is currently no legislation dealing with the overall environmental impacts of products and, in spite of the IPP, the EU regulatory framework for products still struggles to follow a coherent strategy. The Ecodesign Directive is the first piece of legislation that attempts to address environmental protection using life-cycle-oriented thinking. The idea of going one step further

85 Article 4(2) WFD.

86 For example, the UK Department for Environment, Food and Rural Affairs conducted an analysis on the management of waste wood and found that a specific type of wood is more suitable for energy recovery than recycling, see UK Department for Environment, Food and Rural Affairs, *Waste Wood as a Biomass Fuel: Market Information Report*, Waste Infrastructure Delivery Programme, (London: DEFRA, April 2008). Available online at www.gov.uk/government/uploads/system/uploads/attachment_data/file/69405/pb13552-wastewood-biomass-080408.pdf (accessed 8 July 2014).

87 As discussed in the introduction to this chapter, this principle results from Article 193 TFEU.

88 See Article 8(1) WFD.

and adopting a framework directive that would deal with all environmental impacts of products was raised by some scholarly think-tanks⁸⁹ but never developed by the Commission. The opportunity for establishing a horizontal framework is nevertheless worth revisiting, given that product regulation remains fragmented and does not cover all life-cycle stages or product groups (for example, the Ecodesign Directive only applies to energy-related products).

In accordance with the integration principle, regardless of the legal basis chosen for such a legal act, environmental protection has to be ensured. The consequences of choosing the internal market or an environmental legal basis would nevertheless affect the extent of the legislative prerogatives of the EU. With regards to a directive with a wide-ranging scope, it is advisable to use a dual legal base to reflect the use of Article 114 TFEU for some directives and of Article 192 for others and to ensure that the European legislator can both set up minimum standards as well as more stringent rules.

Following the example of the Ecodesign Directive, a framework directive on the environmental impacts of products should only set general principles, which would need to be specified for each product groups through daughter directives or implementing acts.

Such a directive should contain at least a general obligation to put only environmentally sound products on the market.⁹⁰ Soundness would have to be assessed based on the life cycle of products. The directive should include as many parameters as possible that would contribute to producing a sound product, including no toxic materials, energy efficiency, reuse and recycling, and so on.⁹¹

8.4.2 Environmental information about products

Information is the key to any improvements within the life cycle of a product. Knowledge about the impacts of products and the costs associated to them allows producers to make informed choice about the design changes that those products require. Only with sufficient information can recyclers and other entities in charge of waste disposal ensure safe and cost-effective end-of-life management. In addition, several actors, such as individual consumers, professional purchasers and non-governmental organisations, may effectively increase the environmental soundness of products by imposing consumption preferences or creating pressure campaigns.⁹² This democratic process requires access to some information about the impacts of a products' life cycle.

89 In 2004, the European Environmental Bureau drafted a proposal for a directive on the environmental soundness of products based on the model of the existing Product Safety Directive (Directive 2001/95/EC of 3 December 2001 on general product safety, OJ L 11, 15.01.2002, at 4).

90 Carl Dalhammar, *An Emerging Approach in Environmental Law: Incorporating the Life Cycle Perspective*, *IIIEE Dissertation* (Lund University, September 2007), 207.

91 Dalhammar, *IIIEE* 2007, 208.

92 *Ibid.*

Furthermore, to adopt adequate legal acts and to ensure their effective application, the EU and its Member States need access to information, which is usually in the hands of the industry. There are, however, no mandatory legal mechanisms at EU level which enable wide access to environmental information about products when held by the industry. Following the adhesion of the EU to the Århus Convention, EU institutions must make environmental information publicly available.⁹³ These may include documents about products that institutions have received from the industry but private entities are not themselves under any obligations towards the public.

Companies may decide to make some information available on a voluntary basis. Voluntary schemes have been developed at international level, notably the famous ISO standards. With regard to information, the ISO set up three categories: self-declarations or green claims; environmental labels; and life-cycle data declarations.⁹⁴ Encouraging companies to make such information available and ensuring that the information may be easily reviewed and used both by public authorities and consumers must be a priority for the EU.⁹⁵

8.4.3 Developing EU legislation based on life-cycle thinking

As a result of Article 11 TFEU, the choice of the legal basis should not have an impact on the pursuit of the objectives of environmental protection set out in the Treaties. In practice, however, reconciling diverging objectives may prove difficult. To secure a proper application of the integration principle in the EU product regulatory framework, the European legislator needs to systematically take into account life-cycle thinking when adopting product-related measures.

The Ecodesign Directive has shown one way of taking life cycle into account in the early stages of the law-making process; that is, identifying the stage where most pollution caused by products is determined. The European legislator should systematically consider how to improve environmental protection throughout the life cycle when considering the adoption of a new legislative act or the revision of an existing one.

8.4.4 Guiding the implementation of EU law based on life-cycle thinking

Once a legal instrument is adopted at EU level, the implementation phase is crucial to ensure the effectiveness of the law. Because Member States usually

93 Directive 2003/4/EC of 28 January 2003 on public access to environmental information and repealing Council Directive 90/313/EEC, OJ L 41, 14/02/2003, at 26.

94 Respectively, ISO 14021:1999, ISO 14024:1999 and ISO 14025:2006.

95 In Norway, the legislative act implementing Directive 2003/4 also requires companies to be aware of the effect of their business on the environment and to give out such information on request, see Hans Christian Bugge 'Retten til å få, og plikten til å gi, miljøinformasjon etter den nye miljøinformasjonsloven [The right to receive, and the obligation to give, environmental information after the new environmental information act]' (2005) 44 *Lov og Rett*.

have significant powers with regard to implementation, EU provisions should ensure that the national legislator acts in accordance with the need to ensure a high level of protection and improvement of the quality of the environment as set out in Article 3(3) of the Treaty on European Union. In certain cases, this could be achieved by requiring that the product's life cycle is taken into account in the preparation of the implementing legislation. The same should apply where directives and regulations delegate legislative powers to the Commission.⁹⁶

If Member States are the main recipients of a directive, other stakeholders also play an important role in applying the law in concrete situations. In that respect, the margin of manoeuvre left in a provision is determinant. Using life-cycle thinking as a frame of reference may allow the application of EU provisions in a systematic manner and in accordance with high environmental standards throughout the Union, without removing all flexibility for its recipients. The European legislator should strive to incorporate such benchmarks into its legislation.

8.5 Conclusion

In this chapter, it is argued that the principle of integration contained in Article 11 TFEU is crucial in responding to the negative effects that fragmentation may have on the level of environmental protection within EU product regulation. The lack of coherence in addressing the variety of issues the field of products gives rise to the confrontation of possibly diverging objectives and the multiplication of competences at EU and national levels are the main factors of fragmentation. Based on the need to better integrate environmental concerns into its policy, the EU developed the IPP, which embraced the concept of life-cycle thinking as well as identifying measures to be taken at each stage of the product life cycle.

The three focus areas of this chapter – ecodesign, public procurement and waste – show different ways of integrating environmental considerations into EU legislation. A direct result of the IPP, the Ecodesign Directive is a good example of applying Article 11 TFEU into product legislation with environmental protection being at its core. It fails, however, to give strong incentives to the industry to further improve the environmental characteristics of their products. The rules on public procurement focus primarily on market-based considerations and the integration of environmental protection concerns are recent and remain limited. The introduction of the concept of life-cycle costing into the new public procurement directive is one of the main results of that integration. The waste directives, based on the environmental legal basis, contain far-reaching provisions, such as extended producer responsibility, but their scope is limited by the minimum harmonisation nature of the field.

96 Such a requirement can be found in the Ecodesign Directive, Article 15(4), with regard to the preparation of implementing measures.

Four main recommendations are put forward in this chapter to achieve a better integration of environmental considerations in product legislation. Firstly, to achieve a more coherent strategy for products, the adoption of a framework directive on the environmental impacts of products in a life-cycle oriented manner should be discussed. Such an instrument would contribute to creating a coherent framework for product regulation. Secondly, there should be a focus on improving access to information to all stakeholders, not only to allow consumers to make informed choices but also to ensure that recipients of EU laws can adequately perform their law-making tasks. Thirdly, in line with the integration principle, any product legislation adopted at EU level should be developed based on considerations of maximisation of environmental benefits throughout the product life cycle. Finally, the transposition and implementation of EU legislation should also require referring to life-cycle thinking to ensure the environmental standard aimed by the European legislator. In accordance with the integration principle, any EU rule on products, even if it only aims at setting minimum harmonisation, should be framed so that environmental protection is maximised and implemented, to preserve the environmental content, using life cycle as the basis for any decision making.

ARTICLE 2 ‘Exploring the Spaceship Earth: A Circular Economy for Products’

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Abstract: The linear economic model is reaching its limits given its negative impact on the environment that are threatening human survival. This chapter discusses the path towards an alternative economic model: the circular economy. Contrary to the linear model, that requires unlimited exploitation of natural resources, the circular economy is based on a continuous re-use of materials and products. The case for exchanging the linear model for a circular one has been made by scholars and stakeholders for several years already. David Pearce discussed back in 1990 the concept of a circular economy, highlighting the importance of interactions between the economy and the environment. This chapter examines the rationale for the circular economy and briefly reviews the literature on the topic. It then identifies the main factors that have to be in place in order achieve a circular economy. It illustrates each factor with existing and proposed laws and policies, notably those put forward by the European Commission in its 2015 Action Plan for a Circular Economy.

Exploring the Spaceship Earth

A Circular Economy for Products

ELÉONORE MAITRE-EKERN

2.1 Introduction

Traditionally, our economic system has been based on a linear model: from the extraction of natural resources, production and consumption of products based on energy consumption to the final disposal of the products as waste. This model assumes unlimited availability of natural resources and endless possibilities for growth, and it is reaching its limits because the negative impact on the environment is threatening human survival. The reality is that the Earth is more like a spaceship than an illimitable cylinder,¹ in that it is a closed system in which many key natural resources are exhaustible; energy production generates extensive pollution, also impacting the world's climate; most water sources are contaminated; and piles of trash are drifting in the oceans or creating artificial mountains. An alternative economic model exists: the Circular Economy (CE). Based on the continuous re-use of materials and products, much can be done to mitigate these problems. However, it requires a complete change of economic paradigm and of market actors' approach to business and consumption.

This chapter attempts to develop and examine the conditions required to achieve a CE for products in a European context. Section 2.2 asks why the linear model has failed in ensuring environmental protection and why it impairs essential ecosystem services. It follows an analysis of how the misuse of these ecosystem services impacts the environment and puts the economy and, ultimately, human survival at risk. Section 2.3 examines

¹ Indeed, the 'Mercator projection' (1569) showed the Earth as a cylinder which becomes infinite at the poles. The term 'Spaceship Earth' was coined by K. Boulding, 'The economics of the coming Spaceship Earth', in H. Jarrett (ed.), *Environmental Quality in a Growing Economy* (Baltimore: Johns Hopkins University Press, 1966), pp. 3–14.

the rationale and characteristics of the CE, with an emphasis on the technical material flows, the main focus of this chapter. The chapter describes the various loops that ensure the circularity of the economic model while discussing the role of services to reduce resource consumption and waste. Section 2.4 reviews the main schools of thought and key findings that have helped define and prepare the ground for the CE. Section 2.5 develops the five requisite conditions to achieve the CE for products. Each of the conditions is further examined in light of existing European Union (EU) legislation, propositions contained in the 2015 EU Action plan for a circular economy and recommendations by leading scholars.² The chapter ends with conclusions.

2.2 The Failure of the Linear Model

Since the dawn of industrialization in Europe, the dominant economic model has been based on a linear pattern known as ‘take, make and dispose’. In other words, the market produces goods from raw materials, which the consumers consume and discard, ultimately creating waste. The linear economy considers natural resources and waste respectively as free inputs and outputs in the economic system and tends to overlook the environmental dimension of economic activities. Figure 2.1 shows the functioning of the linear economy, including flows of both materials and energy.

Over the last decade, there has been growing recognition that the linear model is threatening both the integrity of natural ecosystems and economic stability. This is because it fails to account for the benefits the environment is providing, as well as its limits. In a linear system, natural resources are depleted, and excessive energy production and consumption eventually exhaust natural resources and pollute the air, water and soil in an unsustainable manner. In addition to seriously harming the environment, the linear system has an adverse effect on the long-term viability of the economy by depleting natural resources and causing supply shortages, as well as increasing volatility in the price of raw materials.

In 1990, Pearce and Turner pointed out four welfare economic functions of the environment.³ Another way to approach this is through the

² Commission Communication, ‘Closing the loop – an action plan for the circular economy’ (hereinafter ‘Action Plan’), 2 December 2015, COM(2015) 0614 final.

³ I.e. (1) resource supply, (2) waste assimilation, (3) utility provision and (4) life-support function. See D. W. Pearce and R. K. Turner, *Economics of Natural Resources and the Environment* (Baltimore: Johns Hopkins University Press, 1990), p. 41.

Figure 2.1 The linear economic model

Source: Based on R. Le Moigne, *L'Economie circulaire* (Paris: Dunod, 2014), p. 10. All translations are by the author.

concept of ‘ecosystem services’. Our planet consists of a multitude of ecosystems – i.e. a self-supporting community of living organisms and non-living elements (like air, water and soil). Ecosystems vary in size from a home garden to a forest, from a drop of water to an ocean. The biosphere itself is an ecosystem. Ecosystems provide basic functions, such as breathable air and drinkable water, that guarantee human and non-human life on the planet. Ecosystems services, which are the direct benefits ecosystems provide to humans, can be divided into four categories: (1) provisioning services, (2) regulating services, (3) cultural services and (4) supporting services.⁴ These services bring a positive value to the economy as long as they are not misused. Exceeding the limits of the environment may ultimately put our very existence at risk if basic requirements, like breathable air and drinkable water, are affected.

For the purpose of this chapter, the following analysis is limited to the first two ecosystem services, their limits and the dangers of mistreating them, a prerequisite to understanding the need to shift towards a circular system and to establishing the conditions for achieving it.

2.2.1 *Provisioning Services*

The environment provides a resource base of essential importance to the economy. Natural resources are provided by the Earth, such as environmental media (air, water and soil) and other ubiquitous resources (sunlight, wind, hydropower and geothermal heat), raw materials (minerals and biomass), animal life and space. Non-renewable or exhaustible resources are those that do not renew in human-relevant periods, typically metals (copper, iron, nickel), minerals (limestone, clays, silica) and fossil energy sources (oil, gas, coal). Other natural resources are renewable in the sense that they can regenerate (or renew) in a human-relevant period, provided the rate of use does not exceed their regenerative capacity. Water, farmed (crops and livestock) and wild resources and wood are examples of renewable resources. Some renewable natural resources, such as sunlight and wind, are absolutely renewable, while the renewability of others is dependent upon their exploitation. Some of these resources are fast growing (most fruits, vegetables and cereals), while others need more time (wildlife, forests). If renewable resources are extracted and harvested at a

⁴ See e.g. Millennium Ecosystem Assessment, *Ecosystems and Human Well-Being: Synthesis* (Washington, DC: Island Press, 2005), p. 39.

rate faster than the rate at which they restore, their stock can be reduced and, potentially, depleted.

Our economy today is still largely dependent on non-renewable energy resources, and exhaustible material resources form the primary source of components in a wide range of consumer products, such as electronic equipment. Some resources, if appropriately handled, could be re-used or recycled a number of times before losing their functionality.⁵ The linear model, however, does not encourage extending the lifespan of products and components, nor their post-consumer life management.⁶

2.2.2 *Regulating Services*

Ecosystems act as regulators, notably by regulating air and soil quality or treating water and waste. The environment is able to assimilate some residues of economic activities. They come from various sources, such as emissions from the burning of fossil fuels, discharges and residual materials from factories and industries, chemical fertilizers and pesticides, sewer and landfill leakages, emissions from road transport and household waste. These residues, or waste, arise at every stage of the production process, as well as at final consumption. The use of natural resources creates waste. This, in essence, is what the first law of thermodynamics tells us: energy and matter can be converted or dissipated, e.g. the combustion of crude oil creates waste gases (CO₂) and solids (ash and slag), but they do not disappear. Any natural resource that is used must end up somewhere in the environmental system. In the words of Pearce and Turner, 'the amount of waste produced in any period is equal to the amount of natural resources used up'.⁷

The assimilative capacity of the environment may mitigate pollution created by the generation of waste, but it is not without limits. Once exceeded, environmental damage begins.⁸ Pollution from waste affects all three media – air, water and soil – and causes terrible damage from erosion, rain cycle disruption and depletion of the ozone layer: it can harm

⁵ This may be because the substances are altered by the recycling process or because they have been mixed with other materials in a way that makes their removal impossible.

⁶ On the contrary, planned obsolescence, which consists in shortening the lifespan of products for the purpose of selling more new products, is a direct result of the Industrial Revolution and the linear model.

⁷ Pearce and Turner, *Economics of Natural Resources and the Environment*, p. 37.

⁸ M. Andersen 'An introductory note on the environmental economics of the circular economy' (2007) *1 Sustainability Science* 2, 133–40 at 135.

wildlife and destroy their habitats, and it can also damage landscapes. So waste may, in itself, result in the degradation of natural resources and accelerate their depletion. An example of devastating pollution is the rapid replacement of electronic appliances, which represent a large proportion of the waste found in open landfills around the world. These appliances contain many toxic components,⁹ which are often not handled properly and leak into the environment, contaminating rivers and soil, damaging the local fauna and flora and endangering human health. Human beings themselves form part of the environment, and pollution is increasingly affecting human health in the form of respiratory diseases and infections, malformation, intellectual disabilities and premature deaths.¹⁰

However, waste is not necessarily a burden and can be turned into useful resources. Biodegradable materials such as food or paper can be decomposed and used as biological nutrients to add to the soil.¹¹ Broken electronic appliances can be disassembled and their metal components (e.g. copper) recycled to make new products.

There are several reasons why we keep drawing on Earth's natural resources and generate increasing amounts of waste rather than re-using and recycling what has already been introduced into the economy. Our economic system tends to disregard the impact of the production process on phases that precede or follow it, and the market fails to account for the impact of the economic process on the environment.

One aspect, however, which is not controllable by humans lies in the second law of thermodynamics. The law explains the inherent tendency of any natural process to dissipate useful energy. In an economic system, materials tend to be used *entropically*, which means that they are dissipated within the economic system.¹² In other words, materials tend to lose their economic value after usage even though, as the first law of thermodynamics established, they do not disappear. For example, burning fossil fuels generates dissipated waste, notably in the form of CO₂ emissions, which, even if they are captured using carbon capture and storage (CCS) technologies, cannot create another fuel.

⁹ E.g. lead, cadmium, beryllium or brominated flame retardants.

¹⁰ See e.g. M. Kampa and E. Castanas, 'Human health effects of air pollution' (2008) 1 *Environmental Pollution* 1, 151, 362–67.

¹¹ W. McDonough and M. Braungart, *Cradle to Cradle: Remaking the Way We Make Things* (New York: North Point Press, 2002), p. 27.

¹² See N. Georgescu-Roegen, *The Entropy Law and the Economic Process* (Cambridge, MA: Harvard University Press, 1971); see also Pearce and Turner, *Economics of Natural Resources and the Environment*, p. 38.

2.3 The Rise of the Circular Economy

2.3.1 *Acknowledging Interconnections*

The linear economy tends to disregard the reality of the environment. It assumes that one can continuously draw on Earth's reserves to feed production and satisfy consumption. The laws of thermodynamics clearly tell us, however, that one cannot see resources in isolation from waste nor ignore the impact of human (economic) activities on the environment's integrity.

To reflect the functioning of the environment and maintain the integrity of ecosystem services, our economic system must embrace the fact that it functions in a closed and circular system in which natural resources and waste are neither the beginning nor the end of a process and in which nothing appears or disappears. In 1990, Pearce and Turner described for the first time the functioning of a circular economic system, insisting on the interconnections between the services: natural resource extraction, production and consumption all create waste (in its broadest meaning), which can return as benefits to the economy if they are recovered or assimilated by the environment or can damage the environment if they exceed its assimilative capacity.¹³

2.3.2 *Technical and Biological Material Flows*

In their book *Cradle to Cradle*, McDonough and Braungart introduced the distinction between two types of material flows: biological and technical nutrients.¹⁴ A *biological nutrient* is a material that is designed to biodegrade safely and return to the soil to feed environmental processes.¹⁵ Such material should be made so that it 'can be tossed on the ground or compost heap to safely biodegrade after use – literally to be consumed'.¹⁶ McDonough and Braungart propose, for instance, to design food packaging as biological nutrients so it can biodegrade or be used as fertilizer after use. Current packaging, including plastics bottles, takes at least 450 years to degrade,¹⁷ while the content

¹³ Ibid., p. 40. ¹⁴ McDonough and Braungart, *Cradle to Cradle*, pp. 100–110.

¹⁵ McDonough Braungart Design Chemistry (MBDC), 'Cradle to Cradle Concepts', www.c2cproducts.com/detail.aspx?linkid=1&sublink=26.

¹⁶ McDonough and Braungart, *Cradle to Cradle*, p. 105.

¹⁷ New Hampshire Department of Environmental Services, 'Time it takes for garbage to decompose in the environment' (2013), http://des.nh.gov/organization/divisions/water/wmb/coastal/trash/documents/marine_debris.pdf.

is meant to be consumed in a matter of days or months (e.g. juices or toothpaste).¹⁸

On the other hand, a *technical nutrient* is ‘a material that remains in a closed-loop system of manufacture, re-use, and recovery called the technical metabolism, maintaining its value through infinite product life cycles’.¹⁹ Electronic devices, such as computers, consist of many materials, some of which are toxic and should be eliminated from the production process (such as PVC). Other materials, including gold, silver, platinum and copper,²⁰ are valuable and should be retrieved to be introduced into the industrial process again, rather than ending up in landfills.

This distinction between biological and technical nutrients is crucial to establishing the groundwork for the CE. The biological and technical cycles function differently and have different purposes: the first seeks to return nutrients to the natural environment, and the second is meant to circulate nutrients indefinitely within industrial life cycles. Each type of nutrient must therefore remain in its own cycle to avoid contaminating the other. The contamination of organic products by chemicals, such as hormones and endocrine disrupters, which are contained notably in pesticides or cosmetics, affects the biological cycle, not least by disrupting the early development of both humans and wildlife in an irreversible manner.²¹ Similarly, feeding biological nutrients into the technical metabolism could make the retrieval of technical materials more complicated (e.g. cleaning food packaging before recycling).²²

2.3.3 A Circular Model for Technical Materials

Since this chapter focuses on products from the technical materials flow, it is essential to define the characteristics of the CE in this specific context as a background to the rest of the analysis. Throughout the supply chain, the CE aims first and foremost at reducing the *extraction* of primary raw materials by using secondary resources (from the technical cycle) instead or by reducing production. In *production*, *assembly* and *supply*, the CE requires

¹⁸ McDonough and Braungart, *Cradle to Cradle*, p. 105.

¹⁹ MBDC, www.c2cproducts.com/detail.aspx?linkid=1&sublink=26.

²⁰ Gold and silver are notably used for making computer chips (CPU), platinum is found in hard drives and copper is the main component for wiring and cables.

²¹ WHO/UNEP, ‘State of the science of endocrine disrupting chemicals – 2012: An assessment of the state of the science of endocrine disruptors’ (2013), www.who.int/iris/bitstream/10665/78101/1/9789241505031_eng.pdf?ua=1.

²² McDonough and Braungart, *Cradle to Cradle*, pp. 104–5.

that industries reduce the use of resources (such as energy and water) and minimize their emissions (air and soil pollution, waste).

In order to reduce repetitive consumption and waste creation, the CE requires a focus on keeping products in use as long as possible whenever appropriate.²³ *Maintenance* activities are meant to retain or restore the product to its desired level of performance in order to resume its use and should be prioritized. Yet, since consumers do not necessarily use their products until the end of their lifespan, these products should ideally be sold to and *re-used* directly by other consumers.

If a product is nonetheless discarded because it is broken or has a defect, the first step should be to repair or recondition it, before selling it again. *Repair* means to correct specified faults in a product, while reconditioning consists in rebuilding major components of a product to restore it to working condition. *Reconditioning* requires more work than repair since it usually requires the rebuilding of major components.²⁴ Both processes create slightly inferior products to the original. *Remanufacturing*,²⁵ on the other hand, aims at achieving the same standard as that of new products. It is usually a more energy and resource consuming process, and it also generates more waste, than either repairing or reconditioning. The same is true for *retrieving*,²⁶ where a limited amount of material is extracted from used products or components. Finally, *recycling* is ‘any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes.’²⁷ The term *recovery* is used here to refer to every activity described in this paragraph.

These ‘loops’ are the main feature of the CE for technical material. Their task is to maintain products and materials in the economy (and more specifically in the technical cycle). Generally, tighter loops are to be preferred since they avoid several stages of the production process, reducing both energy use and raw material extraction. Figure 2.2 illustrates the

²³ It would not make sense to focus on prolonging the lifespan of products under rapid technological development. E. Maitre-Ekern and C. Dalhammar, ‘Regulating planned obsolescence: A review of legal approaches to increase product durability and reparability in Europe’ (2016) 25 *RECIEL* 378–94.

²⁴ A. King et al., ‘Reducing waste: Repair, recondition, remanufacture or recycle?’ (2006) 4 *Sustainable Development* 14 at 261.

²⁵ Some authors alternatively use the term ‘refurbishing’ to describe the same process.

²⁶ Also known as ‘cannibalization’, a term notably used by M. Thierry et al., ‘Strategic issues in product recovery management’ (1995) 2 *California Management Review* 37, 114–35.

²⁷ Article 3(17) Directive 2008/98/EC of 19 November 2008 on waste, OJ L 312, 22 November 2008, p. 3 (WFD).

Figure 2.2 The cycle of technical products
Source: Based on Le Moigne, *L'Economie circulaire*, p. 33.

system of loops, the tightest being waste prevention (maintenance and re-use), followed by materials recovery (re-use, reconditioning, remanufacturing, recovery and recycling).

The two remaining stages, under the CE, should be reduced and ultimately disappear. *Energy recovery* consists in burning waste for the purpose of creating energy. Although it reduces some of our reliance on non-renewable energy sources, it is a quite polluting and wasteful process. *Final disposal* (e.g. landfilling) should not have a place in the CE since it brings nothing back to the economy. In any case, it should not exceed the assimilative capacity of the environment.

2.3.4 *The Inherent Defects of the Loops*

The circular model should work as a completely closed-loop economy where products and materials are indefinitely recovered. However, as Le Moigne put it, '[i]n reality, the loops are spirals along which the value of materials and products dissipates progressively'.²⁸ Products and materials tend to lose part of their value through each loop, as explained by the second law of thermodynamics (see discussion under Section 2.2). The wider the loop, the more value is lost along the way. A product ready for re-use has more value than all of its disassembled components, which in turn have usually more value than all the materials found in each component.²⁹

Recycling is one of the most frequently used processes to manage discarded products in Europe. Yet, depending on the material or the process used, recycling may lead to a high value loss. Metals, theoretically, can be recycled endlessly as long as they are treated properly. But this requires products containing various metals and other materials to be properly disassembled before recycling to preserve their high quality.³⁰ The same is true for glass, which, if treated properly, can be recycled indefinitely without loss in quality or purity.³¹ Some materials deteriorate quickly during the recycling process, which can also be affected by the way it has been used. This is notably the case of paper. The use of inks or paints on paper alters its recyclability and the recycling process itself results in paper of lesser quality. Paper can be recycled up to seven times until its fibres become too thin to bond into new paper and virgin fibres need to be

²⁸ Le Moigne, *L'Economie circulaire*, p. 41. ²⁹ Ibid.

³⁰ McDonough and Braungart, *Cradle to Cradle*, p. 111.

³¹ Glass Packaging Institute, Recycling, www.gpi.org/recycling/glass-recycling-facts.

introduced.³² Some materials, like plastics, degrade during reprocessing and recycling is only successful once. Therefore, plastics are often down-cycled into non-recyclable items such as textiles or plastic lumber.

2.3.5 *Servitization and the Performance Economy*

Achieving a Circular Economy not only requires tackling the product, it also necessitates replacing it, whenever possible, with services. McDonough and Braungart depict a scenario where, instead of having products being bought, owned, and disposed of by ‘consumers’, the service of those products is purchased by ‘customers’ for a defined period of time at the end of which manufacturers – who retain ownership of the materials – recover them and use them to create new products.³³ In recent decades, manufacturers have been increasingly adding services to their core offering. This trend, often referred to as *servitization*, consists in a transaction the value of which comes from a combination of products and services.³⁴ It goes from offering services around the purchased products, such as maintenance services or service support, to clients (e.g. system training), to selling the output of the product (e.g. light, a wash) instead of the product itself (light bulb, washing machine).

Walter Stahel makes the point that a *performance economy* (or functional service economy) – characterized notably by selling services rather than products – creates wealth with less resource consumption, and internalizes the costs of risk and of waste.³⁵ Replacing products by services does not, however, necessarily achieve the expected environmental benefits. A study from Tukker shows that some types of product–service systems (PSS)³⁶ (e.g. product lease) may increase the environmental impact as a result of less responsible user behaviour.³⁷ Moreover, a PSS does not

³² R. Smith, ‘The environmental sustainability of paper’ (2011) 1 *Graduate Studies Journal of Organizational Dynamics* 1, Article 4.

³³ The words ‘consumer’ and ‘customer’ are in quotation marks to highlight the difference between the ‘consumption’ and the ‘use’ of products. McDonough and Braungart, *Cradle to Cradle*, p. 111.

³⁴ S. Vandermerwe and J. Rada, ‘Servitization of business: adding value by adding services’ (1998) 4 *European Management Journal* 6, 314–24.

³⁵ W. Stahel, *The Product Performance*, 2nd edn (London: Palgrave-Macmillan, 2010), p. 85.

³⁶ A PSS is a marketable set of both products and services, which is offered with the aim of achieving environmental benefits.

³⁷ A. Tukker, ‘Eight types of product–service system: eight ways to sustainability? Experiences from SusProNet’ (2004) 4 *Business Strategy and the Environment* 13, 246–60.

necessarily have positive waste effects just because it is product-oriented, use-oriented or result-oriented. Other aspects, such as prevailing consumer behaviours and waste infrastructures for collection and processing, are key to ensuring the sustainable nature of PSSs.³⁸

2.4 A Review of the Main Schools of Thought

In a short essay from 1966 published under the provocative title *The Spaceship Earth*, Boulding exploded the myth that the Earth is an unlimited reservoir of resources and endless waste sink. He described our planet as a ‘closed sphere’, similar to a spaceship with significant limitations:

In a closed system, the outputs of all parts of the system are linked to the inputs of other parts. There are no inputs from outside and no outputs to the outside; indeed, there is no outside at all.³⁹

In 1972, the Club of Rome published a report entitled *The Limits to Growth*, which investigated ‘five major trends of global concerns – accelerating industrialization, rapid population growth, widespread malnutrition, depletion of non-renewable resources, and a deteriorating environment.’⁴⁰ The report presented calculations following which, under a business-as-usual scenario, the world economy would face limitations within the next one hundred years and eventually collapse.⁴¹

Researchers and scientists have since engaged in finding innovative ways to reconcile economic activities and environmental preservation. This helped form the contours of what Pearce and Turner later named – and is now famously known as – the Circular Economy. This section contains a review of the main schools of thought informing the circular model. Table 2.1 presents, in a chronological order (from the date of first publication), leading authors and publications, and outlines their main contribution to the shaping of the CE.

³⁸ H. Corvellec and H. Stål, ‘Evidencing the waste effect of product-service systems (PSSs)’ (2017) 145 *Journal of Cleaner Production* 14–24.

³⁹ Boulding, ‘The economics of the coming Spaceship Earth’, p. 3.

⁴⁰ D. H. Meadows et al., *The Limits to Growth: A Report for the Club of Rome’s Project on the Predicament of Mankind* (New York: Universe Book, 1972), p. 21.

⁴¹ Meadows et al., *The Limits to Growth*, p. 23.

Table 2.1 *Schools of thought on the CE, a chronological breakdown*

School of thought	Start year	Leaders	Key publications	Key contributions to the CE
Performance economy	1976	Walter Stahel and Geneviève Reday-Mulvey	<i>Jobs for Tomorrow. The Substituting Manpower for Energy</i> ^a <i>The Product-Life Factor</i> ^b and <i>The Performance Economy</i>	Extend the use-life of goods by creating loops of re-use, repair, reconditioning and recycling. Substitute service activities for extractive and manufacturing industries Replace large-scale capital-intensive companies by smaller, labour-intensive, locally integrated work units.
Industrial ecology	1989	Robert A. Frosch and Nicholas E. Gallopoulos	<i>Strategies for Manufacturing</i> ^c	Reduce the impacts of industry on the environment by using the waste from one industrial process as raw materials for another one.
Reverse supply chain	1995	Martijn Thierry, Marc Salomon, Jo Van Nunen and Luk Van Wassenhove	<i>Strategic Issues in Product Recovery Management</i>	Establish a network of users of used products, collection, sorting and reprocessing centres, and new stages: 1 product acquisition, 2 reverse logistics, 3 inspection and disposition, 4 reprocessing, and 5 remarketing and resale.
Regenerative design	1996	John T. Lyle	<i>Regenerative Design for Sustainable Development</i> ^d	Place nature back at the core of every industrial process, whether by using directly its assets or as a model.

Table 2.1 (cont.)

School of thought	Start year	Leaders	Key publications	Key contributions to the CE
Biomimicry	1997	Janine Benyus	<i>Biomimicry: Innovation Inspired by Nature^e</i>	<p>Imitate the nature following its nine laws:</p> <ol style="list-style-type: none"> 1 nature runs on sunlight; 2 nature uses only the energy it needs; 3 nature fits form to function; 4 nature recycles everything; 5 nature rewards cooperation; 6 nature banks on diversity; 7 nature demands local expertise; 8 nature curbs excess from within; 9 nature taps the power of limits.
Product-service system (PSS)	1999	Mark Goedkoop, Cees van Halen, Harry te Riele and Peter Rommens	<i>Product Service Systems, Ecological and Economic Basics^f</i>	A PSS is a marketable set of products and services capable of jointly fulfilling a user's need. Replacing a product by a PSS has the potential for unlinking environmental pressure from economic growth.
Natural capitalism	1999	Paul Hawken, Amory Lovins and Hunter Lovins	<i>Natural Capitalism: Creating the Next Industrial Revolution^g</i>	<p>Reconcile business and environmental interests:</p> <ol style="list-style-type: none"> 1 radical increase in resource productivity; 2 shift to an industry based on biological models with closed loops and zero waste, 3 moving to a service economy, and 4 reinvest in the natural capital.
Cradle to cradle	2002	William McDonough and Michael Braungart	<i>Cradle to Cradle: Remaking the Way We Make Things</i>	<p>Cradle-to-cradle design means making products with their afterlife as primary concern and aims at <i>upcycling</i> – i.e. creating a product of higher quality or value than the original.</p>
Blue economy	2004	Gunter Pauli for the Club of Rome	<i>The Blue Economy: 10 Years, 100 Innovations, 100 Million Jobs^h</i>	<p>New business solutions that use resources available in cascading systems and waste of one product as input to create a new cash flow.</p>

(cont.)

Table 2.1 (cont.)

School of thought	Start year	Leaders	Key publications	Key contributions to the CE
Ellen MacArthur Foundation	2010	Ellen MacArthur Foundation	<i>Towards the Circular Economy, Volumes 1 to 3</i> ⁱ and <i>Growth Within: A Circular Economy Vision for a Competitive Europe</i> ^j	The CE is based on three principles: 1 preserve and enhance natural capital; 2 optimize resource yields; 3 foster system effectiveness. And it has the following five characteristics: 1 design out waste; 2 build resilience through diversity; 3 work towards energy from renewable sources; 4 think in systems; 5 think in cascades.

Note: This is not an exhaustive list of every author and contribution of relevance in the field. The author simply aims to introduce a representative range of different (but converging) lines of thought.

^a W. Stahel and G. Reday-Mulvey, *Jobs for Tomorrow: The Substitution of Manpower for Energy* (New York: Vantage Press, 1981). Based on a report to the European Commission from 1976.

^b W. Stahel, 'The product-life factor', in S. Orr (ed.), *An Inquiry into the Nature of Sustainable Societies: The Role of the Private Sector* (The Woodlands: HARC, 1984).

^c R. Frosch and N. Gallopoulos, 'Strategies for manufacturing' (1989) 261 *Scientific American* 144–52.

^d J. Tillman Lyle, *Regenerative Design for Sustainable Development* (New York: Wiley, 1996).

^e J. Benyus, *Biomimicry: Innovation Inspired by Nature* (New York: Harper Perennial, 1997).

^f M. Goedkoop et al., *Product Service Systems, Ecological and Economic Basics* (1999), Report No. 1999/36 submitted to the Dutch Ministries of Environment (VROM) and Economic Affairs (EZ), March, pp. 22–25.

^g P. Hawken et al., *Natural Capitalism: Creating the Next Industrial Revolution* (New York: Little, Brown, 1999).

^h G. Pauli, *The Blue Economy: 10 Years, 100 Innovations, 100 Million Jobs*. Report to the Club of Rome (Taos: Paradigm, 2010).

ⁱ The Ellen MacArthur Foundation, *Towards the Circular Economy* Vol. 1: An Economic and Business Rationale for an Accelerated Transition (2012); Vol. 2: Opportunities for the Consumer Goods sector (2013); Vol. 3: Accelerating the scale-up across Global Supply Chain (2014).

^j The Ellen MacArthur Foundation, 'Growth within: a Circular Economy vision for a competitive Europe' (2015), available at www.ellenmacarthurfoundation.org/assets/downloads/publications/EllenMacArthurFoundation_Growth_Within_July15.pdf.

2.5 Enabling the Conditions for Achieving a Circular Economy for Products and Legal Rules in Europe

This section puts forward the five conditions, based on the literature review in the previous sections, which a legislative framework should follow in order to achieve a CE for products:

- 1 *Take a holistic approach*: any environmental benefits and costs must be viewed in light of the entire life cycle of products, and with a long-term perspective;
- 2 *Replace products with services*: services shall either replace products or prevent repetitive purchase of the same product, provided proven environmental benefits;
- 3 *Design for durability and reparability*: products shall be made to last and be repaired, considering notably the type of materials used, availability of spare parts, and information about the products;
- 4 *Create loops and use waste as resources*: upon discard of products by consumers, materials shall retain or increase their possible value and require as little handling as possible, a responsibility shared by designers, manufacturers and waste handlers. Industries must also collaborate to re-use the resources (e.g. water and energy) released by another;
- 5 *Involve users*: consumers must become active participants in the market, as actors in the supply chain and by making informed choices; other users, in particular public authorities, also have an important role to play.

Under each condition, examples of existing legal provisions adopted at EU and national levels are discussed. The section also includes the relevant legislative proposals in the EU Action Plan, adopted in 2015 as part of the Circular Economy Package. The Package, which aims at putting in place a Circular Economy in Europe, is meant to ‘boost global competitiveness, foster sustainable economic growth and generate new jobs.’⁴² In addition to the Action Plan, the Package includes various legislative proposals, such as the directive on waste (hereafter ‘proposed WFD’), packaging waste, landfill and electrical and electronic waste.

⁴² Commission Press Release, ‘Closing the loop: Commission adopts ambitious new Circular Economy Package to boost competitiveness, create jobs and generate sustainable growth’, 2 December 2015, IP/15/6203.

2.5.1 *A Holistic Approach*

The main lesson to be learned from the concept of the CE is that everything is interconnected and that if any action is taken at any point in the product's life cycle, it will necessarily have repercussions for other aspects. As discussed above, a product's life cycle is composed of different stages, from the extraction of resources, production, purchasing and use to the end of life of the product. Each stage gives rise to environmental impacts known as inputs, such as the energy used during the production process or the use phase, and the materials needed for making a product, and outputs, which are typically emissions and waste.⁴³

Any improvements in the environmental situation achieved at one stage of the product's life cycle may lead to losses in another one. For example, switching the production of bottles from plastic to glass to reduce the generation of plastic waste may actually increase energy consumption in production, and even result in a greater environmental impact throughout the entire life cycle of the bottles. Pollution may also be transferred from one medium (water, soil, air) to another or from one country to another (whether inside or outside the EU). And immediate environmental improvements could cause damage in the future. Hence, a Circular Economy must be organized to achieve a net benefit for the environment in its entirety, both now and in the future.

In a 2003 communication entitled 'Integrated Product Policy' (IPP), the European Commission identified life cycle thinking as one of the five key principles to achieve an integrated product policy, and warned of the risk of burden shifting:

Life-Cycle Thinking – it considers a product's life-cycle and aims for a reduction of its cumulative environmental impacts – from the 'cradle to the grave'. In so doing it also aims to prevent individual parts of the life-cycle from being addressed in a way that just results in the environmental burden being shifted to another part. By looking at the whole of a product's life-cycle in an integrated way, IPP also promotes policy coherence. It encourages measures to reduce environmental impacts at the point in the life-cycle where they are likely to be most effective in reducing environmental impact and saving costs for business and society.⁴⁴

⁴³ L. Lave et al., 'Economic input-output models for environmental life-cycle assessment' (1998) 32 *Environmental Science Technology* 7, 184–91.

⁴⁴ Commission Communication, 'Integrated product policy – building on environmental life-cycle thinking', COM(2003) 0302 final, point 3.

The concept of life cycle thinking requires parties to consider all the interactions and impacts of a product across its entire life cycle. Products should form the starting point of any policy and legislation, and any decision taken at one stage of the life cycle must be evaluated in light of maximizing the product's environmental benefits over its entire life cycle – today and tomorrow. Yet the EU has traditionally focused on cutting point source pollution (e.g. air pollution from industries or waste from households) and adopted legislation while remaining largely oblivious to its negative or positive impact on other sectors. This fragmentation is exacerbated by the division of competences as established in the Treaty on the functioning of the EU (TFEU) and between the different Directorates-General (DG) of the European Commission.⁴⁵

Under EU law, the choice of legal basis for adopting legislation is crucial because it is what defines the scope of the legislative powers (minimum or exhaustive harmonization), the type of instrument to be adopted (directive or regulation), and its primary objective (e.g. functioning of the internal market, environmental or consumer protection). The treaty provision that will form the basis of EU's legislative competences has to be decided against objective factors, in particular the aim and content of the foreseen measure.⁴⁶ With regards to products, various legal bases come into play, leading to disconnected and uncoordinated legislation.⁴⁷ Moreover, some of these legal bases do not have environmental protection as one of their main objectives, but rather pursue economic goals. This is the case of Article 114 of the TFEU, which is primarily designed to ensure the functioning of the internal market and the four freedoms.⁴⁸ This provision is the basis of several important pieces of legislation, not least the Ecodesign Directive, the REACH Regulation on chemicals and the Public Procurement Directives.⁴⁹ It allows a specific issue to be exhaustively

⁴⁵ The names and division of competences of the various DGs have varied over the years. At the time of this publication, the relevant DGs are DG ENER (Energy), DG ENV (Environment), DG GROW (Internal Market, Industry, Entrepreneurship and SMEs).

⁴⁶ See L. Krämer, *EU Environmental Law*, 7th edn (London: Sweet and Maxwell, 2011); Cases C-155/91 *European Parliament v Council* [1993] E.C.R. I-939 and C-164 and 165/98 *European Parliament v Council* [2006] E.C.R. I-107 [1999] E.C.R. I-1139.

⁴⁷ See Chapter 6 in this volume, in which Nicolas de Sadeleer discusses the clash between environmental protection and the free movement of goods.

⁴⁸ I.e. free movement of goods, persons, services and capitals; see Article 26 TFEU.

⁴⁹ Directive 2009/125/EC of 21 October 2009 establishing a framework of eco-design requirements for energy-related products, OJ L 285, 31 October 2009, p. 10 (Ecodesign Directive); Regulation (EC) 1907/2006 of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals

regulated if necessary, adopting direct obligations and leaving little powers to the Member States.⁵⁰

The EU has the power to take legislative steps notably to preserve, protect, and improve the quality of the environment, and ensure prudent and rational utilization of natural resources.⁵¹ The TFEU only allows for the enactment of minimum targets in this respect, and Member States generally retain substantial legislative powers. Following Article 193 TFEU, they can maintain or introduce more stringent protective measures. Article 192 TFEU has been primarily used for the adoption of the waste directives, the content of which reflects their limited powers: most provisions call for the adoption of ‘necessary’ or ‘appropriate’ measures, leaving it to the Member States to decide on the type and substance of the measures.⁵²

The Lisbon Treaty introduced a specific legal basis for the adoption of legislation on energy, namely the functioning of the energy market, the security of energy supply, the promotion of energy efficiency and renewable forms of energy, and of energy networks.⁵³ The Energy Labelling Regulation, adopted in 2017, is based on Article 194 TFEU.⁵⁴

Since the EU can adopt legislation pursuant to an economic objective that may have an environmental impact, the principle of integration contained in Article 11 TFEU is meant to establish environmental protection as a general objective of EU law. The provision requires policymakers to integrate environmental requirements ‘into the definition and implementation of the Union policies and activities’.

A comprehensive approach to minimizing environmental damage from products is nonetheless still largely lacking.⁵⁵ EU product policy lacks a common vision and the obstacles to achieving coherence, notably between product and waste laws, are still significant. Several contributions in this volume also show the clashes between laws and their objectives. For instance, Svensson and Dalhammar point to the difficulty of

Agency, OJ L 396, 30 December 2006, p. 1; and Directive 2014/24/EU of 26 February 2014 on public procurement and repealing Directive 2004/18/EC, OJ L 94, 28 March 2014, p. 65 (Procurement Directive).

⁵⁰ E.g. the Ecodesign Directive leads to the adoption, by the European Commission, of implementing measures that producers must meet in order to have the right to put their products on the market.

⁵¹ Article 191(1) TFEU. ⁵² E.g. Articles 10, 11 and 13 WFD. ⁵³ Article 194(1) TFEU.

⁵⁴ Regulation (EU) 2017/1369 of 4 July 2017 setting a framework for energy labelling, OJ L 198, 28.7.2017, p. 1 (Energy Labelling Regulation).

⁵⁵ See e.g. E. Maitre-Ekern, ‘Towards an integrated product regulatory framework based on life cycle thinking’, in B. Sjöfjell and A. Wiesbrock (eds), *The Greening of European Business under EU Law: Taking Article 11 TFEU Seriously* (London: Routledge, 2015).

introducing recyclability requirements under the ecodesign regime, and suggest increasing the synergies between design and waste regulations.⁵⁶ Tojo and Thidell reveal the difficulty faced by industry to reconcile their obligation to increase recycling rates under the waste directives with the need to eliminate harmful substances from products following chemical legislation.⁵⁷

The Action Plan addresses in a single document a wide range of environmental impacts caused by the economy. One has to welcome the effort, which indeed gives visibility to the pressure on the environment from the current linear economic model, while urging the adoption of a broad set of measures. The Commission points out in particular to the need to assess 'the interaction of legislations on waste, products and chemicals' and overcome unnecessary barriers.⁵⁸

2.5.2 *Services for Products*

The substitution of products for services is a growing trend in Europe, and examples of sharing or renting platforms, product leasing or pooling, and *pay-per-service unit* business models⁵⁹ are flourishing.⁶⁰ A reduction in the consumption of products and resulting wastefulness of resources necessitates an increase in service provision. However, given the evidence that replacing products for services does not necessarily reduce pressure on the environment,⁶¹ policymakers have a responsibility to ensure that manufacturers and other service providers incorporate mechanisms of sustainability into their production and service systems.

Several existing EU policies and legislation encourage environmental servitization. For example, the introduction of durability standards into the ecodesign requirements forces producers to find new business pathways when profit is no longer available from repetitive consumption. Extended Producer Responsibility (EPR), which is one of the pillars of waste legislation, can be seen as a corollary to servitization. They both require producers, respectively service providers, to extend their

⁵⁶ Chapter 9 in this volume. ⁵⁷ Chapter 10 in this volume. ⁵⁸ Action Plan, p. 12.

⁵⁹ For a definition of the various types of systems, see Tukker, 'Eight types of product-service system', pp. 13–14.

⁶⁰ Examples of pay-per-service unit: lighting with pay-per-lux, tyres with pay-per-kilometre, solar energy with pay-per-kilowatt-hour or office equipment with pay-per-page; www.ceguide.org/Strategies-and-examples/Sell/Pay-per-service-unit.

⁶¹ See e.g. Tukker, 'Eight types of product-service system'; and Corvellec and Stål, 'Evidencing the waste effect of product-service systems (PSSs)'.

responsibility for the product beyond the traditional seller–buyer relationship.⁶² White et al. found that servitization may even facilitate the transition towards EPR by providing economic incentives notably to internalize waste management costs and recover the economic value of an end-of-life commodity.⁶³

In the Energy Efficiency Directive, the use of energy services that ‘result in verifiable and measurable or estimable energy efficiency improvement or primary energy savings’ is encouraged.⁶⁴ Energy services mean that the energy service providers offer energy efficiency improvements instead of selling energy-efficient equipment, such as light bulbs or isolation materials.

With the award of public contracts being based on the ‘most economically advantageous tender’, EU public procurement rules have taken a step towards more service-oriented contracts. Various award criteria, other than the price, may serve to assess the bid, such as quality, technical merits, functional and environmental characteristics, running costs, after sales service and technical assistance.⁶⁵ However, the discretion left to the Member States and contracting authorities often results in environmental considerations being overlooked, with the price being the main, if not the sole, focus of the contract award.⁶⁶

There is room to improve the promotion of servitization into various product-related laws. If the Action Plan encourages the development of new forms of business and consumption models, it does not, however, contain specific recommendations nor does it discuss how to ensure environmental gains from service provision.

2.5.3 *Design for Durability and Reparability*

The ‘throwaway society’ has notably led to an increasingly limited use of products in time, whether because producers artificially reduce their

⁶² EPR makes producers responsible, at least financially, for the afterlife of their products, which aims in particular to promote the introduction of environmental considerations as early as the design stage. A. White et al., *Servicizing: The Quiet Transition to Extended Product Responsibility* (Cambridge, MA: Tellus Institute, 1999), p. 21.

⁶³ Ibid., p. 23.

⁶⁴ Articles 1(7) and 18 Directive 2012/27/EU of 25 October 2012 on energy efficiency, OJ L 315, 14 November 2012, p. 1.

⁶⁵ Article 67 (2) Public Procurement Directive.

⁶⁶ See A. Wiesbrock, ‘Socially responsible public procurement: European value or national choice’, in B. Sjøfjell and A. Wiesbrock (eds), *Sustainable Public Procurement under EU Law – New Perspectives on the State as Stakeholder* (Cambridge: Cambridge University Press, 2015).

lifespan in order to stimulate repetitive consumption or because of consumer preferences.⁶⁷ In 2015, the Ellen MacArthur Foundation reported that ‘the average manufactured asset lasts only nine years (excluding buildings)’. In Norway, statistics show that on average, mobile phones were used for 33 months in 2016 – a number that fell to 23.6 months in the thirty to thirty-nine age group.⁶⁸ Moreover, a smartphone battery is only expected to work properly for about a year⁶⁹ even though the phone itself could last much longer. And it is often difficult and costly to replace the battery, moreover.⁷⁰

Designing more durable products is therefore an essential first step to minimize environmental damage. By keeping products in use longer, we can save resources that would be used for making new products, as well as money for consumers that do not have to replace their products as often.⁷¹

The term ‘durability’ refers in particular to the ability of a product to achieve its intended lifetime. A proposed definition of durability at EU level reads as follows:

Durability is the ability of a product to perform its function at the anticipated performance level over a given period (number of cycles/uses/hours in use), under the expected conditions of use and under foreseeable actions. Performing the recommended regular servicing, maintenance, and replacement activities as specified by the manufacturer will help to ensure that a product achieves its intended lifetime.⁷²

Among the factors that can affect the durability of products are the quality of the material that compose the products, the possibility of replacing parts that degrade prematurely (such as the batteries of mobile phones), and of making technological upgrades (software compatibility). Deliberately planned and designed features to make products fail before the ‘normal’ end of life (planned obsolescence) also affect durability of course.⁷³

⁶⁷ Maitre-Ekern and Dalhammar, ‘Regulating planned obsolescence’, p. 379.

⁶⁸ Statista; www.statista.com/statistics/701883/length-of-mobile-phone-usage-on-average-in-norway-by-age-group/.

⁶⁹ According to the Battery University, the battery’s capacity of a mobile phone can reduce 10–15 per cent in eight months and 15–22 per cent in a year; http://batteryuniversity.com/learn/article/how_to_prolong_lithium_based_batteries.

⁷⁰ This, for example, is the case for iPhones, which have built-in batteries.

⁷¹ Maitre-Ekern and Dalhammar, ‘Regulating planned obsolescence’, p. 378.

⁷² S. Boulos et al., ‘The durability of products: standard assessment for the Circular Economy under the EcoInnovation Action Plan’ (2015) Report to DG Environment, Ricardo-AEA/Istituto di Management, p. 4.

⁷³ Maitre-Ekern and Dalhammar, ‘Regulating planned obsolescence’, p. 380.

Another important cause of the short lifetime of a product and resulting over-consumption and wasteful habits is the difficulty to repair products. Many products are simply not designed to be repaired, and many are even designed in a way that makes them very difficult to disassemble.⁷⁴ Moreover, spare parts are often difficult to obtain or simply do not exist. It is true that consumers also throw away products which are still working, but discarded products that are built to last and are easy to repair can – after restoring them to the desired level of performance, if necessary – go back into the economy. The possibility to repair products may be very beneficial both from an environmental perspective and from a consumer perspective (see Section 2.5.5).⁷⁵

At this point, it should be clarified that, in this section, the term ‘repair’ is used to cover both the activities of maintenance during the use and reparation after discard. Although, from a purely environmental point of view, the first is preferred, both face similar challenges from a design perspective. Contrary to the Action Plan, the author does not address design for durability and repair together with design for material and resource recovery even though they may require the adoption of similar measures. The reason is that, as previously stated, maintaining the integrity of the product (even with a change of user) is generally more beneficial from an ecological perspective than taking it apart. Indeed, emissions from the production phase are quite high in relation to those in the consumption phase.⁷⁶

The core of the action to enhance both durability and reparability of products lies in the design phase. The Ecodesign Directive establishes a framework for the adoption of mandatory ecodesign requirements for energy-related products.⁷⁷ In the first implementation phases, the requirements have mainly targeted energy efficiency, but some resource and recycling related requirements have later been introduced.⁷⁸ The Action Plan calls for a systematic examination of a number of other issues such as ‘reparability, durability, upgradability, recyclability, or the identification of certain materials or substances’ in the adoption of future implementation

⁷⁴ G. Pickren, ‘Making connections between global production networks for used goods and the realm of production: a case study on e-waste governance’ (2015) 4 *Global Networks* 15, 414–16.

⁷⁵ Maitre-Ekern and Dalhammar, ‘Regulating planned obsolescence’, p. 378.

⁷⁶ S. Prakash et al., ‘Timely replacement of a notebook under consideration of environmental aspects’ (2012) Study for the German Federal Environment Agency (Umweltbundesamt).

⁷⁷ For a more detailed analysis, see C. Dalhammar, ‘Promoting energy and resource efficiency through the Ecodesign Directive’ (2015) 59 *Scandinavian Studies in Law* 148–77.

⁷⁸ C. Dalhammar, ‘Industry attitudes towards ecodesign standards for improved resource efficiency’ (2016) 123 *Journal of Cleaner Production* 155–66 at 157.

measures. In spite of the success of the Ecodesign Directive, the European Commission has not proposed a similar scheme for other products.

The ecodesign measures consist of minimum requirements producers must meet prior to placing their products on the EU market or putting them into service.⁷⁹ The Directive does not aim to push market actors to make the most environmentally friendly products, but rather to eliminate the worst performers from the market. An energy labelling scheme is meant to encourage further improvements (see discussion under in Section 2.5.5). In Japan, the Top Runner scheme takes a different approach. It sets energy efficiency standards by identifying the ‘best’ product on the market (i.e. the most energy efficient product) and sets it up as the standard to be attained by all economic agents within a specified period.⁸⁰ At the end of that period, a new best standard is set, offering producers incentives to constantly innovate.

Policymakers can only go so far in developing ecodesign requirements. The capacity to innovate and develop more durable products lies with the producers. Moving from a linear to a circular model requires a new way of thinking and considerable upfront investment, so that it may not seem attractive at first. The role of the legislator is to create incentives to stimulate change. The EPR schemes have extended the responsibility of producers to the end of life of their products, notably to encourage producers to design products so as to minimize the costs linked to waste management. Most European EPR schemes are assumed on a collective basis, and financial responsibility is split equally between the participants.⁸¹ As a result, the producers, who are not faced with the real costs of their product’s end-of-life management, lack incentives to make design improvements. This is why the Action Plan calls for differentiating the financial contribution paid by producers in order to reflect the real management costs of each product.

The Action Plan refers, for the first time at EU level, to the term ‘planned obsolescence’, a practice that limits the useful lifetime of products. The

⁷⁹ Article 3 Ecodesign Directive. According to Article 2 (4 and 5), “placing on the market” means making a product available for the first time on the Community market with a view to its distribution or use within the Community, whether for reward or free of charge and irrespective of the selling technique; [and] ‘putting into service’ means the first use of a product for its intended purpose by an end-user in the Community’.

⁸⁰ N. Tojo, *The Top Runner Program in Japan – Its Effectiveness and Implications for the EU*, Report 5515 (Stockholm: Naturvårdsverket, 2006), pp. 32–33.

⁸¹ H. Kalimo et al., ‘Greening the economy through design incentives: allocating extended producer responsibility’ (2012) 21 *European Energy and Environmental Law Review* 274–305.

Commission proposes to set up an independent testing programme to detect such practices and find ways to address them.⁸² A proposal to this effect should be made under the Horizon 2020 Programme for Research and Innovation.⁸³ Otherwise, the Action Plan mainly encourages initiatives to be taken at national and local levels.

There is so far no common understanding of how to regulate the practice in Europe. While the European Economic and Social Committee (EESC) urged ‘a total ban on products with built-in defects designed to end the product’s life’ and proposed the adoption of ‘a labelling system that would guarantee a minimum product lifetime’,⁸⁴ the Internal Market and Consumer Protection Committee (IMCO) of the European Parliament merely called for an EU-wide definition of ‘planned obsolescence’ and the adoption of dissuasive measures for producers.⁸⁵ A 2015 study for IMCO states that planned obsolescence should be redefined with the new definition describing the phenomenon in a more general way and avoid referring to a deliberate intent to deceive consumers.⁸⁶

France, which is a pioneer in the matter, decided to criminalize the practice.⁸⁷ The French Consumer Code (CC) now includes a unique legal definition of planned obsolescence:

Planned obsolescence is defined by all the techniques by which a person that places goods on the market seeks to deliberately reduce the lifespan of a product to increase its substitution rate.⁸⁸

The French Parliament also amended the CC in 2014 to include provisions on the availability of spare parts. Following Article L111-3 French

⁸² Action Plan, p. 7.

⁸³ Answer to a parliamentary question given by Mr Vella on behalf of the Commission on 6 April 2017, E-000570/2017.

⁸⁴ EESC Press Release No 61/2013, ‘The EESC calls for a total ban on planned obsolescence’, 17 October 2013.

⁸⁵ IMCO Press Release, ‘Making durable, repairable goods for consumers and tackling planned obsolescence’, 30 May 2017.

⁸⁶ C. Montalvo et al., *A Longer Lifetime for Products: Benefits for Consumers and Companies* (2016) Study for the IMCO Committee, IP/A/IMCO/2015-11, p. 82.

⁸⁷ According to Article L123-4-1 French Consumer Code (CC), the infraction can be punished by up to two years in prison and a fine of €300 000, which can be increased by up to 5 per cent of the average annual revenue calculated on the basis of the three previous known annual turnovers. The amount should be in proportion to the benefits gained from the breach of the law.

⁸⁸ Article L. 213-4-1 CC. All translations of the French texts are unofficial and the responsibility of the authors.

CC, if the manufacturer provides information about essential spare parts, this information must be brought to the consumer's attention in a visible and legible manner before the conclusion of the sale. Moreover, manufacturers must make the spare parts available upon request and within two months, for the duration they have themselves advertised. Hence, the availability of spare parts may become a sales argument.⁸⁹ Moreover, the CC clearly states that non-certified repairers ('non agréé') may also perform the repair (and make the request for spare parts).⁹⁰ This is meant to support and encourage small or community-based repairers, who often operate at lower prices than certified repairers.

The use of extended periods for legal guarantees and the reversal of the burden of proof – i.e. the seller must prove the item was not defective – may also prove useful in this context. The Commission stated that increasing the time limit on the reversed burden of proof from the current six months to two years would give 'a clear incentive to produce higher quality and more durable products'.⁹¹ Besides, the proposal for a directive on online and other distance sales of goods from 9 December 2015 includes such measure.

2.5.4 *Waste as Resources to Close the Loop*

Longer lifetime and reparability may decrease the volume of discarded products, but the production and consumption of products necessarily create waste. In a linear economy, waste is mostly considered useless and even burdensome. It is an output and a source of pollution. In the CE, on the contrary, waste becomes an asset, a resource. It is an input for the economy. On the condition that *designers* properly plan the composition of their products as well as their afterlife, that *waste handlers* have the capacity and access to the knowledge to treat discarded products and materials adequately, and that *manufacturers* make use of the market for secondary raw materials.

Designers are usually first and foremost concerned about the functionality of their products, their manufacturing costs and their aesthetics. The afterlife of products is rarely planned and, as a result, discarded products

⁸⁹ For further discussion on this issue, see Maitre-Ekern and Dalhammar, 'Regulating planned obsolescence'.

⁹⁰ Article L 111-3, second paragraph, CC.

⁹¹ Answer to a parliamentary question given by Mr Vella on behalf of the Commission on 16 February 2016, E-015113/2015.

are turned into lower quality products than the original (*downcycling*), when they are not disposed of altogether. According to McDonough and Braungart, the afterlife should actually become the primary concern of designers. They should work to design products that, once discarded, can create a product of the same or higher quality or value than the original (*upcycling*).⁹²

Similarly, planning the afterlife of a product requires enabling their disassembly so that its various components can be easily recovered. Proper design of products could considerably reduce, if not eliminate, 'useless' waste.

The Ecodesign Directive has an important role to play in that respect, by introducing relevant requirements, such as using materials that favour an upcycling recovery process or facilitate disassembly. Neither the directive, as it now reads, nor the Action Plan, mentions upcycling as an intended objective. With regard dismantling, the Commission has developed design requirements for electronic displays.⁹³ If a differentiation of costs is put in place for collective EPR schemes, it should incentivize producers to better plan the afterlife of their products. In the area of waste, Article 4 of the Waste Electrical and Electronic Equipment (WEEE) Directive stipulates that Member States must 'encourage cooperation between producers and recyclers and measures to promote better design and production of EEE, notably in view of facilitating re-use, dismantling and recovery of WEEE, its components and materials'.⁹⁴

Good cooperation between producers and waste handlers appears indeed to be crucial especially because they are usually separate entities. For complex products (such as EEE) in particular, extensive knowledge of the product's characteristics, dismantling facilities and quality of the various components may prove essential to ensuring proper recovery. EPR schemes, which extend the responsibility of producers to the afterlife of their products, contribute to bridging the gap between producers and waste handlers. The WEEE Directive specifically requires Member States to ensure that producers provide information free of charge to treatment facilities for each type of new EEE placed on the market. The information is meant 'to facilitate the preparation for re-use and the correct

⁹² McDonough and Braungart give the example of designing a book which is made of non-toxic washable ink and waterproof plastic pages so that it can be recycled indefinitely at the same level of quality. *Cradle to Cradle*, pp. 68–70.

⁹³ Action Plan, p. 4.

⁹⁴ Article 4 Directive 2012/19/EU of 4 July 2012 on waste electrical and electronic equipment (WEEE), OJ L 197, 24.7.2012, p. 38 (WEEE Directive).

and environmentally sound treatment, including maintenance, upgrade, refurbishment, and recycling.’⁹⁵

The CE intends to close the loop of resources and avoid both the extraction of primary raw materials and the final disposal of waste. This requires manufacturers to use secondary materials in their production process. Their current reluctance to do so is mainly due to uncertainty about the quality of the materials.⁹⁶ Article 6 of the Waste Framework Directive (WFD) aims at re-valuing materials that have gone through a recovery process by removing them from the definition of waste. The proposed rephrasing of the first paragraph is meant to clarify what is considered ‘end-of-waste’ by establishing the conditions in the directive.⁹⁷ The new Article 6 would also allow the Commission to adopt implementing measures to establish detailed criteria, including, notably, limit values for pollutants, for certain type of waste.⁹⁸

The production of products tends to be resource and energy intensive, generating waste. The development of industrial symbioses, such as the ecoindustrial park Kalundborg,⁹⁹ where industries share materials and waste products, is an attempt at reducing this burden.¹⁰⁰ The WFD explicitly excludes substances or objects ‘resulting from a production process, the primary aim of which is not the production of that item’.¹⁰¹ Rather than being qualified as ‘waste’, they are considered as ‘by-products’ and fall outside the scope of the Directive, which is meant to facilitate industrial symbiosis.¹⁰²

The development of markets for secondary raw materials is also prevented by the presence of toxic substances in products, which can be costly to detect and remove. The REACH Regulation aspires notably to improve the identification of the chemical substances that are put in the market and substitution of the most dangerous chemicals (‘substances of very high concern’). As Kuraj suggests, the lack of precaution in the current REACH procedure does not adequately handle the risks linked, in particular, to new complex chemicals such as endocrine disruptors

⁹⁵ Article 15(1) WEEE Directive. ⁹⁶ Action Plan, p. 11.

⁹⁷ Amendment to Article 6(1) of the proposed WFD.

⁹⁸ Amendment to Article 6(2–4) of the Proposal for a Directive amending Directive 2008/98/EC on waste, COM/2015/0595 final (proposed WFD).

⁹⁹ A good explanation of the functioning of the ecoindustrial park of Kalundborg can be found in J. Ehrenfeld and N. Gertler, ‘Industrial ecology in practice: the evolution of interdependence at Kalundborg’ (1997) 1 *Journal of Industrial Ecology* 1, 67–79.

¹⁰⁰ M. Chertow, “Uncovering” industrial symbiosis’ (2007) 1 *Journal of Industrial Ecology* 11–30.

¹⁰¹ See Article 5(1) WFD. ¹⁰² Action Plan, p. 5.

and nanosubstances.¹⁰³ Regulatory measures already in the preliminary steps of the risk assessment process should therefore be adopted, she argues. The Action Plan does not contain direct propositions to amend the REACH Regulation, or improve its implementation. It merely states the need to investigate how the legislations on waste, products and chemicals interact.

The WFD asserts the need to maintain loops as tight as possible through the waste management hierarchy, established in Article 4, which prioritizes waste prevention over preparation for re-use, recycling, energy recovery and, finally, disposal. This compulsory provision lacks a number of useful processes that impose less pressure on the environment than recycling and energy recovery, such as reconditioning, remanufacturing and retrieving. The result is an undue focus and promotion of recycling activities. The proposed WFD does not contain any proposition to amend the waste hierarchy nor does it emphasize whether, for the purpose of meeting the targets of Article 11, recycling is meant to play a minor role in comparison to preparation for re-use.

2.5.5 *The Role of Users*

In the CE, consumers are no longer mere buyers of products; they are active participants, who may influence what is produced, ensure durable use and proper recovery of products and materials, and engage in second-hand trading and sharing. The market failure of incomplete or asymmetric information is characterized by the fact that consumers lack the information that would enable them to match choices with preferences.¹⁰⁴ They are notably unaware or unable to observe how their consumption choices affect the environment. Providing information to consumers about the expected lifetime of products, their reparability, discarding practices or hazardous components, coupled with the communication of reasoned arguments about preferring long-term benefits over sales price, is hence meant to correct this market failure. Findings from behavioural economics indicate, however, that consumers do not always act in the way presumed by traditional information economics.¹⁰⁵ Providing

¹⁰³ See Chapter 11 in this volume.

¹⁰⁴ M. Kotchen, 'Voluntary- and information-based approaches to environmental management: a public economics perspective' (2013) 2 *Review of Environmental Economics and Policy* 7, 276–95 at 278.

¹⁰⁵ M. Faure and H. Luth, 'Behavioural economics in unfair contract terms. Cautions and considerations' (2011) 34 *Journal of Consumer Policy* 3, 337–58.

information to consumers is not always sufficient as they do not necessarily act as expected in theory, and misleading or excessive information may even prove damaging.¹⁰⁶

Information disclosure may nonetheless contribute to changing market behaviour regardless of the potential impact on consumer choice. For instance, if disclosing the energy efficiency of products is indeed meant to affect consumer preferences, it is also intended to compel producers not to market low performing products. According to the 2015 study for the IMCO, providing information to consumers about the products' lifetime could usefully contribute to reducing the appeal of planned obsolescence.¹⁰⁷ Whether it would result from consumers' expected reaction or producers' fear of bad publicity, the outcome is to be welcomed.

The Energy Labelling Directive, which accompanies the Ecodesign Directive, takes steps to provide information to consumers about the consumption of energy and other resources by energy-related products. An evaluation by the Commission shows that the effect of the combination of ecodesign requirements and energy labels not only eliminates the worst performers from the market, it also creates a market for high performers and pushes innovation beyond the requirements.¹⁰⁸ The new Energy Labelling Regulation, which recently replaced the former Directive (2010/30/EU), introduces improvements to the labelling system, which may notably include information about the environmental performance of a product.¹⁰⁹ The term 'durability' contained in the Commission proposal from 2015 has, however, fallen out of the final version.¹¹⁰

Empowering consumers also requires providing them with the right to complain about low quality products. The proposed extension of the time limit on the reversal of the burden of proof to two years instead of six months (see analysis under Section 2.5.3) is a step in that direction.

Repair should be a major aspect of sustainable consumption, but it is often one of its main obstacles. Among the necessary improvements are better access to information to support self-repair and the development of small business and collective platforms; and guaranteed availability of essential spare parts over a certain period with accompanying

¹⁰⁶ Faure and Luth, 'Behavioural economics in unfair contract terms'.

¹⁰⁷ Montalvo et al., 'A longer lifetime for products', p. 65.

¹⁰⁸ Commission Staff Working Document, 'Impact assessment accompanying the proposal for a regulation setting a framework for energy efficiency labelling', SWD(2015) 140 final.

¹⁰⁹ Article 1(24) Energy Labelling Regulation.

¹¹⁰ Proposal for a Regulation setting a framework for energy efficiency labelling, COM(2015) 341 final.

information. The effects of the French law presented in Section 2.5.3 on the actual availability of spare parts and increase in repair is a pioneer measure and should be followed closely.

The development of second-hand markets is also crucial. The proposed WFD promotes ‘preparation for re-use’ activities notably by requiring Member States to encourage ‘the establishment of and support for re-use and repair networks’ and facilitate ‘the access of such networks to waste collection points’.¹¹¹

A report from the Swedish Ministry of Environment and Energy recommends introducing tax deductions (corresponding to 50 per cent of the service purchased) to encourage households that choose to rent or repair consumer products or resell second-hand products.¹¹² The report also envisages measures to increase second-hand trading and sharing, such as the introduction of certification systems and guidance documents.¹¹³

Consumers are not the only users of relevance. In Europe, public procurement contracts account for nearly 20 per cent of EU GDP and governments exercise significant influence over the markets, where they represent a large part of the market share.¹¹⁴ The EU has developed Green Public Procurement (GPP) criteria, which are used by public authorities on a voluntary basis. The Action Plan proposes to introduce criteria relevant to the CE in the GPP, but not to turn it into a mandatory regime. The public procurement directives, revised in 2014, and which regulate the procurement procedure, contain very limited provisions about the sustainability of the contracts.¹¹⁵

2.6 Concluding Remarks

Reconciling economic activity with environmental preservation necessitates a fundamental shift from the current linear model to a circular one. In this chapter, it has been established that, in the Circular Economy, technical materials remain in the economy, thereby minimizing the need to extract raw materials and generation of waste. The consumption of

¹¹¹ Amendment to Article 11(1) proposed WFD.

¹¹² Swedish Ministry of Environment and Energy, *Från värdekedja till värdecykel*, p. 241.

¹¹³ Ibid., p. 341. ¹¹⁴ Chapter 12 in this volume.

¹¹⁵ Article 67 Procurement Directive requires, for awarding the contract, identifying the ‘most economically advantageous tender’ and introduces ‘life cycle costing’ (LCC) (defined in Article 68) as one of the possible approaches. Other environmental protection considerations are found in other stages of the procurement procedure as well, in the form of technical specifications or criteria for qualitative selection.

energy and other resources also diminishes thanks to the creation of loops promoting waste prevention (maintenance and re-use), material recovery (repair, remanufacturing, recycling), and waste recovery (energy recovery). The replacement of certain products by services is another feature of the CE that is meant to reduce a product's impact on the environment, although empirical studies show limited environmental benefits.

This chapter introduced five enabling conditions to achieve a Circular Economy for products and discussed each in light of existing and prospective policies and laws at the EU and, whenever relevant, national level.

The first condition consists in *taking a holistic approach*, the starting point of which is the product's life cycle. Any measure adopted to regulate products must bring environmental benefits throughout the life cycle of the products, also in the long term. The fragmented nature of EU product policy endangers coherence of action and preservation of the environment. The challenges of achieving a coherent legal framework relate both to the need to integrate environmental requirements into each product-related law, and to achieve useful interaction between the different instruments.

The second condition, the *replacement of products by services*, follows the recommendations of numerous authors to move from away from the focus on product consumption to targeting its use. As the environmental benefits of servitization are not given, policymakers have a particular responsibility in the matter. Existing legal instruments, such as EPR, energy efficiency or public procurement offer examples of promoting environmental servitization, but further inquiry into how laws can support the transition to services is needed.

The third condition requires *designing for durability and reparability*. Keeping products in use longer can save resources as well as money for consumers, but it requires producers to address both durability and reparability of their products already at the design phase. This can be achieved by introducing legal standards (such as ecodesign requirements, ban of particular practices, or obligations to make available spare parts), or by creating incentives (e.g. EPR schemes or extended legal guarantees), or, preferably, a mix of both approaches.

The fourth condition asserts the need to *create loops and use waste as resources*. As for the third condition, the afterlife of products must be planned from birth with a view to 'upcycling', i.e. creating a new product of at least the same value as the original product. Generally, the use of secondary raw materials is undermined by uncertainty about their quality and the presence of toxic substances in certain products. The proposed

WFD includes a stricter definition of 'end-of-waste' so as to increase the guarantee of quality of materials that have gone through a recovery process. It also endeavours to facilitate industrial symbiosis by using the 'by-products' exemption. Chemicals regulation should play an important role in removing hazardous substances from the production processes.

The fifth condition concerns the *role of users* in the CE. The actual effect of information disclosure on consumer preferences and subsequent influence on the supply chain is disputed. Information is nonetheless a useful tool to foster innovation as shown by the use of energy labelling. If fostering the active role of consumers may, to some extent, require better access to quality information, it also (and mainly) necessitates other measures: extended rights to complain about sub-standard products; easy access to repair facilities and equipment; and development of secure second-hand markets.

ARTICLE 3 ‘Regulating Planned Obsolescence: A Review of Legal Approaches to Increase Product Durability and Reparability in Europe’

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Abstract: Improving product durability and reparability can save resources and money for consumers but may not always be in the best interest of all manufacturers. With the emergence of the Circular Economy as an important policy objective in the European Union (EU), there is renewed interest in policies to promote durability and address planned obsolescence. In this article, we review different legislative approaches to provide incentives for design for durability and reparability at the EU and Member State levels. The EU has started to regulate durability through the Ecodesign Directive, whereas Member States have made use of other legal approaches such as longer consumer warranties, the criminalization of planned obsolescence, and measures to incentivize the availability of spare parts. In this contribution, we review some of the legislation in place and discuss benefits and disadvantages of different legal approaches.

Regulating Planned Obsolescence: A Review of Legal Approaches to Increase Product Durability and Reparability in Europe

Eléonore Maitre-Ekern and Carl Dalhammar*

Improving product durability and reparability can save natural resources and money for consumers but may not always be in the best interest of all manufacturers. With the emergence of the circular economy as an important policy objective in the European Union (EU), there is renewed interest in policies to promote durability and address planned obsolescence. Different legislative approaches are currently used to provide incentives for design for durability and reparability at the EU and Member State levels. The EU has started to regulate durability through the Ecodesign Directive, whereas Member States have made use of other legal approaches such as longer consumer warranties, the criminalization of planned obsolescence and measures to incentivize the availability of spare parts. In this contribution, we review some of the legislation in place and discuss benefits and disadvantages of different legal approaches.

INTRODUCTION

There is a growing political consensus in the European Union (EU) that we have to move away from our current linear economic system to one that is based on closing material loops, a circular economy.¹ This implies that we need to move up the waste management hierarchy;² while material recycling and incineration with energy recovery are better options than landfilling, there is a need to consider how we can promote waste prevention through designing more durable products, and how we can stimulate re-use, repair, remanufacturing and refurbishment of products.

The design of more durable products can save resources by keeping products in use longer, while also saving money for consumers that do not have to replace their products as often. The term 'durability' is often used

interchangeably with 'product lifetime'. While there is no legal definition of durability, the following definition has been proposed:

Durability is the ability of a product to perform its function at the anticipated performance level over a given period (number of cycles/uses/hours in use), under the expected conditions of use and under foreseeable actions. Performing the recommended regular servicing, maintenance, and replacement activities as specified by the manufacturer will help to ensure that a product achieves its intended lifetime.³

This definition does not include repair, though the potential to repair products can be very beneficial from an environmental perspective and can also save consumers money. One reason for not including repair is that 'design for reparability' is difficult to measure.⁴ Many products are not designed in a way that makes it possible to repair them, or designed for easy dismantling and recycling of components, but are instead designed in a way that makes it very difficult to separate materials and components.⁵ Of course, consumers sometimes throw away products while they are still functioning, but products could be made to be repaired, refurbished or remanufactured and put back into the economy. Repair and remanufacturing industries request policies that incentivize product durability and reparability, as this is often a necessity for the potential to have a 'second life' market.⁶ Durability and reparability are also design features that make it possible to upgrade and sell discarded products on second-hand markets in the EU or in developing countries to consumers who may not be able to afford new products.⁷ Durability and reparability, therefore, are two faces of the same coin and must be addressed together.

³ S. Boulos *et al.*, *The Durability of Products: Standard Assessment for the Circular Economy under the Eco-Innovation Action Plan* (European Commission, 2015), at 4.

⁴ *Ibid.*, at 4.

⁵ G. Pickren, 'Making Connections between Global Production Networks for Used Goods and the Realm of Production: A Case Study on E-waste Governance', 15:4 *Global Networks* (2015), 403, at 414–416.

⁶ C. Westblom, 'Towards a Circular Economy in Sweden: Barriers for New Business Models and the Need for Policy Intervention' (Master's thesis, Lund University, 2015).

⁷ This is the case for discarded televisions; see D. Hinchliffe, 'Does Product Efficiency Regulation in Europe Lead to an Energy Efficient World? Examining the Global Energy Use of Our Used Goods Exports' (ECEEE 2015 Summer Study Proceedings, 2015).

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¹ European Commission Communication of 2 December 2015 on Closing the Loop – An EU Action Plan for the Circular Economy, COM (2015) 614.

² The hierarchy is outlined in Article 4 of Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on Waste and Repealing Certain Directives, [2008] OJ 2008 L212/3.

While designing products that last longer is not optimal from an environmental perspective in all cases,⁸ it is desirable for most product groups both due to environmental benefits and in order to save money for consumers. However, making products durable is not always in the best interest of industry. There are several reasons for why manufacturers may not design durable products. In some cases they may even intentionally plan the obsolescence of products, artificially reducing the lifespan to stimulate repetitive consumption.⁹ Intention on the part of producers is often hard to establish, however, even for experts.¹⁰ Moreover, it must be acknowledged that some cases of obsolescence may not be intentional.

If manufacturers have limited incentives to design durable products, and there is great difficulty for consumers to promote change through consumer choices, legislation seems necessary.¹¹ The European Commission has also proposed that they will investigate whether planned obsolescence occurs, and if necessary take actions to address it.¹²

Several recent reports have looked into potential EU regulations to trigger durability, reparability and recyclability of products.¹³ In addition to the design considerations, two more issues are of high importance for the durability/reparability potential: the access to spare parts at reasonable cost and the access to appropriate repair

information. In reality, manufacturers often try to stop other actors on the market from having access to spare parts, or to refurbish and resell old products.¹⁴ Further, they often do not want to release information that can aid repairs. The EU has set rules on durability for lighting and vacuum cleaners, through standards set under the Ecodesign Directive.¹⁵ However, this process is slow, as the Commission has to carefully consider the legal design. At the same time, several EU and European Economic Area (EEA) Member States have taken national legal measures in order to trigger durability. Most interestingly, France has recently adopted several measures to combat intentional planned obsolescence and improve reparability. Another approach, championed by Norway, consists of extending consumer guarantees for products.

In this article, we examine the EU, French and Norwegian efforts to promote durability and reparability, and analyse the potential advantages and disadvantages of different legal options. We will further discuss the potential interactions between EU and Member State initiatives. The article will first examine the multifaceted concept of planned obsolescence. It then discusses potential legal options for the EU to address planned obsolescence, including durability standards for vacuum cleaners and lighting products set under the Ecodesign Directive, and the use of energy labelling and voluntary agreements. The article next examines the French and Norwegian rules, followed by a discussion of the interactions between national and EU rules, notably in the context of free movement of goods.

PRODUCT DURABILITY AND PLANNED OBSOLESCENCE

PLANNING FOR PREMATURE FAILURE

The first use of the term 'planned obsolescence' dates back to the Great Depression, when Bernard London recommended the strategy as a way to foster economic recovery.¹⁶ With the rise of new machines, manufacturers could produce more than they were able to sell. Instead of considering limits to production, the focus was to ensure that the excess of production would be sold.

Stevens stated in 1954 that planned obsolescence consisted of 'instilling in the buyer the desire to own

⁸ In some cases, prolonging the product lifetime may not be optimal from a life cycle perspective, as it delays the replacement of a product by a more energy efficient one. However, this only applies for some product groups and depends on consumer behaviour; for more details, see T. Tasaki *et al.*, 'Assessing the Replacement of Electrical Home Appliances for the Environment', 17:2 *Journal of Industrial Ecology* (2013), 290; F. Ardenete and F. Mathieux, 'Identification and Assessment of Product's Measures to Improve Resource Efficiency: The Case-Study of an Energy Using Product', 83 *Journal of Cleaner Production* (2014), 126. When it comes to notebooks, prolonging the life cycle is a good strategy from an ecological perspective, as the emissions from the production phase are quite high in relation to those in the consumption phase; cf. S. Prakash *et al.*, *Timely Replacement of a Notebook under Consideration of Environmental Aspects* (Umweltbundesamt, 2012).

⁹ G. Slade, *Made to Break: Technology and Obsolescence in America* (Harvard University Press, 2007), at 5. For a more thorough discussion on the concept 'planned obsolescence', see R. Lawlor, 'Delaying Obsolescence', 21:2 *Science and Engineering Ethics* (2015), 401.

¹⁰ C. Rampell, 'Planned Obsolescence, as Myth or Reality', *New York Times* (31 October 2013).

¹¹ See R. Lawlor, n. 9 above, at 426.

¹² See COM(2015) 614, n. 1 above, at 7–8.

¹³ See, e.g., D. Jepsen, L. Spengler and D. Augsberg, *Delivering Resource-Efficient Products: How Ecodesign Can Drive a Circular Economy in Europe* (European Environmental Bureau, 2015); A.M. Bundgaard, A. Remmen and K. Overgaard Zacho, *Ecodesign Directive Version 2.0: From Energy Efficiency to Resource Efficiency* (Miljøstyrelsen, 2015); F. Ardenete, F. Mathieux and M. Recchioni, 'Recycling of Electronic Displays: Analysis of Pre-processing and Potential Ecodesign Improvements', 92 *Resources, Conservation and Recycling* (2014), 158; F. Ardenete and F. Mathieux, *Application of the Project's Methods to Three Product Groups* (Joint Research Centre, 2012); RREUSE, 'Improving Product Reparability: Policy Options at the EU Level' (RREUSE, 2015); C. Dalhammar, 'Industry Attitudes towards Ecodesign Standards for Improved Resource Efficiency', 123 *Journal of Cleaner Production* (2015), 155.

¹⁴ In the United States (US), there is ongoing litigation on these issues, as several manufacturers want to stop other companies from refurbishing or remanufacturing their used products; see 'Patent Law Shouldn't Block the Sale of Used Tech Products', *New York Times* (7 September 2015).

¹⁵ Directive 2009/125/EC of 21 October 2009 Establishing a Framework for the Setting of Ecodesign Requirements for Energy-Related Products, [2009] OJ L298/10.

¹⁶ B. London, *Ending the Depression through Planned Obsolescence* (University of Wisconsin, 1932).

something a little newer, a little better, a little sooner than is necessary'.¹⁷ According to Oxford Dictionaries, planned obsolescence is 'a policy of producing consumer goods that rapidly become obsolete and so require replacing, achieved by frequent changes in design, termination of the supply of spare parts, and the use of non-durable materials'.¹⁸ This definition highlights three important ways to stimulate repetitive consumption:¹⁹ the limitation of material durability, the lack of reparability and the psychological element of design.

Planned obsolescence *per se* is characterized by the deliberate planning and design of obsolescence in products to make them fail before the 'normal' end of life. This is the most severe case of planned obsolescence, as it means that producers intentionally introduce a failure that will unduly limit a product's life. Light bulbs are known to be the first victims of planned obsolescence *per se*: in 1924, representatives from the leading electrical companies got together to create a cartel to control light bulb production. One of its decisions was to limit the lifespan of a light bulb to 1,000 hours; at the time some bulbs lasted up to 2,500 hours.²⁰ Companies that did not meet this requirement were fined. Another well-known example concerns printers, including smart ink cartridges which disabled themselves after a specified amount of prints or ink level. At this point, consumers were pressured to replace their perfectly functioning printer with a new one because new cartridges would cost more than the printer itself.²¹

MATERIAL DURABILITY

A straightforward way of shortening the lifespan is to limit product durability. One consequence of the Industrial Revolution was a shift from lasting, washable or repairable products to disposable or single-use ones.²² In

the early 1900s, Gillette revolutionized the razor industry by replacing the blunt steel razor that had to be professionally sharpened by disposable razors made of thin metal blades. Most of us have grown so accustomed to a wide range of disposable products, such as plastic cutlery, kitchen paper and non-refillable pens, that we hardly even notice them anymore. Yet, all these products were originally made to last and be used over and over.

This type of obsolescence is based on the use of materials that are cheaper and less durable. This allows producers to cut production costs and lower prices in order to stimulate consumption, rather than, for example, to focus on maintenance or repair of their products.

REPARABILITY

A product is typically made of various components, some of which may be more fragile or have a shorter lifespan than others. One type of planned obsolescence, sometimes referred to as functional obsolescence, is characterized by producers relying on the normal – yet rapid – obsolescence of one component of a product to force the purchase of a new product. There exist various ways to limit the reparability of products, notably: restricting the availability of spare parts or stopping their production after the expiration of the legal guarantee; creating incompatibilities with similar parts of more recent models; and preventing disassembly by using specific tools or gluing parts together.

Batteries are often the first element of electronic products that fail,²³ and this may happen long before the rest of the product starts deteriorating. However, electronic equipment cannot function without a battery. Apple has built the battery in all their devices, which means that it is very difficult – and often costly – to remove and replace the battery only.²⁴

TECHNOLOGICAL INNOVATION

Technological innovation is normal and often desirable, but it may also be used to shorten the lifespan of products. This may happen if producers decide to withhold technological advancement in order to regularly place new products on the market that make previous models comparably less attractive. Software updates may slow

¹⁷ Cited in: G. Adamson, *Industrial Strength Design: How Brooks Stevens Shaped Your World* (MIT Press, 2003), at 129.

¹⁸ See <<http://www.oxforddictionaries.com/definition/english/planned-obsolescence>>.

¹⁹ Cf. J. Guiltinan, 'Creative Destruction and Destructive Creations: Environmental Ethics and Planned Obsolescence', 89:S1 *Journal of Business Ethics* (2009), 19.

²⁰ M. Krajewski, 'The Great Lightbulb Conspiracy', *IEEE Spectrum* (24 September 2014).

²¹ Several class action suits were brought before the US courts against HP in 2007. One of them, *Jackie Blennis v. HP*, concerned the design of certain cartridges to shut down on an undisclosed expiration date and the fact that at this point consumers were prevented from using the ink that remains in the expired cartridge. Although HP always denied the claims, it settled to pay \$5,000,000, and agreed to discontinue the use of certain pop-up messages and to disclose clear information about expiry dates and functioning. See <<https://www.hpinkjetprintersettlement.com/>>. The scandal of printer cartridges was revealed to a large audience by the documentary 'The Lightbulb Conspiracy' (2010) by Cosima Dannoritzer.

²² See G. Slade, n. 9 above, providing the example of the invention of disposable razors by Gillette and that of disposable sanitary napkins.

²³ According to Apple, after 500 complete charge cycles, the battery of an iPhone will be reduced to 80% of its original capacity: <<http://www.apple.com/batteries/service-and-recycling/>>. The effect in terms of the battery lifespan will vary depending on the use of the phone by each consumer.

²⁴ The Apple website states that for products with built-in lithium-ion polymer batteries (i.e., iPhone, iPad, iPod and MacBook), the batteries should be serviced by Apple or an authorized service provider, and costs \$99 for an iPhone battery after one year's use. See <<http://www.apple.com/batteries/service-and-recycling/>>.

older models to drive consumers to discard them. It may also take the form of incompatibilities of by-products with new models where, although no failure has occurred, the technology renders them obsolete nonetheless.

Again, Apple gives a prime example of such a case with the release in 2012 of the iPhone 5, which was accompanied by a new charger. Apple benefited from the fact that owners of the new iPhone 5 were forced to purchase adapters in order to use older by-products, and vice versa. Moreover, the new charger contained a chip that ensured cables purchased from competitors would not work.²⁵

PSYCHOLOGICAL OBSOLESCENCE

The rationale for building early obsolescence into a product is to encourage consumers to make repetitive purchases of the same brand. Not only do they need to focus on reducing the material durability of products, but also on the willingness of consumers to purchase a new disposable product – sometimes even before the old one breaks – and preferably from the same producer. This is the type of obsolescence often referred to as psychological, because it is based on the consumer's perception rather than on the product itself.²⁶

Aesthetical as well as technological considerations can be used to persuade the purchase of new products. As early as the 1920s, General Motors (GM) undertook to boost its sales based on psychological obsolescence. A new marketing strategy consisted of developing cars that included design advances. The purpose of including style as one of the key features of cars was to make them 'more desirable and pulling potential buyers into the showroom'.²⁷ Hence, consumers who previously would only buy a new car when their old one was broken and could not be repaired, were suddenly encouraged to buy based solely on improved design. The clothing industry is another striking example of psychological obsolescence where consumers are prompted through various forms of advertising and promotion (e.g., seasonal sales) to renew their wardrobe regularly to stay 'in fashion'.

PLANNING FOR DURABILITY

A recurring argument from producers accused of planned obsolescence is that they did not intend to

reduce the lifespan of products, but that obsolescence may be a side effect from efforts to improve user-friendliness, lower prices or develop new technologies. Beyond discussions about the true intention of producers, what such claims reveal is that the focus of many producers is not on durability, and that the intervention of legislators might be necessary.

Obviously, there is a variety of ways in which a producer can plan for the obsolescence of its product. The policy solutions have to be diverse as well. Whether a product is meant to fail prematurely or whether its repairation is made economically unattractive, both circumstances will limit the durability of that product, but the manner in which to address these issues must be different.

Most consumer products are likely to be influenced by more than one type of obsolescence, and identifying the 'weakest link(s)' would allow the legislators to determine what kind of legislative response is needed.²⁸ A combination of different solutions will probably have to be adopted in most cases. In the following sections, different approaches adopted at different levels, regional and national, are reviewed. They exemplify the variety of measures that can be taken.

REGULATING DURABILITY AT THE EU LEVEL

In the Action Plan for a Circular Economy adopted in December 2015, the Ecodesign Directive is proposed as a key instrument in order to promote durability.²⁹ This section first discusses various legal options to promote durability at the EU level. It then discusses two product groups for which durability standards have been set under the Ecodesign Directive – vacuum cleaners and lighting – and explores what we can learn from these examples. Then the section briefly discusses the potential for using energy labelling and voluntary agreements to promote durability.

LEGAL OPTIONS FOR REGULATING DURABILITY AT THE EU LEVEL

The EU can foster durability in several ways.³⁰ One approach is to regulate durability in a direct manner, for instance by setting clear mandatory requirements on product lifetime, as has been done through the Ecodesign Directive. Other potential approaches

²⁵ See, e.g., E. Wrenn, 'Apple "Added Authentication Chip" to iPhone 5 Cable to Stop Third-Parties Making Cheaper Versions (then Charges you £30 for its Own Adapter)', *Daily Mail Online* (25 September 2012).

²⁶ See G. Slade, n. 9 above, at 5.

²⁷ *Ibid.*, at 264.

²⁸ B. Burns, 'Re-evaluating Obsolescence and Planning for It', in: T. Cooper (ed.), *Longer Lasting Products – Alternatives to the Throw-away Society* (Gower, 2010), 39.

²⁹ See COM(2015) 614, n. 1 above, at 7.

³⁰ Cf. D. Jepsen *et al.*, n. 13 above; C. Dalhammar, n. 13 above.

include integrating durability information in energy labelling, or entering into voluntary agreements with industry over durability issues. Yet another option is the adoption of legal measures that make the products easier to repair or upgrade, for instance by requiring that spare parts are made available for a number of years after product purchase, and by mandating manufacturers to provide information to repair shops and remanufacturers that can aide repair and recycling practices. A different legal approach is to mandate longer warranties for consumers, or require manufacturers to inform consumers on the expected lifetime of the product. One category of rules would thus directly regulate durability, whereas other approaches make use of more indirect methods to incentivize durability. In the Action Plan for a Circular Economy, the Commission signals that all these regulatory techniques may be relevant and should be considered in EU policy making.³¹

Further, the remanufacturing and repair industries want rules that clarify that the repairer, or anyone putting the product into re-use, should not be considered to be the manufacturer/producer of the repaired/re-used product in the normal case. The latter issue is most likely considered important both because remanufacturers do not want to become 'producers' in the meaning of some EU directives³² and be economically responsible for collection and recycling of waste products, and also because remanufactured products often do not comply with criteria put on 'new' products, such as energy efficiency requirements.

Consumer rights legislation provides an indirect impetus for design for durability. In Directive 1999/44, the seller is liable for a product for a period of two years, but after the first six months the burden of proof that there was a defect at the time of delivery lies with the consumer.³³ The Directive aims at minimum harmonization and different EU Member States have different rules. RREUSE³⁴ recommends that the burden of proof lies with the manufacturer for at least two years.³⁵ This could be enforced through higher 'mean time between failure' requirements for critical sub-assemblies such as

those with electro-mechanical parts and components.³⁶ RREUSE also recommends the introduction of requirements for showing the 'average expected product lifetime' at the time of purchase to better inform consumers about purchase decisions.³⁷

THE ECODESIGN DIRECTIVE AND DURABILITY

The Ecodesign Directive provides the framework for setting eco-design requirements for energy-relevant product groups. This is done through adopting separate regulations for specific product groups. The legal process is quite long and complicated. Initially, the Commission orders a study from consultants for the relevant product group, which includes a market analysis and proposals for legal requirements. This is followed by several rounds of stakeholder interactions and negotiations until a regulation is adopted (through comitology).³⁸ The various regulations have primarily been used to set binding minimum energy efficiency requirements for the use phase of products, but the scope of the Directive allows for a wider range of environmental aspects to be regulated through eco-design standards.³⁹ Increasingly, new eco-design requirements are being set. For several product groups we now have requirements where manufacturers have been mandated to provide information relevant for proper disposal, disassembly and recycling at the end-of-life stage.⁴⁰ There are also product groups where the manufacturers must provide information about toxic content in the products, such as mercury.⁴¹

Regarding the extension of lifetime, this issue is specifically listed in the Ecodesign Directive among important parameters that should be investigated, when relevant for addressing important environmental aspects for the product group under investigation: '(i) extension of

³¹ See COM(2015) 614, n. 1 above.

³² The 'producer' can be any natural or legal person who professionally develops, manufactures, processes, treats, sells or imports products. Cf. Directive 2009/125/EC, n. 15 above, Article 8. The various directives on producer responsibility provide more details on producer obligations for the respective waste streams.

³³ Cf. Directive 1999/44/EC of 25 May 1999 on Certain Aspects of the Sale of Consumer Goods and Associated Guarantees, [1999] OJ L171/12, Article 5.

³⁴ RREUSE is an organization that represents social enterprises working on re-use, repair and recycling. They want the EU and national governments to move from promoting just recycling and waste management to putting second-hand first.

³⁵ See RREUSE, n. 13 above, at 7.

³⁶ Mean time between failures describes the expected time between two failures for a repairable system, while mean time to failure denotes the expected time to failure for a non-repairable system. A requirement on mean time between failure could provide incentives for manufacturers to invest in spare parts and better repair services.

³⁷ See RREUSE, n. 13 above, at 7.

³⁸ For a thorough review of the legal process, see H.-P. Siderius, *The Ecodesign and Energy Labeling Process – Challenges and Solutions* (2012), found at: <<http://www.eceee.org/static/media/uploads/site-2/ecodesign/horizontal-matters/assessment-ecodesign-en-energy-label-delays-120227-1.pdf>>.

³⁹ See A.M. Bundgaard *et al.*, n. 13 above; D. Jepsen *et al.*, n. 13 above; C. Dalhammar, 'Promoting Energy and Resource Efficiency through the Ecodesign Directive', 59 *Scandinavian Studies in Law* (2015), 147.

⁴⁰ For an overview, see D. Jepsen *et al.*, n. 13 above.

⁴¹ One example concerns information to consumers if lighting products contain mercury; see Regulation 1194/2012 of 12 Dec 2012 Implementing Directive 2009/12/EC of the European Parliament and of the Council with Regard to Eco-design Requirements for Directional Lamps, Light Emitting Diode Lamps and Related Equipment, [2012] OJ L342/1, Annex III, at paragraph 3.1.2.

lifetime as expressed through: minimum guaranteed lifetime, minimum time for availability of spare parts, modularity, upgradeability, reparability'.⁴² Additional potential informative requirements related to durability are listed in the Directive, most notably: consumer information on how to optimize life expectancy, information on the period of availability of spare parts and information on the possibilities of upgrading products.⁴³

All ecodesign standards set in the regulations must however comply also with the other rules of the Directive (especially Article 15.5). Most notably, they should not affect functionality, health and safety, and costs negatively. Furthermore, it must be possible to monitor the requirements by the authorities. The cost issue is hardly a problem, as durability is often positive from a consumer perspective. In some cases, however, improving durability of products with poor energy efficiency can be negative from a consumer perspective, as the old products may use more energy, and keeping them in use longer may add costs for consumers. When it comes to the issue of verification methods, there must be an established method, for instance described in the relevant ecodesign regulation or in a standard, in order for producers to ensure that their products comply with mandatory requirements. Some things can be inspected by testing the product whereas others may rely primarily on technical documentation. In reality, market surveillance authorities primarily make use of technical documentation to investigate compliance, but testing activities in laboratories are also used.

DURABILITY STANDARDS FOR VACUUM CLEANERS

The Commission ordered a study on vacuum cleaners in 2007. The final report of the consultants, which was delivered in February 2009,⁴⁴ concluded that there were good reasons to regulate vacuum cleaners at the EU level because – unlike most other product groups – they have become less energy efficient over time. Many manufacturers use high energy consumption as a sales argument, as consumers often believe that high energy use equals good vacuuming function. But there is actually little correlation between effect and vacuuming function, and small energy-efficient vacuums may in some cases perform better cleaning than large, high-voltage machines.⁴⁵ The consultants identified a number of potential technical improvements to improve the

energy efficiency, including changes to designs and construction of fans, motors and nozzles.⁴⁶

The issue of durability was considered to be complex. There were vacuum models with poor performance on the market, and the optimal approach was considered to be the pushing of durability, but not until the worst performers had been removed from the market. The consultants stated: '... we conclude that the issue of product durability should be considered after the proposed measures have been put into place and older less efficient vacuum cleaners have disappeared from the working EU stock'.⁴⁷

The regulations for ecodesign requirements⁴⁸ and labelling⁴⁹ were introduced simultaneously in 2013. The Ecodesign Regulation sets requirements in two tiers: the first set of binding standards entered into force in 2014, and new ones will enter into force in 2017. Apart from requirements on energy efficiency, the Regulation also contains rules related to functions such as noise, dust pick up capacity, motor operational lifetime and the durability of the hose.⁵⁰

The rules of durability of motors and hoses do not enter into force until 2017, when the more stringent energy efficiency requirements also enter into force. In 2017, all vacuum cleaners introduced on the market will be significantly more energy efficient than most current models, and the rate of future improvements of energy efficiency of vacuums will probably slow down. The hose and the motor are the two parts of vacuum cleaners that are addressed by the durability requirements. These are formulated as follows:⁵¹

- the hose, if any, shall be durable so that it is still useable after 40,000 oscillations under strain;
- operational motor lifetime shall be greater than or equal to 500 hours.

As the requirements on durability have not yet entered into force, there is no report yet on the performance of vacuum cleaners on the market with respect to durability requirements. Consumer organizations perform

⁴⁶ Ibid., Chapter 7.

⁴⁷ Ibid., at 102.

⁴⁸ Regulation 666/2013/EU of 8 July 2013 Implementing Directive 2009/125/EC of the European Parliament and of the Council with Regard to Ecodesign Requirements for Vacuum Cleaners, [2013] OJ L192/24.

⁴⁹ Regulation 665/2013/EU of 3 May 2013 Supplementing Directive 2010/30/EU of the European Parliament and of the Council with Regard to Energy Labelling of Vacuum Cleaners, [2013] OJ L192/1.

⁵⁰ Regulation 666/2013/EU, n. 48 above, Annex I.

⁵¹ Ibid., Annex II deals with measurement and calculation methods, and detailed provisions of how compliance with durability requirements should be measured are given. Annex III provides instructions for testing, which is performed by market surveillance authorities. Among these instructions, a 5% deviation is allowed for 'Operational motor lifetime'.

⁴² Directive 2009/125/EC, n. 15 above, Annex I, at paragraph 1.3(i).

⁴³ Ibid., Annex I, at paragraph 2(c).

⁴⁴ AEA Energy & Environment, Work on Preparatory Studies for Ecodesign Requirements of EuPs (II) Lot 17 Vacuum Cleaners (European Commission, 2009).

⁴⁵ Ibid., at 3.

tests on vacuum cleaners, but durability is seldom part of such consumer tests.

DURABILITY STANDARDS FOR LIGHTING

Lamps and lighting products are a diverse product group, regulated under several ecodesign regulations. Here we review requirements for durability in the Regulation for directional lamps, light emitting diode lamps and related equipment,⁵² which has the most elaborated criteria for durability.

In the preparatory study for lighting products, it was clear that a long lifetime was positive both for reducing environmental impacts and from a consumer cost perspective.⁵³ However, the issue of lifetime extension is much more complicated for lighting than for vacuum cleaners. This is because (i) lighting is a product group under rapid technological development, where LED lighting products are expected to increase market share significantly in the coming years, and (ii) because durability is a concept that actually includes several dimensions in the case of lighting. We typically think of the lamp lifetime as the time before a lamp stops functioning, but durability has more dimensions. The lighting quality in terms of lumen (which measures luminous flux or luminous power, which is the measure of the perceived power of light) is also important. The lumen output of a lamp deteriorates during its lifetime, but not equally for all lamp types. There are additional measures that relate to lighting durability, as will be discussed below.

Annex II of Regulation 1194/2012 provides some definitions that are important for the understanding of durability requirements:

(h) 'colour rendering' (Ra) means the effect of an illuminant on the colour appearance of objects by conscious or subconscious comparison with their colour appearance under a reference illuminant;

...

(j) 'lamp lumen maintenance factor' (LLMF) means the ratio of the luminous flux emitted by the lamp at a given time in its life to the initial luminous flux;

(k) 'lamp survival factor' (LSF) means the defined fraction of the total number of lamps that continue to operate at a given time under defined conditions and switching frequency;

(l) 'lamp lifetime' means the period of operating time after which the fraction of the total number of lamps which continue to operate corresponds to the lamp survival factor of

the lamp under defined conditions and switching frequency. For LED lamps, lamp lifetime means the operating time between the start of their use and the moment when only 50% of the total number of lamps survive or when the average lumen maintenance of the batch falls below 70%, whichever occurs first;

(m) 'lamp start time' means the time needed, after the supply voltage is switched on, for the lamp to start fully and remain alight;

(n) 'lamp warm-up time' means the time needed after start-up, for the lamp to emit a defined proportion of its stabilised luminous flux;

...

(x) 'switching cycle' means the sequence of switching the lamp on and off at set intervals;

(y) 'premature failure' means when a lamp reaches the end of its life after a period in operation which is less than the rated lifetime stated in the technical documentation.⁵⁴

The functionality requirements are outlined in Annex II. There are different requirements for three types of lighting products, namely 'directional compact fluorescent lamps', 'other directional lamps (excluding LED lamps, compact fluorescent lamps and high-intensity discharge lamps)' and 'non-directional and directional LED lamps'. There are reasons for having different requirements for the three different lamp types. For instance, there can be stricter requirements on 'life survival factors' for LED products, as these can last very long, and the requirements on 'colour consistency' and 'colour rendering' can also be differentiated. As the rules are quite complex, we will only provide some examples on the requirements for 'directional compact fluorescent lamps' here. The requirements include: 'lamp survival factor at 6,000 hours' (with a 50% requirement at the first stage and a 70% requirement at the second stage); 'lumen maintenance' at 2,000 and 6,000 hours, respectively; 'number of switching cycles before failure'; 'premature failure rate' at 500 and 1,000 hours (maximum number of failure products in percentages); and 'colour rendering' for various applications.

There are additional functionality requirements, but these will not be discussed here. Annex II mandates manufacturers to provide some information to consumers. This information must be provided on free access websites and sometimes also on the packaging. As the rules are very complex, the Regulation also contains quite detailed rules on the verification procedures for market surveillance purposes (in Annex IV).

The rules have only been in place for a few years, so there is no definite study on whether durability

⁵² Regulation 1194/2012/EU, n. 41 above.

⁵³ VITO et al., *Final Report Lot 19: Domestic Lighting. Study for European Commission DGTREN* (European Commission, 2009).

⁵⁴ Regulation 1194/2012/EU, n. 41 above, Annex II.

requirements for the first tier of requirements (which entered into force in March 2014) have been reached. However, a study from 2014 – conducted by EU national market surveillance authorities – reported on tests of 18 lamps on the EU market, and the results were very promising.⁵⁵ An update of the study in 2015 reported very positive results on the tested models after 1,000 hours of testing; 15 out of 17 LED lamps tested did not have any product performance concerns relative to the legal quality requirements.⁵⁶ The study indicated that the energy efficiency of lamps has improved quicker than was projected a few years ago, and also that the product costs have decreased more than was expected. Other studies have come to similar conclusions.⁵⁷ Thus, the market is under rapid development.

SOME REFLECTIONS ON THE TWO CASES

Vacuum cleaners are a relatively mature product group, and no major changes regarding looks, function or user behaviour are expected in the near future. While there was a perceived need to regulate energy efficiency of vacuums, not least because of the large differences among models on the market and misconceptions among consumers, no major breakthroughs in technology are expected in the near future. Since vacuums are typically switched on only during a limited part of their lifetime, and a significant part of the environmental impacts relate to other life cycle phases than the energy used, setting ecodesign requirements related to durability makes sense both from an environmental and consumer perspective.

It is more complex to regulate durability for lighting than for vacuum cleaners. First of all, the product group is under rapid development: traditional light bulbs have been banned, and new technologies are used which may differ according to application and country. In the future, it is expected that LED technology will be used for more and more applications, which will lead to increased energy efficiency and longer product lifetimes. Regulating lighting products will become more challenging in the future as new products are under development with new functions such as dimming and

changing of colours.⁵⁸ For these reasons, it appears as if the lighting manufacturing sector is under development. Some large manufacturers like Philips are selling their lighting component businesses in order to focus on selling integrated lighting systems and services, and the software required. The LED business is likely to become a lower-margin commodity business, with providers of integrated systems and services generating the higher profit margins.⁵⁹ Ecodesign regulations that increase product durability and quality will probably exacerbate the current trends. It is of course also possible that lighting manufacturers will invest heavily in new products with high aesthetic values in the future, to persuade consumers to switch lighting products long before they break down.

THE POTENTIAL USE OF ENERGY LABELLING AND VOLUNTARY AGREEMENTS

Currently, energy labelling of products is regulated in Directive 2010/30, which covers only information about energy consumption during use.⁶⁰ However, the inclusion of durability information in energy labelling seems to receive more and more support, with France notably calling for an ambitious EU action plan for environmental labelling.⁶¹ The Commission published in 2015 a proposal for a new Regulation for energy labelling,⁶² and proposed that new types of information be included in the mandatory energy labelling scheme. Durability requirements in particular should be investigated when relevant.⁶³ In the EU Action Plan for a Circular Economy, the Commission also states that it will ‘specifically consider . . . durability information in future Energy Labelling measures’.⁶⁴

Energy labelling requires that a product is labelled in order to be put it on the EU market, but allows for different performances among products (e.g., labelled on the scale A–E, with A being the best). Including durability in energy labelling could then allow for segmentation of the product group in accordance with expected lifetime and allow consumers to choose products that are

⁵⁵ Swedish Energy Agency *et al.*, *Test Report – Clear, Non-directional LED Lamps: A Test Report Prepared for the European Commission and the Consultation Forum on the Performance of Clear LED Lamps in the European Market in the Third Quarter of 2014* (Swedish Energy Agency, 2014).

⁵⁶ Swedish Energy Agency *et al.*, *Test Report – Clear, Non-directional LED Lamps: Updated to Reflect 1000 Hours Testing and with a Detailed Discussion on Lighting Europe’s Comments on this Report* (Swedish Energy Agency, 2015).

⁵⁷ Danish Energy Agency *et al.*, *European LED Market Evolution and Policy Impacts* (Danish Energy Agency/CLASP, 2015).

⁵⁸ E. Page *et al.*, ‘Not so Clever when They Are Off: Standby Power Use in Smart Lamps’, paper presented at the ECEEE Summer Proceedings (2015).

⁵⁹ R. van Daalen and D. Lerner, ‘Philips to Set Up Stand-Alone Lighting Company’, *Wall Street Journal* (30 June 2014).

⁶⁰ Directive 2010/30/EU of 19 May 2010 on the Indication by Labelling and Standard Product Information of the Consumption of Energy and Other Resources by Energy-Related Products, [2010] OJ L153/1.

⁶¹ ‘UBA Calls for Product Resource Efficiency Policies’, *ENDS Europe Daily* (17 February 2016).

⁶² Proposal for a Regulation of the European Parliament and of the Council Setting a Framework for Energy Efficiency Labelling and Repealing Directive 2010/30/EU, COM(2015) 341 (‘Energy Labelling Regulation Proposal’).

⁶³ *Ibid.*, see especially recital 20 and Article 2.

⁶⁴ See COM(2015) 614, n. 1 above, at 8.

more durable. In theory, a coordination between mandatory durability requirements set under the Ecodesign Directive and labelling criteria for durability set under the Energy Labelling Directive can be achieved. This coordination may take place in at least two ways: (i) minimum durability requirements are set under the Ecodesign Directive, and apply to all products on the market, whereas labelling criteria allow consumers to choose among legally compliant products according to their expected lifetime; and/or (ii) when it is not appropriate to set mandatory durability requirements through the Ecodesign Directive, labelling can be an alternative.

However, it should be noted that it will be quite complex to include durability both in binding ecodesign standards and in energy labelling for many product groups. It requires the development of harmonized methodologies to measure durability and reparability, and the existence of test standards and calculation methodologies to define and validate the estimated lifetime for specific product groups. The Commission has issued a standardization mandate to the European standardization organization, with the organization being requested to develop general standards related to: extending product lifetime; ability to re-use components or recycle materials from products at end-of-life; and use of re-used components and/or recycled materials in products.⁶⁵ The intention is that these standards can be used as a basis when setting product-specific standards under the Ecodesign Directive, but they could also be used for labelling purposes.

Including durability requirements in labelling has a high potential to increase consumer awareness and change manufacturers' practices. We could foresee a situation where most manufacturers would not want to be associated with products that are labelled as having poor durability. However, as was discussed above, durability has several dimensions, so it may be quite difficult to deal with them all in labelling. One way forward is that manufacturers simply have to provide information on expected lifetime and the availability of spare parts. In that case, the French experience (see below) will be very relevant to consider. But the potential for cheating among some manufacturers will probably be quite high, as it will take several years before we know if the claims on lifetime are correct or not. Further, promises on availability of spare parts may be exaggerated, and in reality it may be difficult to obtain the spare parts. Therefore, it is likely that consumer guarantees will

have a role to play as well, to complement the Ecodesign Directive and the energy labelling scheme.

Finally, we should mention that voluntary agreements are a potential alternative to binding standards or the inclusion of durability in energy labelling. However, the EU experiences with voluntary agreements between the Commission and industry are not positive, and for that reason the Ecodesign Directive sets rather stringent criteria for using voluntary agreements or self-regulation as alternatives to binding requirements.⁶⁶ While EU industry associations have made voluntary commitments in the past, many of them have abandoned them due to the existence of free riders,⁶⁷ and instead advocate the use of mandatory regulations.⁶⁸ However, recently a voluntary agreement on imaging equipment⁶⁹ was adopted in the context of the Ecodesign Directive. Thus, this policy option can still be relevant. For new product groups under rapid technological progress, such as 3D printers, it may be difficult to set binding requirements on durability through the Ecodesign Directive. It may not be possible to adopt an energy labelling scheme either. Under such circumstances, voluntary agreements may be a feasible option, and include also durability. Some of the main concerns about voluntary agreements, most notably how they are monitored and enforced, will however be a main concern also in the future. The fact that durability is harder to measure than energy efficiency in the use phase also increases the risks that manufacturers will not have to deliver on their promises. Therefore, voluntary agreements should not be viewed as the primary policy solution, and only be applied under specific circumstances.

THE FRENCH APPROACH: CRIMINALIZING INTENTIONAL BEHAVIOUR AND IMPROVING REPARABILITY

This section focuses on two amendments to the French Consumer Code adopted in 2014 and 2015.⁷⁰ The first set of amendments aimed at improving the reparability

⁶⁵ Commission Implementing Decision of 17.12.2015 on a Standardisation Request to the European Standardisation Organisations as Regards Ecodesign Requirements on Material Efficiency Aspects for Energy-Related Products in Support of the Implementation of Directive 2009/125/EC of the European Parliament and of the Council, found at: <<http://ec.europa.eu/growth/tools-databases/mandates/index.cfm?fuseaction=search.welcome#>>.

⁶⁶ Directive 2009/125/EC, n. 15 above, Article 17 and Annex VIII.

⁶⁷ Free riders are in this context to be understood as manufacturers that do not take part in the voluntary commitment, and may benefit from the commitment – for instance, because it enhances the reputation of the industry and aids in avoiding binding regulations – although their products do not comply with the voluntary targets.

⁶⁸ C. Dalhammar, 'An Emerging Product Approach in Environmental Law: Incorporating the Life Cycle Perspective' (PhD thesis, Lund University, 2007), at 304–305.

⁶⁹ 'Industry Voluntary Agreement to Improve the Environmental Performance of Imaging Equipment Placed on the European Market' (April 2015), found at: <<https://ec.europa.eu/energy/sites/ener/files/documents/VA%20Imaging%20Self-Regulatory%20Initiative-V-4-0.pdf>>.

⁷⁰ Consumer Code (CC), FR490.

of products by introducing a duty for the seller to inform consumers about the availability of essential spare parts and for producers to deliver those parts. The amendment resulted from the Parliament's adoption of Law no. 2014-344 on consumption,⁷¹ followed by a governmental Decree (*décret*) no. 2014-1482.⁷² A year later, the French Parliament adopted the law on energy transition for green growth,⁷³ which introduced a unique definition of the concept of 'planned obsolescence' and established this behaviour as a criminal infraction that may lead to a prison sentence.

CRIMINALIZING PLANNED OBSOLESCENCE

France is the first country to adopt a law that expressly refers to planned obsolescence and defines it. Article L. 213-4-1 of the Consumer Code now reads: 'Planned obsolescence is defined by all the techniques by which a person that places goods on the market seeks to deliberately reduce the lifespan of a product to increase the substitution rate.'⁷⁴

This definition is the result of a compromise reached by the two chambers of the French Parliament – the National Assembly and the Senate – after months of intense discussions. An earlier definition proposed by the National Assembly was a lot more ambitious, and included acts that would deliberately reduce the potential duration of the use of products.⁷⁵ It also contained a non-exhaustive list of the techniques that amount to planned obsolescence: '... the voluntary introduction of a defect, a weakness, a planned or premature outage, a technical limitation, an inability to repair, or an incompatibility'.⁷⁶ A later amendment from the same chamber even included a specification of what the 'inability to repair' could consist of, namely 'the fact that a product cannot be dismantled or that spare parts necessary to its functioning are missing'.⁷⁷

The addition of a paragraph listing different types of planned obsolescence would have had the advantage of resolving any ambiguity regarding the extent of the definition. Hence, any voluntary actions that seek to

shorten the life of products would likely fall within the law, whether they consist of an obvious case of in-built failure during design or in an incompatibility created after the product's release. If the text as it was eventually adopted is broad enough to cover at least all of the techniques listed in the early amendment remains to be seen; a certain level of uncertainty as to the application of the law will remain until courts get the chance to rule on specific cases. Such uncertainty may work in favour of producers in a field where the plaintiffs – generally individual consumers – will often be hesitant to bring a suit.

France is also a pioneer in the fight against planned obsolescence because the behaviour is now criminalized. Indeed, the new Article L. 213-4-1 of the Consumer Code introduces planned obsolescence as an infraction that can be punished by up to two years in prison and a fine of €300,000, which can be increased by up to 5% of the average annual revenue calculated on the basis of the three previous known annual turnovers. The amount should be in proportion with the benefits gained from the breach of the law.

Notwithstanding the rather wide definition of planned obsolescence in the law, convicting a producer of infraction will not be easy. Consumer and environmental associations heavily criticized the use of the word 'deliberately', which requires a proof of intention from the side of the producer. Yet, apart from a few blatant cases such as the light bulb affair, in most cases producers can argue that there was no intentional design choice: the battery of the iPhone was sealed for aesthetical purposes (the iPhone chassis has no gaps), to make the equipment as thin and light as possible, and to reduce the chances of moisture and dirt getting inside;⁷⁸ the chip of the printer cartridge stops functioning at 25% capacity because from that point on there is a high risk of the ink being paler or uneven on the page; incompatibilities with older versions of a same product result from an unexpected but fundamental technology innovation. The possibility for producers to demonstrate their good intentions is undeniably great and their rationale not always inaccurate, though it may cover less worthy objectives.

In addition, the plaintiff must prove that the defendant has reduced the lifespan of a product for the purpose of increasing its substitution. We have mentioned in the previous section a number of examples of planned obsolescence that appear quite obvious. However, bringing proof that the lifespan of a product has been reduced, in particular in a deliberate manner, so that a judge can deliver a judgment is another matter, and leads to a number of important yet arduous questions: How does one establish the theoretical lifespan of a product? When does a product have a *short* lifespan and when does it have a *reduced*

⁷¹ Law n° 2014-344 of 17 March 2014, published in JORF n° 0065 of 18 March 2014, p. 5400, n° 1.

⁷² Decree n° 2014-1482 of 9 December 2014, published in JORF n° 0286 of 11 December 2014, p. 20707, n° 38.

⁷³ Law n° 2015-992 of 17 August 2015, published in JORF n° 0189 of 18 August 2015, p. 1426, n° 1.

⁷⁴ All translations of the French texts are unofficial and the responsibility of the authors.

⁷⁵ Article L. 213-4-1.I of the draft law on energy transition for green growth, as adopted by the *Assemblée Nationale* on 14 October 2014, TA n° 412.

⁷⁶ *Ibid.*, Article L. 213-4-1.II.

⁷⁷ Article L. 213-4-1.II of the draft law on energy transition for green growth, as adopted by the *Assemblée Nationale* on 26 May 2015, TA n° 519.

⁷⁸ See notably the patent of the 'Integrated Embedded Battery', US 20110292598 A1, filed by Apple Inc. (1 December 2011), found at: <<http://www.google.com/patents/US20110292598>>.

lifespan? How do you unveil the intention of the producer? This may require access to internal documents of the incriminated firm. Also, how does one prove that the reduced lifespan was intending to boost sales and not to reduce production costs?

TACKLING THE ISSUE OF SPARE PARTS

The French Parliament amended the Consumer Code to integrate provisions on reparability. Article L. 111-3 requires that the information professional sellers receive from manufacturers or importers of products about the availability of essential spare parts be placed on the product or any lasting media accompanying it.⁷⁹ The information must be brought to the consumer's attention in a visible and legible manner before the sale is concluded. In accordance with Article L. 111-3 of the governmental decree, the information must also appear on the purchase order, if there is one, or any other durable document certifying or accompanying the sale.⁸⁰ With regards to the scope of the new provisions, they concern 'movable property' (*biens meubles*), such as appliances and furniture,⁸¹ and cover only spare parts that are 'essential' (*indispensables*) to the functioning of the product. Spare parts that merely serve an aesthetical function are not covered by the legal obligation.

Contrary to what the provisions may suggest, there is no obligation to provide information about spare parts. It is only if the information has been made available by manufacturers and importers that it must be communicated to consumers. This is apparent from the second paragraph of Article L. 111-3 which reads: '*As long as he has indicated the period or date mentioned in the first paragraph, the manufacturer or importer is obliged to make available . . . the spare parts. . .*'⁸²

Although the absence of such information may make consumers aware that there is a risk that spare parts will not be available for a specific product, compulsory display of the information for all products would certainly have been more useful. In particular, an obligation to provide information may have encouraged some producers to improve the availability of spare parts.

To summarize, the duty for the sellers includes the following obligations:

- (i) they must provide information about spare parts to the consumers *if* they have received that

information from the manufacturer or importer of a product;

- (ii) the information shall relate to the period within which the spare parts will be available;
- (iii) that information has to be brought to the consumer's attention in a visible and legible manner before the conclusion of the sale;
- (iv) only spare parts essential to the functioning of the product are concerned.

For manufacturers and importers, the provision of information about spare parts also has direct consequences: they must make those spare parts available during the period that they have advertised.⁸³ Within that period, the seller or any repairer may request those spare parts, which shall be made available within a period of two months.⁸⁴ In other words, although manufacturers and importers do not have an obligation to provide information about spare parts, they have an obligation to follow through – that is, to supply the spare parts – if they decide to make the information available to consumers.

According to Article L. 111-3.2, consumers may get their products repaired by non-certified repairers (*non agréé*). This is significant, because it allows for small or community-based repairers to operate, often at lower prices than certified repairers. Lowering costs of repair and empowering local professionals may create an impulse towards the recourse to repair services rather than disposing and buying new, which is often considered by consumers to be cheaper and easier. However, the possibility to go to any repairer might be hampered in practice by the producers, who are not requested by the law to use standardized tools nor to supply repair manuals. Moreover, some producers discourage consumers from addressing non-certified repairers with the threat of losing their warranty,⁸⁵ or even build in an automatic failure in case of repair by a non-certified technician.⁸⁶

The failure to inform the consumer or to provide the spare parts within the two-month deadline can be sanctioned by an administrative fine of up to €3,000 for a natural person and €15,000 for a legal person.⁸⁷ In case

⁸³ Ibid.

⁸⁴ Ibid.

⁷⁹ CC, n. 70 above, Article L. 111-3 CC. Following Article 2 of the French Decree 2014-1482, n. 72 above, this measure is only applicable to products that have been placed on the market from 1 March 2015.

⁸⁰ CC, n. 70 above, Article L. 111-3.2.

⁸¹ As opposed to 'immovable property', such as buildings. Ibid., Article L. 111-3.

⁸² Ibid. (emphasis added).

⁸⁵ On their website, Apple stipulates that: 'All repairs covered under warranty must be performed by Apple-certified technicians.' See <<https://www.apple.com/lae/support/programs/aasp/>>.

⁸⁶ British newspaper *The Guardian* recently revealed that the iPhone 6 has been made to fail under such circumstances, see M. Brignall "Error 53" Fury Mounts as Apple Software Update Threatens to Kill your iPhone 6', *The Guardian* (5 February 2016).

⁸⁷ CC, n. 70 above, Article L. 111-6.

of a dispute, the burden of proof lies with the professionals.⁸⁸ This aims at increasing the power of consumers to make informed choices and making the reparability of products a sales criterion. Currently, the availability of spare parts varies greatly between producers from a few years to more than 10 years.⁸⁹ Some producers never even produce spare parts.

An important aspect regarding spare parts is absent in the law: their cost. Indeed, a major reason for consumers purchasing a new product rather than repairing their old one is monetary. The cost of one spare part is often just below the price of the new model, and it is easy for sellers to convince consumers not to carry on with the repair. This will be even truer if, in the long term, the consumer has to repair a product more than once. The added cost of all spare parts may quickly exceed the price of the product itself.

Finally, the law does not touch upon the issue of the expected lifespan of the product and of its spare parts. It would however seem important for the consumer to know, for instance, if an essential spare part of a product meant to last 20 years has an expected lifespan of two years and will be available from the manufacturer for no more than those two years.

EXPECTED OUTCOMES

We have exposed the problems that will inevitably come in the way of proving that a producer is guilty of planned obsolescence under the Consumer Code. Despite this grim picture, the proponents of the new provision argue that its greatest merit will be to send a strong signal to producers that their design and manufacturing processes are closely reviewed and that their freedom is being limited.⁹⁰ Future research will show whether industrial practices are affected in the long run.

The provisions on spare parts have clear flaws, not least their conditional character and limited scope. The benefits may however be to bring awareness on the side of both producers and consumers and potentially an impulse towards repair. Consumer associations bear an important responsibility to foster these issues and include factors like availability of reasonably priced spare parts, and better after-sales services, in their consumer tests of products on the market.

⁸⁸ Ibid.

⁸⁹ For example: Philips (audiovisual) – 2.5 years for Blu-ray players; Miele (household electrical) – 11 years. See <http://www.60millions-mag.com/actualites/articles/pièces_detachees_nbsp_la_chasse_aux_appareils_durables_est_ouverte>.

⁹⁰ See, e.g., the statement of Agnès Banaszuk, at the nongovernmental organization France Nature Environnement (FNE) for the French magazine *Science et Avenir*: <<http://www.sciencesetavenir.fr/nature-environnement/20150729.OBS3331/l-obsolence-programmee-est-desormais-punie-par-la-loi>>.

THE NORWEGIAN APPROACH: EXTENDING THE DURATION OF THE WARRANTY AND FOSTERING REPAIR

The Norwegian Consumer Law from 2002 contains provisions that aim at providing incentives to make longer lasting and repairable products without regulating any specific aspect of the product's durability. The legal consumer warranty is two years, and is extended to five for products expected to last longer. Within this period, consumers may request the seller to either repair or replace their defected product. Interestingly, in spite of their differences, the Norwegian and French approaches both focus on consumer rights, and count on consumer empowerment to foster change in producers' manufacturing and maintenance processes. In this section, we review the Norwegian provisions and compare them with those of the other EEA Member States.

EXTENSION OF WARRANTY

Article 27 of the Norwegian Consumer Law states that consumers can complain about the defects of products within two years of the purchase, or five years for products that have a 'significantly longer' (*vesentlig lenger*) expected lifetime.⁹¹ In any case, the consumer may not complain to the seller later than two months of discovering the defect.⁹²

The seller is automatically considered liable during the first six months after the sale of the product as long as the defect existed at the time the risk was passed on to the consumer.⁹³ The burden of proof is reversed after the initial six months and placed on the consumer for the remaining duration of the legal warranty. In the preparatory works, members of the Labour and Left Socialist parties (who formed the parliamentary majority at the time) emphasized that strengthening consumer protection would benefit the environment. Their reasoning was that manufacturers would have incentives to produce more durable goods, which would decrease both the energy costs of producing new products and the volume of waste.⁹⁴

However, the law does not specify which types of products are included in the extended warranty, so the

⁹¹ Article 27.2, Consumer Law (CL), LOV-2002-06-21-34.

⁹² Ibid., Article 27.1.

⁹³ Ibid., Article 18.2. The risk is usually passed on to the consumer once the product has been delivered to her (ibid., Article 14.1).

⁹⁴ Recommendation of the Justice Committee on the CL, Innst. O. nr. 69 (2001–2002), at paragraph 3.17.2.

Norwegian Supreme Court was asked to rule on it. In a 2007 case about cell phones, it concluded that the expected lifespan of such devices is three–four years, so that it is ‘significantly longer’, and that the deadline of five years applied.⁹⁵ In other words, any product expected to last longer than two years should be covered by the five-year warranty.

REPAIR OR REPLACEMENT

Once the defected product is deemed to have fallen under the warranty, Article 29 of the Consumer Law provides that: ‘The consumer may choose whether to request that the seller corrects the defect or supply a similar product (redelivery). This does not apply if the implementation of the requirement is impossible or causes the seller unreasonable costs.’⁹⁶

In a case from 2006, the Supreme Court was asked to rule over the choice between rectification and redelivery, notably in light of the exceptions mentioned in paragraph 2 of Article 29. The case concerned a pair of high-heeled boots. Six weeks after the purchase of the boots, one of the heels had fallen off, and the buyer requested the replacement of the boot. The seller argued, however, that such replacement, as opposed to repair, would involve ‘unreasonable costs’ (*urimelige kostnader*).⁹⁷

The judges were divided on the issue, but a small majority (3:2) ruled in favour of the seller, emphasizing the need to consider the environmental impacts of each choice offered to the consumer:

It is important to take into account the environmental impacts of the law. If the seller has the opportunity to correct the initial complaint, this can help to reduce the number of items that are scrapped/destroyed unnecessarily. It must be a goal that most objects are repaired so that they can be used longer. The majority believes one should place particular emphasis on an environmentally friendly practice of consumer law...⁹⁸

The judgment also pointed out that there is almost no second-hand market for shoes in Norway and that

prioritizing replacement would undoubtedly increase the amount of footwear being thrown away in the short term.⁹⁹ In the preparation of the law, the majority had expressed similar concerns. They worried that allowing the buyers to request a new item would reinforce the throwaway mentality in the society, and pleaded in favour of a rectification option.¹⁰⁰ However, the Supreme Court judgment does not establish an absolute rule so that consumers and sellers may well agree to prefer replacement to repair. The mere fact that the law allows for replacement may be considered in contradiction to the principle of the circular economy.

COMPARISON WITH OTHER EEA MEMBER STATES

The Norwegian provisions provide a high level of protection to consumers, but in a European context they are neither an exception nor the most protective rules. The Consumer Goods Directive has levelled the playing field, and EEA Member States¹⁰¹ provide for similar protection of their consumers as Table 1 shows. The majority of EEA Member States has hence a legal warranty of two years,¹⁰² in line with the Consumer Goods Directive,¹⁰³ but some countries, like Norway, have raised it to five years for certain products, and some, like Iceland and Ireland, to respectively five and six years for all products.¹⁰⁴ The Netherlands and Finland do not provide for a fixed legal warranty so that the duration is based on the expected lifespan of the product category. Other factors such as the price, the type of store selling the product, statements from the seller and information from the producer are also taken into account to establish the duration of the warranty.¹⁰⁵ One may argue that this undetermined duration creates uncertainty for consumers. On the other hand, it may also induce them to choose, within one product group, a more expensive item that is advertised to last longer or be more energy efficient, because they would benefit from a longer legal warranty for that product. In other words, it may contribute to make durability a strong sales argument.

In Norway and a majority of the other EEA Member States, the burden of proof is usually placed on the

⁹⁹ Ibid., at paragraphs 38–39.

¹⁰⁰ Recommendation of the Justice Committee, n. 94 above.

¹⁰¹ Although it was adopted by the EU, the Consumer Goods Directive also had to be transposed in the EEA/EFTA countries.

¹⁰² France just increased its legal warranty from six months to two years following the adoption of the law n° 2014-344 on consumption, which modified Article L. 211-7 CC, n. 70 above. This new duration will enter in force on 18 March 2016, i.e., two years after the publication of the law.

¹⁰³ Directive 1999/44/EC, n. 33 above, Article 5.1.

¹⁰⁴ Based on a report from The European Consumer Centres Network, *Commercial Warranties – Are They Worth the Money?* (The European Consumer Centres Network, 2014).

¹⁰⁵ Ibid., at 17.

⁹⁵ *Stiftelsen Elektronikbransjen versus HELP Forsikring AS* (Mobiltelefondommen), HR-2007-01592-A, Rt. 2007 s. 1274.

⁹⁶ CL, n. 91 above, Article 29.

⁹⁷ Ibid., Article 29, second paragraph, states: ‘In determining whether the costs are unreasonable under the first paragraph, second sentence, there should be particular emphasis on the value of a defect product, the importance of the defect and whether other remedies can be completed without significant inconvenience to the consumer.’

⁹⁸ *Jato AS, hjelpeintervenant: Handels- og Servicenæringens Hovedorganisasjon versus Anne Kristin Solbakken, hjelpeintervenant: Forbrukerrådet (Støvlethædommen)*, HR-2006-00299-A, Rt. 2006 s. 179, at paragraph 33.

Table 1. THE LEGAL WARRANTY IN THE EEA

Person responsible for the application of the warranty	The seller
Duration	<ul style="list-style-type: none"> • Two years in the majority of European countries • Three years in Sweden • Five years in Norway and Iceland for products with a longer expected lifespan • Five years in Scotland • Six years in Ireland, England, Wales and Northern Ireland • In the Netherlands and Finland, the duration of the legal warranty is based on the expected lifespan of the product
Reversal of the burden of proof	<ul style="list-style-type: none"> • For the first six months in the majority of European countries, including Norway • One year in Slovakia and Poland • Two years in Sweden for building elements only • Two years in Portugal and France (from 18 March 2016)
Types of solutions	<ul style="list-style-type: none"> • Usually, the choice varies between repair or replacement, or if that is impossible or cannot take place within a reasonable time or without major inconvenience for the consumer, reduction in the price or total reimbursement • None of the countries favour repair over replacement in their legislation, but most rank them higher than adequate price reduction or refund. Greece, Portugal and Slovenia do not provide such hierarchy • The consumer has the choice between repair or replacement, but the seller may object if the solution is impossible or disproportionate

seller for the first six months, and then shifted to the consumer. So producers would, in the first six months, have to prove that the consumer has been misusing the product to get out of liability. Only a few countries (Sweden, Portugal and France) put the burden on sellers for the whole duration of the warranty. None of the EEA Member States chose to establish a legal preference for repair over replacement, but most establish a ranking with other forms of redress. In accordance with the Consumer Goods Directive, adequate price reduction or refund may often intervene only if repair and replacement are impossible.

From a consumer perspective, an extended legal warranty is likely to trigger interest for repair, in particular if it is accompanied by a reversal of the burden of proof. Consequently, it may drive producers to make more durable and repairable goods. However, it may also trigger perverse incentives, such as investments in technological and psychological obsolescence to convince consumers to make a new purchase when they would not actually need to.

THE INTERACTION BETWEEN NATIONAL RULES AND EU LEGISLATION

In this section, we briefly discuss the relationship between the national and the EU level. The previous sections exemplify how durability and reparability can be addressed through various types of laws, both at the EU and national levels. An important issue concerns the scope of national measures. This is usually tested by: (i) a review of the secondary EU legislation, and its legal foundation, to see if there is scope for national

measures, and (ii) when there are no EU rules, or EU rules that are aimed at minimum harmonization rather than total harmonization, the scope for national laws should be evaluated based on the relevant parts of the Treaty of the Functioning of the European Union (TFEU).¹⁰⁶

The Ecodesign Directive has been adopted under Article 114 of the TFEU, and its main purposes are to harmonize EU product rules and allow for the free movement of goods. Distortions may apply if EU Member States interpret the rules in different ways, or make use of different methods for market surveillance. However, these activities are increasingly harmonized, and specific instructions for testing and surveillance provided in the Ecodesign Regulations for the specific product groups. Therefore, the durability requirements set under the Ecodesign Directive are not expected to lead to any major concerns when it comes to free movement. Industries generally favour EU-wide rules compared to national rules. There are also indications that industries prefer the kind of durability requirements applied for vacuum cleaners, where manufacturers provide evidence of how many hours of operation a motor can last, to requirements on extended warranties to consumers.¹⁰⁷ The stated reason for this is that extended warranties mean that consumers may have limited interest in taking care of their products, and there can also be a problem if some consumers use their products much more frequently than the normal consumer. One example could be if a person purchases a vacuum

¹⁰⁶ Consolidated Version of the Treaty on the Functioning of the European Union, [2012] OJ C326/47 ('TFEU'). See also J.H. Jans and H.H.B. Vedder, *European Environmental Law after Lisbon*, 4th edn (Europa Law, 2012), Chapters 2, 3 and 6.

¹⁰⁷ See C. Dalhammar, n. 13 above.

cleaner and then uses it in his cleaning business. Therefore, manufacturers may claim that laboratory tests based on technical lifetime is a better regulatory approach to incentivize durability than extended warranties. However, one additional reason for such claims could be that mandatory warranties stretching for several years may destroy the often used – and often very profitable – business practice of selling extended warranties.¹⁰⁸

The above means that there is very little scope for EEA countries to set their own rules for product design, also regarding durability. A potential objection is that eco-design durability requirements have not been set for most product groups under the Ecodesign Directive (vacuum cleaners and lighting being the exception), which may leave some scope for national measures. However, in light of the intent of the Ecodesign Directive and its wording,¹⁰⁹ this scope seems very limited.

The scope for national information requirements on durability and reparability that do not relate to product design as such are more difficult to establish. The Ecodesign Directive does allow for the setting of such information requirements, which may imply that they are intended to be harmonized, but this cannot be established with certainty. National schemes must however be compliant with the Energy Labelling Directive and, more generally, in compliance with Article 34 of the TFEU. The Energy Labelling Directive is most certainly aimed at full harmonization for at least those environmental aspects and issues regulated under the Directive. The Directive is based on Article 194 (under the 'Energy' section) of the Treaty. The wording of Article 194 TFEU, the intent of the Directive, and the fact that the predecessor of the current Energy Labelling Directive was based on the 'internal market' provisions in the old Treaty seem to indicate that full harmonization of labelling is aimed for.¹¹⁰ Current rules, however, only regulate energy, though durability can possibly be considered to fall under its scope, which includes: '... energy and where relevant of other essential resources during use, and supplementary information concerning energy-related products, thereby allowing end-users to choose more efficient products'.¹¹¹

It is questionable if there is any scope for Member States to set up their own labelling schemes on durability. In any case, this scope would most likely disappear

if the proposed Regulation for energy labelling is adopted, as it explicitly aims to include durability in the labelling scheme.¹¹² However, the Commission proposal specifically discusses how the legal proposal is based on Article 194.2 TFEU instead of Article 114 TFEU, as the use of Article 114 could 'unintentionally limit Member States legislating on provision of information on energy-related products that may be complementary to the energy label'.¹¹³ France's consumer protection law on the provision of information on availability of spare parts is mentioned as an example. This seems to imply that the Commission aims to harmonize labelling rules for energy, resources and durability throughout the EEA, whereas there is scope for EEA States to set rules that do not relate directly to the inherent properties of products (e.g., aesthetics, functionality, design), such as the availability of spare parts.

As was discussed previously, consumer warranty practices and rules vary throughout the EEA, and the Norwegian rules discussed in this contribution are therefore hardly controversial. The French rules may be more problematic from an internal market perspective. As discussed above, there seems to be limited scope for national rules on eco-design and durability labelling. But the French rules do not regulate product design and function, nor do they mandate information or make use of a specific labelling scheme. Thus, they seem not to infringe on the EU rules, but can be viewed as a complement, as evidenced by the Commission's comments.¹¹⁴ Further, if one is to consider that environmental protection is the main aim of the French rules, some support for the scheme can be found in secondary law, most evidently in the Waste Framework Directive.¹¹⁵ The waste framework hierarchy outlined in Article 4 of the Waste Framework Directive lends some support to national schemes that promote durability. More interestingly however, Article 29 mandates EU Member States to establish waste prevention programmes, where a link is made to Annex IV of the Framework Directive, which outlines examples of relevant measures. The promotion of eco-design and the promotion of re-use and repair are specifically mentioned in Annex IV.

Still, a relevant question concerns the legality of the French requirements should they be challenged under Article 34 of the TFEU, which states that: 'Quantitative restrictions on imports and all measures having equivalent effect shall be prohibited between Member States'.¹¹⁶ The case law of the Court of Justice of the EU

¹⁰⁸ Ibid.

¹⁰⁹ Directive 2009/125/EC, n. 15 above. Especially *ibid.*, Article 6 lends support to the view that full harmonization is the aim, as it states that the Regulations can state that no eco-design requirements are necessary; this is one way to indicate to EEA States that they should avoid setting national rules on eco-design. Further, the Directive's safeguard clause (*ibid.*, Article 7) provides no support for Member States to restrict the free movement of products unless they are non-compliant with Ecodesign Regulations.

¹¹⁰ See also J.H. Jans and H.H.B. Vedder, n. 106 above, at 86.

¹¹¹ Directive 2010/30/EU, n. 60 above, Article 1.

¹¹² See Energy Labelling Regulation Proposal, n. 62 above, recital 20 and Article 2.20.

¹¹³ *Ibid.*, at 2–3 of the explanatory memorandum.

¹¹⁴ *Ibid.*

¹¹⁵ Directive 2008/98/EC, n. 2 above.

¹¹⁶ TFEU, n. 106 above, Article 34.

shows that Article 34 should be interpreted quite broadly,¹¹⁷ including labelling requirements.¹¹⁸ In Case C-110/05 (*Commission v. Italy*), it was established that:

... measures adopted by a Member State the object or effect of which is to treat products coming from other Member States less favourably are to be regarded as measures having equivalent effect to quantitative restrictions ... Any other measure which hinders access of products originating in other Member States to the market of a Member State is also covered by that concept.¹¹⁹

If the French rules would in practice lead to a situation where foreign manufacturers have a disadvantage on the French market compared to domestic ones, the rules may constitute a potential breach of Article 34. This could for instance be the case if domestic manufacturers are in a better position to provide information about spare parts, and provide spare parts, which could increase retailer and/or customer loyalty to domestic brands. In such a case, Article 36 of the TFEU could still provide a justification for national measures, under certain circumstances.¹²⁰

On the other hand, if the French scheme is considered to be adopted with consumer protection as the main aim, it becomes relevant to discuss its relation to consumer protection law. EU law on consumer protection is a mix of both acts that aim at minimum harmonization and acts that aim at total harmonization. The main benefits of minimum harmonization are that it secures minimum rights for the consumer while allowing Member States to strengthen consumer protection. The main drawback is that practices in EU Member States differ, which forces producers to adopt different business practices throughout the EU.¹²¹ When it comes to sales of consumer goods and warranties, the relevant Directive is a minimum harmonization act.¹²² It means that as long as the EU has not exhausted an issue, Member States should be allowed to adopt legislation. This should be the case for the French scheme as well as for the Norwegian scheme.

It should be noted that national schemes to promote re-use, repair and recycling are usually encouraged by the Commission, both in relation to waste policies and circular economy policies. The French scheme is an example of a policy innovation that may be adopted also by other EEA States, and may in the longer run also lead to similar rules at the EU level. However, the Council has generally welcomed Member State initiatives for the

transition to a circular economy but also cautioned that there must be consistency among European and national approaches.¹²³ Too many diverging national schemes would threaten the proper functioning of the internal market.

Ecodesign and labelling requirements related to durability may be best adopted at the EU level, but a wide range of policy options are still available to Member States. Apart from the ones mentioned here, additional ones may emerge, such as durability criteria applied in public procurement and eco-labelling.

CONCLUSIONS

The various legal approaches discussed in this article show the manifold strategies that can be applied to directly and indirectly promote product durability and reparability. The EU needs to lead the developments to avoid too diverging practices among Member States. The ecodesign regulations for vacuum cleaners and lighting show how durability standards can be set, and with the circular economy Action Plan the Commission has signalled its intent to take further steps to address planned obsolescence in the future.

While ecodesign standards will be developed at the EU level, the national schemes discussed in this contribution show how EU Member States may come up with new initiatives that move policies forward. However, they could also lead to increasingly diverging practices in the internal market. The Commission needs to monitor the situation and reflect on the need for a more harmonized EU legal framework for consumer and environmental protection. In that sense, the adoption by Member States of original ways to combat planned obsolescence may provide a useful impulse for more protective rules at the EU level.

Interestingly, the new legal approaches are based on a lack of faith that market forces will lead manufacturers to develop more durable products. Both manufacturers and consumers have reasons to question their ethical choices regarding production and consumption, but consumers are often locked in and often have limited information about the choices they can make in the market. It is urgent for the society at large to accept the idea that non-durable products would only be viable if we lived in a world with unlimited resources, where the environment was capable of absorbing any harm done to it in good time.

¹¹⁷ See J.H. Jans and H.H.B. Vedder, n. 106 above, at 262–267.

¹¹⁸ ECJ, Joined Cases C-267 and 268/91, *Keck*, [1993] ECR I-6097, at paragraph 15.

¹¹⁹ ECJ, Case C-110/05, *Commission v. Italy*, [2009] ECR I-519.

¹²⁰ See J.H. Jans and H.H.B. Vedder, n. 106 above, 270–273.

¹²¹ Cf. R. Manko, 'Methods for Unifying Private Law in the EU' (European Parliamentary Research Service), at 2–3.

¹²² Directive 1999/44/EC, n. 33 above.

¹²³ Council of the European Union, 'Council Conclusions on the EU Action Plan for the Circular Economy' (Press Release 367/16, 20 June 2016), at 6.

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ARTICLE 5 ‘Towards a Hierarchy of Consumption Behaviour in the Circular Economy’

Authors: E. Maitre-Ekern and C. Dalhammar

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Abstract: In their respective roles as purchasers, users, and dischargers of used products, consumers play an important role in the Circular Economy (CE). In this article, we put forward a ‘hierarchy of consumption behaviour’ to support European Union (EU) policymaking. Among the priorities are to avoid the purchase of single use and unnecessary products, prolong the lifetime of products through maintenance, and engage in repair activities. Moreover, the hierarchy intends to privilege sharing and leasing to buying, and second-hand products to new ones. Finally, consumption in the CE also requires allowing products to re-circulate. Changing consumption patterns is difficult insofar as they are largely determined by the paradigm upon which our economy is built, and enabled by the existing legal framework, most notably EU consumer law. The article contains concrete recommendations to develop EU law and promote the proposed hierarchy.

Towards a hierarchy of consumption behaviour in the circular economy

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Abstract

In their roles as purchasers, users and dischargers of used products, consumers play an important role in the circular economy. In this article, we put forward a ‘hierarchy of consumption behaviour’ to support European Union policymaking. Among the priorities are avoiding the purchase of single-use and unnecessary products, prolonging the lifetime of products through maintenance and engaging in repair activities. Moreover, the hierarchy intends to privilege sharing and leasing to buying and second-hand products to new ones. Finally, consumption in the circular economy also requires allowing products to re-circulate. Changing consumption patterns is difficult insofar as they are largely determined by the paradigm upon which our economy is built and are enabled by the existing legal framework, most notably European Union consumer law. The article contains concrete recommendations to develop European Union law and promote the proposed hierarchy.

Keywords

Circular economy, sustainable consumption, hierarchy of consumption behaviour, EU law, consumer law, policy mix

1. Introduction

A circular economic model is characterized by resource reduction and re-utilization. It is a system in which rates of production and consumption are decreasing, maintenance, repair and re-use prevail and the value of products, components and materials is retained across tight and closed cycles. The circular economy (CE) is meant to achieve a gradual decoupling of economic growth

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from the consumption of finite resources and lead to designing waste out of the system.¹ The CE concept has elements of old and well-established thinking related to resource efficiency and toxic free-material streams, but it also stresses the economic aspects of saving resources and the potential gains it allows for.² Although the European Union (EU) has not yet adopted a formal definition of CE, there are certain generally shared notions of what it means, notably the four building blocks that are deemed vital for the transition to a CE: (i) materials and product design; (ii) new business models; (iii) global reverse networks; and (iv) enabling conditions (namely policies and infrastructure).³

Without policy interventions, the chance of realizing the CE vision is small. Businesses that have, or plan to adopt, a circular business model face a systemic ‘web of constraints’ such as people’s preferences and life circumstances, weakly developed infrastructures and conflicting policies.⁴ The EU Action Plan on the CE outlines existing and new policies in support of this transition with proposals on product design, production processes, consumption, waste management and markets for secondary raw materials.⁵ The breadth and variety of these policies give a sense of the fundamental changes that are required at every level and by every actor in the value chain to realise the CE. The CE agenda also opens up a wide array of legal research avenues of great interest.⁶

The role of consumers in the CE is particularly compelling. Consumers can be seen to be at the centre of the value chain. Indeed, they are the main target of the product supply chain and the starting point of the reverse supply chain. Achieving the goals of the CE will not be possible without their involvement. Consumers contribute to the CE notably by purchasing more durable products, with their readiness to repair items and by properly disposing of waste products. However, the specific role of consumers in the CE is somewhat under-researched. For instance, although there are abundant studies of public procurement for CE, private procurement research is largely absent from the literature.⁷ There are also disparities in the focus areas. The role of consumers in certain sectors or related to certain problems – such as food waste, textiles and electronics and more generally collection and recycling of waste – is quite well researched. Few studies, however, investigate the specific role(s) of consumers as enablers of the CE in spite of engaging prospects. A study on the attitudes of Finnish consumers towards the CE states that

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1. Towards the Circular Economy Vol. 2: Opportunities for the consumer goods sector, Ellen MacArthur Foundation.
 2. A. Murray, ‘The Circular Economy: An interdisciplinary exploration of the concept and application in a global context’, 140(3) *Journal of Business Ethics* (2017), p. 69.
 3. P. Planing, ‘Business Model Innovation in a Circular Economy Reasons for Non-Acceptance of Circular Business Models’, *Open Journal of Business Model Innovation* (2015), http://lup.lub.lu.se/search/ws/files/33914256/MISTRA_REES_Drivers_and_Barriers_Lund.pdf.
 4. Policy mixes for a resource-efficient Europe, POLFREE; C. Westblom, ‘Towards a Circular Economy in Sweden: Barriers for new business models and the need for policy intervention’, IIIIEE Master thesis, Lund University 2015, p. 55.
 5. Commission Communication, ‘Closing the loop - An EU action plan for the Circular Economy’, COM(2015) 614 final.
 6. E. Maitre-Ekern, ‘Present and Future Challenges for Europe’s Environmental Product Policy’, in E. Maitre-Ekern (ed.), *Preventing Environmental Damage from Products - An analysis of the policy and regulatory framework in Europe* (Cambridge University Press, 2018).
 7. See e.g. S. Witjes and R. Lozano, ‘Towards a more Circular Economy: Proposing a framework linking sustainable public procurement and sustainable business models’, 112 *Resources, Conservation and Recycling* (2016), p. 37; C. Leire and C. Dalhammar, ‘Long-term Market Effects of Green Public Procurement’, in E. Maitre-Ekern (ed.), *Preventing Environmental Damage from Products - An analysis of the policy and regulatory framework in Europe* (Cambridge University Press, 2018); L. Milios, Policies for Resource Efficient and Effective Solutions: A review of concepts, current policy landscape and future policy considerations for the transition to a Circular Economy, IIIIEE Lund University.

‘consumers used [CE] services only marginally, but expressed a high likelihood for using such services in the future’.⁸ Another study examined consumer attitudes, motivations and barriers to alternative models of consumption (second-hand, access-based and collaborative consumption) and exposed the crucial role of consumers in the success of new business models: ‘The results demonstrate that consumer attitudes vary greatly to the consumption models and depending on the product group. Attitudes towards buying second-hand furniture and short-term renting are largely positive, while attitudes to long-term renting are negative. Collaborative consumption has higher acceptance for seldom-used products.’⁹

This research gap might be due to that fact that consumers are not seen as powerful market actors. In the eyes of lawmakers, consumers are traditionally the weaker part in a contractual relationship, requiring special protection against the seller. Moreover, consumer protection as an EU policy objective has not developed under the aegis of sustainable development (including environmental, social and economic elements), but as part of the establishment of an internal market that aims at economic development. Because today’s consumer law continues to reflect this paradigm, its objectives may contradict those of the CE. Questioning the current throwaway model of the ‘linear economy’, with a view to triggering consumption changes, encouraging the purchase of durable products and use of repair services, also requires us to investigate the basic postulates of the existing legal framework for consumer protection.

In this contribution, we discuss the role of consumers in the CE and more specifically the many roles that individuals need to embrace in shaping sustainable production and consumption models. We begin by framing the topic. We introduce the CE objectives and main policy developments before outlining the various roles of consumers and users in the CE and review current orientations for sustainable consumption policies (Section 2). We then propose a hierarchy of consumption behaviour in line with the CE objectives, explain the rationale behind this prioritization and provide some directions for its application. The section ends with a presentation of some of the main barriers to the hierarchy, especially consumption behaviours, market and legal barriers (Section 3). The ensuing section addresses the current paradigm underlying consumer protection policy and law and discusses how it conflicts with environmental protection requirements as put forward notably by the Treaty on the Functioning of the European Union (TFEU).¹⁰ A change of paradigm is not unreasonable, we argue, but requires legal intervention (Section 4). We therefore propose various legal measures to promote the hierarchy of behaviour at EU level. They show how complementary policies can form a powerful and valuable mix in efforts to realize the highest priorities of the hierarchy, namely to avoid, maintain and repair (Section 5). The article ends with a summary of the main findings and a short discussion about current and possible new policies (Section 6).

8. M. Antikainen, Towards Circular Economy Business Models: Consumer acceptance of novel services, Proceedings from SPIM Innovation Summit Brisbane.

9. E. Gullstrand Edbring, ‘Exploring Consumer attitudes to Alternative Models of Consumption: Motivations and Barriers’, 123 *Journal of Cleaner Production* (2016), p. 5.

10. Consolidated version of the Treaty on the Functioning of the European Union, [2012] OJ C 326/47.

2. The CE and the role of consumers

A. CE goals and lifecycle thinking

The reason for establishing a *circular* economic model as opposed to a *linear* one is to achieve overall long-term preservation of the environment. The current model of production and management of resources that seeks to promote short-term overconsumption of new products is unsustainable. Its impacts in terms of resource depletion, environmental degradation and waste generation are threatening the planet's limits and, indeed, human survival.¹¹

Sustainable production and consumption require the introduction of several interrelated strategies and policies. The regulation of products is a central part of this process. A holistic approach is required in relation to products, aiming to minimise environmental effects throughout their life cycle. In many ways, product regulations are key to reaching sustainability objectives. Perez has identified the regulation of products to incentivize durability and maintenance and making producers responsible for the entire lifespan of their products as key measures to promote the CE and manufacturing durability, as well as stimulating the growth of a rental and maintenance economy.¹²

In the last few decades, 'life-cycle thinking' has grown in importance in EU environmental law.¹³ The EU and its Member States are increasingly adopting product regulations looking at products in their entirety rather than specific processes. Policies promoting product design and content, handling of waste products, product taxes and taxes on repair activities all affect the life-cycle performance of products and can affect consumption patterns in different ways.

Early product policies and laws mainly addressed: (i) chemicals in products; (ii) collection and recycling of used products; and (iii) energy efficiency of products. We now see new policies emerging that address conflict minerals, product durability and reparability.¹⁴ There is a lot of 'experimentation' regarding CE-related policies at the national, regional and local levels, where new practices include the set-up of re-use centres at recycling stations, the criminalization of planned obsolescence and public procurement of manufactured goods. These types of policies are very different in nature and include mandatory requirements, as well as market-based approaches. Interestingly, some of the recent policies clearly signal that markets cannot be trusted to deliver durable products even if consumers want them and that public intervention is needed. We can also see that governments are starting to take serious action and to pose specific questions to corporations suspected of undertaking measures that may shorten the lifespan of products.¹⁵ A case that has received a lot of media attention is the probe of French and US prosecutors into whether Apple's iPhones show evidence of planned

11. See W. Steffen, 'Planetary boundaries: Guiding human development on a changing planet' 347 *Science* (2015), 1259855.

12. C. Perez, 'Capitalism, Technology and a Green Global Golden Age: The role of history in helping to shape the future', in M. Jacobs and M. Mazzucato (eds.), *Rethinking Capitalism* (Wiley Blackwell, 2016); see also J. Hojnik, 'Ecological Modernization through Servitization: EU regulatory support for sustainable product-service systems', 27 *RECIEL* (2018), p. 1.

13. C. Dalhammar, 'The Application of 'Life Cycle Thinking' in European Environmental Law: Theory and practice', 12 *Journal for European Environmental & Planning Law* (2015), p. 97.

14. M. Faure and C. Dalhammar, 'Principles for the Design of a Policy Framework to Address Product Life Cycle Impacts', in E. Maitre-Ekern (ed.), *Preventing Environmental Damage from Products - An analysis of the policy and regulatory framework in Europe* (Cambridge University Press, 2018).

15. E. Maitre-Ekern and C. Dalhammar, 'Regulating Planned Obsolescence: A Review of Legal Approaches to Increase Product Durability and Reparability in Europe', 25 *RECIEL* (2016), p. 378.

obsolescence.¹⁶ The signals governments are sending to the market are important and will probably trigger changes in industrial practices such as standardization, where product durability may become more important.

Lately, policymakers have also shown growing interest in addressing consumption behaviours more directly, by means of longer mandated consumer warranties (EU and national rules),¹⁷ promoting the availability of spare parts (France)¹⁸ and supporting repair services through tax reductions (Sweden).¹⁹

B. Outlining the various roles of consumers in the CE

In the official documents and research related to the CE and the sharing economy (SE),²⁰ we can discern different roles for the individuals who engage in consumption activities. Depending on the context, they can be labelled *inter alia* as ‘consumers’, ‘users’ or ‘peers’.²¹ In relation to the CE objectives, expectations on users are often expressed in normative terms: they are expected to be well informed and make purchasing decisions either through motives of self-interest or to support other preferences. In the documents, we see the expectations of users in their various ‘roles’. Examples of such ‘roles’ and activities that can support the CE and the SE are outlined in Table 1 below.

Although the table is merely a preliminary attempt to categorize the different roles that consumers may come to play in the CE, it offers nonetheless a useful account of the wide range and importance of their potential contribution. It is important to remember that markets and society are in a state of flux, not least given the surge in sharing and digitalization. Those roles are therefore likely to further evolve and develop and the exercise of mapping will need updating.

The law needs to recognize new circumstances and consumption patterns and adapt accordingly. Consumer law, in particular, originated from the traditional role of individuals purchasing new goods,²² but new forms of use and consumption (such as peer-to-peer (P2P) transactions) require new rules. Moreover, consumers cannot keep being considered merely as the vulnerable party that needs protecting, but as an agent of change, whose behaviour will make a difference in the struggle for sustainability.²³

16. See e.g., BBC, ‘Apple investigated by France for ‘planned obsolescence’, *BBC* (2018), www.bbc.com/news/world-europe-42615378; *Drantiv v. Apple Inc.*, 1:17-cv-07480, N.Y. Eastern District 2018; *Mailyan v. Apple Inc.*, 2:17-cv-09192, Cal. Central District Court 2018.

17. See Commission Communication, ‘A New Deal for Consumers’, COM(2018) 183 final.

18. See Code de la consommation (version consolidée au 18 mai 2019), Article L. 111-3.

19. Sweden has lowered the value added tax (VAT) for some types of repair businesses and allow consumers to make tax deductions for some repairs. A more fundamental tax deduction for leasing and repair activities has recently been proposed; see the Swedish government’s report: O. Alterå, *Från värdekedja till värdecykel - så får Sverige en mer cirkulär ekonomi*, Miljö- och Energidepartementet.

20. The SE is discussed and explained in Section 2.3.4 below.

21. In EU policy documents, the term ‘consumer’ is used in the CE context and ‘user’ for the collaborative economy. The Ellen MacArthur Foundation makes the distinction between ‘consumers’ as part of the biological cycle and ‘users’ of the technical cycle, see n 1. In this paper, we use the term ‘consumer’ broadly to encompass all individuals engaged in non-professional consumption, including, e.g. P2P transactions, and ‘users’ to refer specifically to consumers purchasing services rather than products.

22. And, of course, services, though consumer law has traditionally struggled with providing equal rights to consumers of services and consumers of products.

23. Consumer law expressly excludes non-professional sellers from its scope, and hence P2P transactions, see e.g. Directive 1999/44/EC on certain aspects of the sale of consumer goods and associated guarantees [1999] OJ L 171/12, Article 1(2)(a).

Table 1. Attempted mapping of the ‘roles’ of consumers in the CE.

Main role	Main potential activities/interests that can support the CE
Purchaser	<ul style="list-style-type: none"> • Avoiding purchasing unnecessary items • Rewarding circular business models in their purchasing decisions • Making use of product labels, information and look for missing information • Optimizing the product choice • Purchasing re-used and second-hand products as alternatives to new products • Leasing instead of buying products and services • Focusing on the services instead of the products • Buying durable, high-quality products • Buying products for which spare parts are available
Maintainer	<ul style="list-style-type: none"> • Avoiding replacing products that work • Prolonging the life of products (proper use; maintenance; updates)
Repairer	<ul style="list-style-type: none"> • Preferring repair to buying new • Engaging with own repairs when possible (DIY); communities (for example, repair cafés) • Taking part in repair workshops etc.
Seller	<ul style="list-style-type: none"> • Avoiding throwing away items that can be sold or re-used
Sharer and collaborator	<ul style="list-style-type: none"> • Prioritizing sharing schemes over leasing or buying • Engaging with P2P schemes enabling sharing of resources
Engaging with waste sorting and re-use	<ul style="list-style-type: none"> • Handing in items for re-use rather than recycling • Ensuring waste is sorted and collected properly

CE: circular economy; DIY: do-it-yourself; P2P: peer-to-peer.

C. Overview of consumer-oriented policies in the CE

When it comes to CE policies directly aimed at consumers, we can identify four main trends: (i) informing consumers through labelling and signage in stores; (ii) giving economic incentives to promote certain behaviour through taxation and price adjustments; (iii) empowering consumers through reinforced rights to complain and possibilities to undertake repair; and (iv) enabling new forms of consumption notably not ownership based. Here, we briefly introduce these trends before discussing the necessary policy mix and investigating specific policies in Section 5 below.

1. Information

The issue of information is a challenging one. The EU CE Action Plan states that consumer choice is ‘shaped by the information to which consumers have access, the range and prices of existing products, and the regulatory framework’.²⁴ Targeting consumption patterns through information disclosure has become a classical approach to environmental protection regulation.²⁵ Indeed, environmental labels have flourished in recent decades at European, regional and national levels with varied aims, content and levels of trustworthiness.²⁶ Generally, it is important consumers

24. Commission Communication, ‘Closing the loop - An EU action plan for the Circular Economy’, COM(2015) 614 final.

25. E. Maitre-Ekern, ‘The Choice of Regulatory Instruments for a Circular Economy’, in K. Mathis and B. Huber (eds.), *Environmental law and economics* (Springer, 2017).

26. E.g. the EU Ecolabel, EU energy labels, the Nordic Swan (Nordic countries), or the Blue Angel (Germany).

easily understand and trust the labels, which requires monitoring of the adequacy of the standards set under the labelling schemes.²⁷

There is a lot of discussion at the EU level on the need for a consumer label on expected lifetime, allowing consumers to benchmark products on the market for durability.²⁸ This type of label could be mandatory or voluntary; a mandatory label would of course have a greater effect in the market and could trigger innovation among manufacturers to compete for durability. In any case, designing such a label is complex for several reasons, including:²⁹ (i) consumers may have different ideas on what ‘durability’ entails and it may differ between consumer segments and product groups; (ii) for some product groups, such as lighting, durability has many dimensions (for example, switching cycles, colour and luminous flux); (iii) for very durable products it is hard for market surveillance authorities to establish whether the manufacturers’ claims are true; unless there is an access to ‘stress tests’, the only way to see how long a product lasts is to test it continuously for years; (iv) the durability of the product is not only linked to the design as such; access to spare parts at a reasonable cost is equally important; (v) durability may vary depending on the product usage (frequency; conditions of use and storage; maintenance).

2. Economic incentives

Products made from low-quality materials requiring frequent replacement are typically cheaper upfront compared to high-quality, longer-lasting items. For consumers who only see the sales price, the first category of products would clearly appear more attractive.³⁰ Yet the long-term economic cost of repetitive purchases could rapidly exceed that of a one-time, expensive acquisition. The same holds true of the long-term cost of purchasing cheap energy-intensive equipment against something more expensive and efficient. Consumers may find it difficult to make such calculations upon purchase. Moreover, prices of new products are often so low that the comparative advantage of repairing existing products or purchasing re-used or remanufactured is not an attractive option. The environmental cost of manufacturing a product from scratch is nevertheless in most cases higher than any recovery treatment.³¹ Beyond awareness-raising campaigns and labelling, economic incentives could help prevent unsustainable products from appearing more economically advantageous, and new products from being a worthwhile choice.

Internalizing the environmental costs of products and reflecting them in the price is one way to influence purchasing decisions. From the perspective of the CE, high taxes on materials and low taxes on labour are key to the solution, as they would support product durability and repair (as repair is labour intensive). However, there is no common tax policy in the EU. Current national tax

27. M. Faure and C. Dalhammar, in E. Maitre-Ekern (ed.), *Preventing Environmental Damage from Products - An analysis of the policy and regulatory framework in Europe*.

28. ENDS Europe, ‘UBA Calls for Product Resource Efficiency Policies’, *ENDS Europe* (2016), <https://www.ends europe.com/article/45200/uba-calls-for-product-resource-efficiency-policies>; C. Montalvo, A Longer Lifetime for Products: Benefits for Consumers and Companies, European Parliament Directorate-General for Internal Policies.

29. C. Dalhammar and J. Luth Richter, ‘Options for Lifetime Labeling: Design, scope and consumer interfaces’, 9 *PLATE: Product Lifetimes and the Environment* (2017), p. 461.

30. For an overview see e.g. J. Kaenzig and R. Wustenhagen, ‘The Effect of Life Cycle Cost Information on Consumer Investment Decisions Regarding Eco-Innovation’, 14 *Journal of industrial ecology* (2010), p. 121; C. Dalhammar, ‘Energy Efficiency Regulations, Market and Behavioural Failures, and Standardization’, in E. Maitre-Ekern (ed.), *Preventing Environmental Damage from Products - An analysis of the policy and regulatory framework in Europe* (Cambridge University Press, 2018).

31. For an overview, see e.g. Promoting Remanufacturing, Refurbishment, Repair, and Direct Reuse, European Commission.

systems and the international trading system provide incentives that are quite different: whereas new products are made in countries with low taxes and raw materials are cheap, taxes on labour are high in advanced economies, inhibiting willingness to repair in these jurisdictions. Some countries are exploring other tax policies, such as exemptions for certain economic activities (such as repair), or deductions for consumers who engage in repair, sharing or second-hand trading.³² One could also examine the practicability and potential benefits of introducing consumption taxes. This, however, is beyond the scope of this article.

3. Consumer protection

Traditionally, consumer protection legislation seeks to protect consumers against abuse. For instance, legal guarantees protect consumers against faulty products. From an environmental perspective, these guarantees can incentivise producers to prolong product lifetime and consumers to go for repair instead of discarding broken items. This is not the case today because of insufficient legal provisions and high market constraints.

Nowadays, when a product breaks during the guarantee period, consumers can choose between repair and replacement. While consumer organizations appear unwilling to compromise on the consumer's freedom of choice,³³ the result of this freedom adversely affects efforts to realise the CE. Replacing a faulty product with a new one usually has a much greater environmental impact than repairing it. The product may end up as waste even before it has started its useful life. Moreover, current business models still tend to favour the production of new products at the least cost. Because producers do not have an obligation (or even many incentives) to facilitate product repair, that option may not be available at all, for instance if the product cannot be disassembled without damaging it or if spare parts are not available. In Section 4, we discuss in more detail the tension and conflict between environmental protection and EU law on consumer protection.

4. New forms of consumption

The discussion of the role of consumers in the CE is inevitably entangled with the activities of consumers in the SE, where they are more frequently referred to as 'users' or 'peers'. The two concepts – CE and SE – have slightly different origins. Where the first is anchored in sustainability, the second does not necessarily pursue any environmental objective per se. The main SE focus has been on the organization of economic activity. The SE is a 'market-oriented' policy field, whereas CE is 'sustainability oriented'. The SE has, however, significant – but difficult to calculate – potential to achieve resource savings. Exchanges and leases between individuals have clear direct environmental benefits: secondary markets reduce demand for new goods.³⁴ So when consumers opt for repairing, sharing, swapping and leasing items within the SE, their activities can promote the CE and 'sustainable consumption' more broadly.³⁵

32. E.g. O. Alterå, *Från värdekedja till värdecykel - så får Sverige en mer cirkulär ekonomi*, Miljö- och Energidepartementet.

33. At a conference at Leuven University in May 2018, a representative from BEUC stressed her organisation's opposition to any limitations to consumer freedom of choice.

34. J. Schor, 'Debating the Sharing Economy', *Great Transition Initiative* (2014), www.greattransition.org/publication/debating-the-sharing-economy.

35. See e.g. O. Mont and C. Dalhammar, 'Public Policy for Sustainable Consumption' in S.J. Evans (ed.), *Public Policy Issues Research Trends* (NOVA Publishers, 2014).

Similarly, purchasing a service instead of a product is also considered an effective way of encouraging sustainable consumption patterns.³⁶ It is argued that service-oriented consumption³⁷ could bring about sustainability benefits by breaking the link between profit and production volume.³⁸ Among the potential benefits are the increased incentives to prolong the useful life of products, since this is what firms make their money from when leasing out products, as opposed to the sale price of that product.³⁹ Other possible sustainability gains are the reduction in resource consumption, enhanced efficiency in use, increase in repair activities and increased amount of materials re-used.⁴⁰

The relationship between the new consumption patterns and sustainability is not, however, that straightforward. With regards to real-life service provision, Corvellec and Stål argue that it is anything but immaterial because it involves a product or activity that necessarily requires the consumption of natural resources and the production of waste.⁴¹ Both sharing and service-based activities can negatively affect the environment albeit providing economic benefits, notably as a result of consumption behaviour (see Section 3.C.1 below).⁴² Ensuring the sustainability of new models requires consideration of the environmental benefits not only upon their creation but also during their implementation.⁴³

The European Commission is generally positive towards new models of consumption. The communication on the ‘collaborative economy’ (terminology used for referring to the SE) focuses solely on the social and economic components of sustainability. It discusses the consequences on consumer protection and labour law of having atypical actors participating on the market. It also stresses the need to carefully consider tax rules.⁴⁴ Thus, the policies advocated for the SE are quite different from those usually stressed in CE policy documents, though they sometimes overlap. Consumer guarantees are, for instance, relevant in both policy areas, but the objectives are clearly distinct: whereas the first seeks to protect consumers against sales abuse, the second aims at using the legal rules to promote product durability and reparability.

36. W. Stahel, ‘The Product-Life Factor’, in S. Grinton Orr (ed.), *An Inquiry into the Nature of Sustainable Societies: The role of the private sector* (Houston Area Research Center, 1982).

37. This trend is strongest in the business-to-business (B2B) sector, however it is also growing in the business-to-consumer (B2C) sector, e.g. car leasing. For companies, going from selling products to selling services entails both risks and opportunities, see e.g. M. Lindahl, ‘Business Implications of Integrated Product and Service Offerings’, *17th International Conference on Engineering Design* 4 (2009), p. 71.

38. N. Bocken, ‘A Literature and Practice Review to Develop Sustainable Business Model Archetypes’, 65 *Journal of Cleaner Production* (2014), p. 42.

39. A. Tukker, ‘Product Services for a Resource-Efficient and Circular Economy: A review’, 97 *Journal of Cleaner Production* (2015), p. 76, 79.

40. N. Bocken, ‘A Literature and Practice Review to Develop Sustainable Business Model Archetypes’, 65 *Journal of Cleaner Production* (2014).

41. H. Corvellec and H. Stål, ‘Evidencing the Waste Effect of Product–Service Systems (PSSs)’, 145 *Journal of Cleaner Production* (2017), p. 14; J. Hojnik, 27 *RECIEL* (2018), p. 4.

42. A. Barquet, ‘Sustainability Factors for PSS Business Models’, 47 *Procedia CIRP* (2016), p. 436.

43. For a broader review of the concept and its relation to other concepts and various laws see e.g., J. Hojnik, 27 *RECIEL* (2018).

44. Commission Communication, ‘A European agenda for the collaborative economy’, COM(2016) 356 final.

Figure 1. Hierarchy of consumption behaviour in the circular economy (CE).

3. A hierarchy of consumption behaviour

A. Establishing the priorities

The Waste Framework Directive establishes a waste management hierarchy (WMH) that prioritizes waste prevention over preparation for re-use, followed by recycling, energy recovery and finally landfilling.⁴⁵ We contend that the first priority – waste prevention – needs to be expanded and clarified. Therefore, we propose developing that priority into an own ‘hierarchy of consumption behaviour’ (see Figure 1)⁴⁶ that shall complement the WMH. Similar to the WMH, which is binding and applies ‘as a priority order in waste prevention and management legislation and policy’,⁴⁷ the consumption hierarchy is meant to guide and constrain future product-related policy-making and contribute to realizing the CE.

At the top of the hierarchy, avoiding the purchase of single-use and unnecessary products may seem provocative. It is not. If the CE is to optimize resource utilization and prevent waste production, then low-quality, short-lived products must eventually disappear from the shelves. Their environmental impact throughout their life cycle is too great (in particular at the production stage and through waste pollution) and the potential to minimise that impact – mainly through cascading – is too limited. These products are inherently unsustainable and have no place in a CE. The harmful potential of some of those products is so great that the EU had proposed banning them.⁴⁸ Single-used plastics, such as cutlery and straws, constitute 70% of marine litter and are responsible for killing millions of sea birds and marine animals each year.⁴⁹ A policy related to avoidance cannot be based upon voluntary measures only, but should include legislation. For

45. Compare Directive 2008/98/EC on waste and repealing certain Directives, [2008] OJ L 212/3, Article 4(1).

46. This hierarchy was first developed by E. Maitre-Ekern and C. Dalhammar, ‘Consumers in the Circular Economy: A Scandinavian Perspective’, *Conference Consumer in the Circular Economy* (2018).

47. WFD, Article 4(1).

48. Commission Proposal, ‘Proposal for a Directive on the Reduction of the Impact of Certain Plastic Products on the Environment’, COM(2018) 340 final.

49. Commission Press Release, ‘Single-use plastics: New EU rules to reduce marine litter’, COM(2018) IP/18/3927.

instance, banning single-use plastics and certain kinds of packaging, imposing durability and reparability requirements, or introducing an environmental tax on products.

Repair and maintenance are also key to the success of the CE. Their second place in the hierarchy stems from the rationale that consumers today already own many items and should first and foremost aim to prolong their lifetimes rather than replace them with new products. Products naturally wear down with use, they become outdated (especially technologically), they sometimes have inbuilt faults, or certain components have a shorter lifetime than the entire device. By repair and maintenance, consumers seek to retain or restore products to a desired level of performance to continue using them. For example, upgrading existing appliances when necessary instead of buying a newer model, or changing the depleted battery of otherwise well-functioning electronic equipment. Policies supportive of repair and maintenance are typologically quite different and include consumer guarantees, eco-design requirements and lower taxes for repair services. It should be noted that the repair potential – both technical and economic – is usually greater for a high-quality product, thus linking the strategy to purchase high quality to repair.

As of 2018, there were about 300 million vehicles on European roads, or one for every two people.⁵⁰ Every household owns an increasing number of appliances. A UK study from 2010 showed that households owned on average 41 electrical products (not including lighting).⁵¹ Each of them consume energy. In 2016, European households used on average 5% of their total consumption expenditure on clothing and footwear, representing a total expenditure of €395.4 billion.⁵² The wide variety of products on the market and their affordability, coupled with steady population growth, are negatively impacting the environment. Individual ownership of an increasing number of items is unsustainable. Sharing products appears a possible alternative to individual purchasing. This is not true in every case, because some items simply cannot be shared, such as mobile phones, or because of geographical distances. In Europe, however, around 75% of the population lives in urban areas, so opportunities to share are high. Cars are a definite example of shareable goods, as are garden tools.

Going one step further in challenging individual ownership, we put a call for the leasing of high-quality products as the fourth priority. Moving away from ownership, this form of consumption consists of purchasing the service of a product rather than the product itself. As discussed in Section 2.C.4, leasing's sustainability cannot be taken for granted. Yet good leasing arrangements – through P2P platforms or as part of a business model – appear to offer greater opportunities to reach sustainable consumption levels. The main benefit of leasing compared to sales is that manufacturers have incentives to design durable, upgradeable products, as they do not make money from each sale but from keeping a product functional for a long time.

In our view, the purchase of products needs to be divided into two separate priorities. Consumers should aim primarily to buy second-hand or remanufactured products rather than new ones.⁵³ Upon purchase of new products, priority should then be given to quality, durability and energy efficiency over products of poorer quality. This will also strengthen the repair potential.

50. Eurostat, 'Passenger Cars in the EU', *Eurostat* (2018), ec.europa.eu/eurostat/statistics-explained/index.php/Passenger_cars_in_the_EU.

51. P. Owen, Powering the Nation: Household electricity-using habits revealed, Energy Saving Trust.

52. Household spending on clothing and footwear close to €400 billion, *Eurostat* (2018), ec.europa.eu/eurostat/web/products-eurostat-news/-/DDN-20180103-1?inheritRedirect=true.

53. For example, the sales of remanufactured computers and smartphones are growing, though they still constitute a small quantity of the total market. Some Swedish municipalities procure remanufactured computers in larger quantities. This

Finally, and this last priority is where the consumption hierarchy joins and overlaps the WMH, products must recirculate. This requires consumers to refrain from discarding items they no longer want, but instead sell or pass them on for re-use, or explore the possibilities of returning them for remanufacturing or recycling. We need to stop seeing recycling as a positive activity per se: although it is better than landfilling and incineration, it should still be a last resort. Recycling too often implies ‘downcycling’, namely producing products of lower quality than the original. Consumers should avoid whenever possible discarding products as residual, unsorted waste. There are a lot of initiatives around Europe to divert products and materials from recycling to re-use, including municipal re-use parks and public procurement of remanufactured furniture and ICT products.⁵⁴

B. Aim and implication of the hierarchy

Introducing this hierarchy shall mandate policymakers to prioritise action areas and the adoption of measures that support these stated priorities. At the same time, it informs consumers about how they can best support sustainable consumption. With regards to policymakers, applying the hierarchy requires laws and policies that enable and encourage behaviour reflecting the priorities. Consequently, measures promoting the purchase of long-lasting, expensive and repairable high-quality products should be adopted, as well as widening access to and expanding repair activities. Examples of such policies are discussed in Section 5. Other policies should also aim at ensuring the sustainability of product sharing and leasing and encouraging second-hand purchasing.

The hierarchy of consumption behaviour shall be binding on policymakers as in the case of the WMH, but not absolute.⁵⁵ Various circumstances could affect the order of priorities. For instance, if a second-hand product pollutes much more or is more energy intensive than a new one, the benefit of keeping it is cancelled out by the environmental impacts. Another example of the limitations of the hierarchy relates to sharing and lending activities. Although they are labelled high priorities, one cannot assume they are necessarily better than purchasing in all cases. Earlier, we warned of the potentially negative environmental impacts of the sharing and service economies. The behaviour of consumers as ‘sharers’ and ‘lenders’ may also bring these activities into conflict with the CE (see Section 3.C.1). Like the WMH, the hierarchy should privilege the best overall environmental outcome over a strict application of the priorities. It may also be very difficult in practice to design policies applicable to all products and every market. Different strategies may be needed for specific product and service categories to accommodate the reality of the market and people’s willingness to take part in it. We do not, however, advocate policies that ‘force’ consumers to share if they do not want to, or in other ways compel them to move up the hierarchy. Rather, we recommend policies that make it more attractive – economically and in other ways – to move up the hierarchy.

allows to halve the total IT budget and the product quality is deemed sufficient for most uses; compare M. Öhgren, ‘Upphandling av rekonditionerade kontorsmöbler - En strategi för att stärka utvecklingen mot en cirkulär ekonomi’, *Lund University MSc Paper* (2017).

54. See E. Maitre-Ekern and C. Dalhammar, *Conference Consumer in the Circular Economy Conference* (2018); M. Faure and C. Dalhammar, in E. Maitre-Ekern (ed.), *Preventing Environmental Damage from Products - An analysis of the policy and regulatory framework in Europe*.

55. In fact, the priorities set out in the waste management hierarchy are not absolute either; deviations are allowed if motivated by life-cycle thinking; compare WFD, Article 4(2).

One weighty objection to the hierarchy will doubtless come from consumer protection advocates as unduly affecting the basic policy principle of consumer choice. This opposition goes to the core of the consumer protection paradigm and its development in line with the linear and throw-away economic model. In Section 4, we discuss and challenge this philosophy, and argue that new ways of thinking are required if we are to move towards a sustainable CE.

C. Barriers to promoting the hierarchy

1. Consumers and consumption behaviours

Consumers are very volatile and complex market actors. Motivations behind consumer choices are manifold and may vary with time and circumstances. A recent study by Deloitte concluded that the lack of interest and awareness of consumers constitutes the main barrier to the CE.⁵⁶ Environmental considerations may prompt some consumers to favour products that are (or appear) more sustainable, but even consumers who care for the environment may take harmful decisions given their circumstances and need to balance other social needs, notably health, housing and education.⁵⁷ Moreover, consumers are traditionalists and tend to purchase the same bulk of items every time.⁵⁸ Changing these preferences in favour of less harmful products and more sustainable purchasing habits is deemed a particularly challenging task. Consumers who may be willing to consume more sustainably are often, according to Sanne, ‘locked in by circumstances’ and unable to engage in more sustainable consumption practices even if they want to.⁵⁹

In spite of them being seen quite favourably in the CE context, the new consumption models spurred by digitalization may actually lead to unsustainable behaviour. The indirect environmental impacts of participating in the SE should not be underestimated and must be accounted for. An important challenge facing the SE is the risk of indulging consumption, in particular of ‘concerned’ consumers. The negative environmental impacts of P2P exchanges are increasingly documented.⁶⁰ These practices prompt overconsumption not least because environmentally conscious consumers are more likely to indulge when using second-hand P2P platforms. For the mainstream consumer, it is more tempting to buy unnecessary items because of the lower price on secondary markets or because of the capacity to resell them easily.⁶¹ Moreover, rebound effects occur through purchasing additional items because of the ‘savings’ from buying second hand.⁶² Similarly, private sellers and leasers are likely to spend the money earned to buy other items.⁶³

56. J. Kirchherr, ‘Breaking the Barriers to the Circular Economy’, *Deloitte* (2017), <https://www.uu.nl/en/files/breaking-the-barriers-to-the-circular-economy-white-paperwebpdf>.

57. E. Maitre-Ekern, in K. Mathis and B. Huber (eds.), *Environmental law and economics*;

B. Field and M. Field, *Environmental Economics: An introduction* (6th edition, McGraw-Hill, 2013), p. 4.

58. J. Schneider and J. Hall, ‘Why Most Product Launches Fail’, 11 *Harvard Business Review* (2011).

59. C. Sanne, ‘Willing consumers—or locked-in? Policies for a sustainable consumption’, 42 *Ecological Economics* (2002), p. 273.

60. B. Parguel, ‘Sustainability of the Sharing Economy in Question: When second-hand peer-to-peer platforms stimulate indulgent consumption’, 125 *Technological Forecasting and Social Change* (2017), p. 48.

61. B. Parguel, 125 *Technological Forecasting and Social Change* (2017).

62. V. Peugeot, ‘Partager pour Mieux Consommer? Enquête sur la consommation collaborative’, 7 *Esprit* (2015), p. 19.

63. J. Schor, ‘Debating the Sharing Economy’, *Great Transition Initiative* (2014), www.greattransition.org/publication/debating-the-sharing-economy.

Besides, studies show that consumers tend to be less careful when using rented, leased or shared products than products they own.⁶⁴ Intlekofer et al. note that consumers prefer 'to buy new products after only a few years of use'.⁶⁵ Because of rapid technological improvements, some products, such as computers and mobile phones, have a user-preferred lifetime that is much shorter than their actual functioning lifetime.⁶⁶ The increase in leasing contracts does not appear to have altered this trend. On the contrary, it may lead to even more rapid return of products to the service provider than would be the case with purchased products because it may be both easier and cheaper. Yet, re-use can prove difficult, if not impossible, for those very products for which innovation is taking place at such high speeds, hence undermining the very foundation of the product-service economic model.⁶⁷ Interestingly, however, mandatory requirements about product durability could encourage industries to change business models towards leasing.⁶⁸ Thus, the sustainability of product-service contracts might depend not on the model itself, but on legal requirements about product characteristics.

Analysing consumer behaviour through the lens of behavioural economics would be very interesting and indeed useful when developing accompanying measures and changing the consumption paradigm. These issues are, however, beyond the scope of this article.

2. Market barriers

There are other important barriers to promoting the hierarchy that are independent of consumption behaviours but come from the market itself. The lack of clear and useful information about products is a particularly important problem. It prevents consumers from making enlightened choices and being able to communicate their preference, for example for more durable products. More and more, consumers are overloaded with unnecessary or unreliable information and even false claims (greenwashing).⁶⁹

The throwaway society that developed following the industrial revolution is driven by the idea that what is new is good and what is used or broken must be thrown away. Linear business models are producing short-lived and cheap products, effectively hindering the aims of the CE. The premature obsolescence of products, whether intentional or not, may result from design measures, use of low-quality materials, technical and psychological outage to name a few.⁷⁰ Mainstream industries continue to view the sale of new products and accessories as their main business and have little interest in providing cheap and easy updates or enabling repairs on which they might not make money. Typical CE activities related to maintenance and repair, re-use and recycling prove often impossible or simply too costly and troublesome for consumers in comparison to tossing aside older products to buy new ones. Moreover, there is increasing evidence that some companies

64. A. Barquet, 47 *Procedia CIRP* (2016); T.C. Kuo, 'Simulation of Purchase or Rental Decision-Making based on Product Service System', 52 *The International Journal of Advanced Manufacturing Technology* (2011), p. 1239.

65. K. Intlekofer, 'Energy Implications of Product Leasing', 44 *Environmental Science Technology* (2010), p. 4409, 4414.

66. *Ibid.*, p. 4411.

67. A. Tukker, 97 *Journal of Cleaner Production* (2015), p. 89.

68. C. Dalhammar, 'Industry Attitudes towards Ecodesign Standards for Improved Resource Efficiency', 123 *Journal of Cleaner Production* (2016), p.155-166.

69. Commission Communication, 'A European Consumer Agenda - Boosting confidence and growth', COM(2012) 225 final.

70. G. Slade, *Made to Break: Technology and obsolescence in America* (Harvard University Press, 2007); E. Maitre-Ekern and C. Dalhammar, 25 *RECIEL* (2016).

deliberately discourage and hinder such operations, for instance by preventing disassembly (using glue or proprietary screws) and not making spare parts (in particular batteries, which are known as having a shorter lifespan than other electronic devices), special tools or manuals available.⁷¹

Consumer interest in repair is growing,⁷² and initiatives to enable own and independent repair – such as iFixit – are flourishing. However, consumers still face various obstacles to undertaking repair, not least the availability and cost of spare parts.⁷³ At present, manufacturers do not have an obligation to produce or supply spare parts. The General Court of the EU recently found that refusal to provide spare parts to independent repairers was not a breach of competition law.⁷⁴ But even when spare parts are available, the price of a new product in comparison to that of the replacement part often discourages consumers to pursue repair. Alternatively, spare parts may be useless if the product cannot be disassembled. The use of proprietary screws, non-removable batteries and similar procedures can impede repair. Fashions such as ‘slim and sleek’ result in the use of encased batteries and non-visible screws, making products more difficult to disassemble and repair while increasing the likelihood of damaging them.⁷⁵

3. Legal barriers

Various barriers to the hierarchy can also be found in the law. There are various barriers to accessing repair. For example, several IP regulations, such as copyright and patent laws, contain repair-related restrictions that may compromise their access.⁷⁶ Similarly, sales contracts between producers and end-users may contain clauses specifically forbidding unauthorized repair or modification, the disassembly of software-enabled products, or the use of unlicensed spare parts. Whether these clauses are valid will depend on contract law, which remains largely a national issue with a great variety of national approaches.⁷⁷ Although very important, we will not discuss these legal barriers in more detail in this article as they are not directly relevant to our analysis and legal recommendations. We refer to the work of Svensson et al. for further discussions on the matter.

Of more relevance are the legal barriers found in consumer law. Provisions contained in consumer legislation may indeed clash with the hierarchy either because the protection granted to consumers is not sufficient to promote sustainable choice (for example, too short legal guarantees compared to expected product lifetime) or because they fail to prioritize options for redress based on their environmental friendliness (repair and replacement are put forward as equivalent alternatives). We discuss these issues in the following section.

71. See e.g. K. Wiens, ‘Apple’s Diabolical Plan to Screw Your iPhone’, *iFixit* (2011), www.ifixit.com/blog/2011/01/20/apples-diabolical-plan-to-screw-your-iphone/.

72. Commission Report on Attitudes of Europeans Towards Waste Management and Resource Efficiency, European Commission Directorate-General for the Environment.

73. S. Svensson et al., ‘The emerging ‘right to repair’ legislation in the EU and the U.S’, *Go Green – CARE INNOVATION Conference* (2018).

74. Case T-712/14 *CEAHR v. Commission*, EU:T:2017:748.

75. S. Svensson et al., ‘*Go Green – CARE INNOVATION Conference* (2018).

76. *Ibid.*

77. This has been identified as a particular problem in the US; see *ibid.*

4. Consumer law in need of a new paradigm

A. Conflicting goals and the integration principle

The initial ‘productivist’ logic of the founding EU Treaties, which focused on the producer of economic value and the realization of the ‘internal market’ remains strongly anchored in EU consumer policy. Consumer welfare and the ‘raising of the standard of living and quality of life’ has long been seen as an adjunct to the four market freedoms.⁷⁸ The transformation of relatively small-scale national markets into a large European and globalized economy has sharpened competition between producers, multiplied available goods and lowered product prices.⁷⁹ This intensification of competition was – and still largely is – seen as favourable to consumers who benefit from a wider choice of products at lower cost. Economic law has become a tool to ensure proper competition on the market and consumer choice as primary interests. The Court of Justice of the EU (CJEU) has repeatedly held that competition law should take a stand against practices that harm consumers directly and that harm them indirectly through their impact on competition.⁸⁰

Similarly, the liberalization of the market for products and services is said to have expanded consumer choice. For example, in *Walter Rau v. de Smedt*, the CJEU commented that Belgian consumers were paying more for their margarine than consumers in neighbouring states because of restrictive national measures.⁸¹ The question of how to prioritise the different aspects of consumers’ interests, and consequently restrict trade or promote deregulation, has faced the Court with some difficult choices.⁸² Extending consumer choice through unrestricted trade in the internal market has often prevailed over the protection of other consumer interests although, for instance, national rules prohibit deceptive marketing practices.⁸³ In some cases, the CJEU upheld national rules that restricted trade to protect consumers.⁸⁴ It is undeniable, however, that the Court tends to see the ‘average consumer’ as robust and self-reliant and therefore without the need for protection against harmful commercial conduct. Instead, they rather benefit from the freedom to make informed choices.⁸⁵ The problem is that this assumes the market only provides consumers with appropriate choices and they just have to choose what they consider best for them. This is far from the case in practice. Today, a lot of products that are placed on the market are not only harmful to the environment,⁸⁶ some are even dangerous to human health.⁸⁷

78. I.e. person, goods, services and capita,; see J. Pelkmans, ‘The Institutional Economics of European Integration’, in M. Cappelletti (ed.), *Integration Through Law, Vol. 1, Methods, Tools and Institutions* (de Gruyter, 1985), p. 318.

79. S. Weatherill, *EU consumer law and policy* (2nd edition, Edward Elgar, 2013), p. 29.

80. See e.g. Case C-52/09 *TeliaSonera Sverige*, EU:C:2011:83; C-209/10 *Post Danmark*, EU:C:2012:172.

81. Case C-261/84 *Walter Rau v. de Smedt*, EU:C:1985:338.

82. S. Weatherill, *EU consumer law and policy*, p. 61.

83. Cases C-120/78 *Rewe Zentrale*, EU:C:1979:42; Case C-407/85 *Drei Glocken*, EU:C:1988:401; Case C-362/88 *GB-INNO*, EU:C:1990:102.

84. Cases C-286/81 *Oosthoek*, EU:C:1982:438; Case C-328/87 *Buet and Others v. Ministère public*, EU:C:1989:198.

85. S. Weatherill, *EU consumer law and policy*, p. 58; Case C-362/88 *GB-INNO*, EU:C:1990:102; Case C-126/91 *Rocher*, EU:C:1993:191; Case C-315/92 *Clinique*, EU:C:1994:34; Case C-220/98 *Estée Lauder*, EU:C:2000:8; Case C-470/93 *Mars*, EU:C:1995:224.

86. Such as single-used or short-lived products, energy-intensive equipment or materials containing hazardous chemicals.

87. E.g. many cosmetic products contain heavy metals (lead, cadmium, zinc), see B. Kaličanin and D. Velimirović, ‘A Study of the Possible Harmful Effects of Cosmetic Beauty Products on Human Health’, 170 *Biological Trace Element Research* (2016), p. 476.

In classical economics, the consumer is seen as the *homo oeconomicus passivus*, the passive market participant. Because their rights need to be protected against active and powerful market participants, the companies, consumer law seeks to protect the autonomy of consumers, guarantee their power of choice and allow them to seek redress. Article 169(1) TFEU states the Union ‘shall contribute to protecting the health, safety and economic interests of consumers, as well as to promoting their right to information, education and to organise themselves in order to safeguard their interests.’

The alleged correlation between the interests of the market and those of the consumers has strongly influenced consumer law. Consumer policy appears essentially built on the premise of the right of consumers to ‘make a good deal’. For some, that good deal may indeed mean buying durable high-quality products, but for most people today, a good deal means being able to purchase as many products as possible at the cheapest price. Moreover, current protection does not prompt consumers to buy durable products. Access and opportunity (notably financial) to repair services is far from guaranteed. Consumer law neither secures, nor even promotes, sustainable consumption. Should it? The TFEU says it should: ‘[e]nvironmental protection requirements must be integrated into the definition and implementation of the Union’s policies and activities, in particular with a view to promoting sustainable development.’⁸⁸

This provision in the Treaty, also known as the integration principle, imposes a legally binding duty on the EU institutions to recognize and uphold the overarching sustainability principle in all policies and legislative decisions. It applies to consumer protection as well. The preeminence of environmental over consumer protection objectives is evident in the language used in the TFEU: Article 11 TFEU requires environmental integration, whereas Article 12 merely recommends lawmakers to ‘take into account’ consumer protection requirements. A correct application of the TFEU would require EU consumer legislation to properly integrate and reflect environmental protection requirements. This is not (yet) the case.

B. The EU legal framework in light of environmental protection requirements

The core EU *horizontal* consumer law is composed of seven directives, but we will discuss only two in this article, the Consumer Sales and Guarantees Directive 1999/44/EC (CSGD)⁸⁹ and the Consumer Rights Directive 2011/83/EU (CRD).^{90,91}

The CSGD harmonized after-sales rights for consumers. First, consumers have the right to receive goods that are in conformity with the contract of sales notably in terms of quality and performance ‘which are normal in goods of the same type’.⁹² Second, any lack of conformity gives rise to remedies. Consumers are entitled to have goods brought into conformity free of charge by repair or replacement, to benefit from an appropriate price reduction, or to have the contract rescinded.⁹³ Third, consumers may benefit from their right to remedy within 2 years of delivery of the goods, with

88. Article 11 TFEU.

89. Directive 1999/44/EC (‘CSGD’).

90. Directive 2011/83/EU on consumer rights, [2011] OJ L 304/64 (CRD).

91. The others are the Unfair Contract Terms Directive 93/13/EEC, the Price Indication Directive 98/6/EC, the Unfair Commercial practices Directive 2005/29/EC, the Misleading and Comparative Advertising Directive 2006/114/EC, and the Injunction Directive 2009/22/EC.

92. Article 2 CSGD.

93. Article 3 CSGD.

a 6-month presumption that the fault pre-existed the delivery.⁹⁴ After 6 months, the burden of proof shifts from the seller to the consumer. These are minimum standards. Member States may lay down more stringent provisions to secure a higher level of consumer protection.⁹⁵

The rights laid down in the CSGD form an essential part of consumer protection and benefit to some extent our proposed hierarchy. Indeed, allowing consumers to remedy product faults free of charge is a very effective way of avoiding unnecessary discard. Without such a guarantee, repair would not be as attractive an option to consumers. However, it is clear that the legal provisions were not written with environmental protection in mind. The fact that repair and replacement are set out as equivalent alternatives is particularly revealing. If these remedies prove equally satisfactory to consumers, they are quite distinct when it comes to their environmental impacts. Although repair is a priority of the CE, replacement clashes with its main purpose, namely minimising waste and reducing manufacturing activities. Moreover, the current guarantee of 2 years may be in line with the consumption behaviours of the throwaway society, but in a sustainable economy most products can and should be kept in use – and be guaranteed – for a much longer period.

The CRD is the result of intense debates that resulted in significantly lowering original ambitions to achieve full harmonization of EU consumer law. Ultimately, it merely established certain basic consumer rights across the Union. Information duties are the central element of the Directive, which applies to both on- and off-premises contracts. It is required in particular that, prior to the conclusion of a sales contract, traders provide information to consumers ‘in a clear and comprehensible manner’. This information must include the main product characteristics, the total price (including tax) and trader’s identity, as well as information about rights in case of lack of conformity or regarding contract termination.⁹⁶ The Directive also establishes a right of withdrawal for distance or off-premises contracts for a period of 14 days free of charge.⁹⁷

In spite of having been adopted after the Lisbon Treaty, which established the environmental integration principle in its current mandatory form, the CRD does not seem to include more considerations about environmental protection than the CSGD. The Directive seeks rather to remove the legal disparities between the Member States that created significant internal market barriers and affected the cross-border sale of goods.⁹⁸ The legal provisions were intended to increase consumer confidence and, with that, sales volumes. The quality of the purchase, particularly in terms of durability or reparability, is not enhanced as such by the CRD, which indeed comes across as a missed opportunity given the information requirements that the Directive contains.

A fitness check conducted by the European Commission in 2017 pointed at a lack of knowledge and enforcement capacity as the main deficiencies of current consumer protection policy.⁹⁹ The proposed Directive, currently under legislative review, aims at strengthening the enforcement of existing law,¹⁰⁰ but contains no measures to promote sustainability in consumption or encouraging consumers to side with the purpose of the CE.

94. Article 5 CSGD.

95. Article 8(2) CSGD.

96. Articles 5 and 6 CRD.

97. Article 9 CRD.

98. Recital 6 CRD.

99. Commission Staff Working Document, ‘Fitness Check on Consumer and Marketing Law’, SWD(2017) 208 final.

100. Commission Proposal, ‘Proposal for a Directive as regards better enforcement and modernisation of EU consumer protection rules’, COM(2018) 185 final.

More interesting is the proposed Online Sales Directive that aims to reinforce consumer rights in case of lack of conformity with the contract.¹⁰¹ A key improvement with regards more sustainable consumption is certainly the absence of a reversal of burden of proof from the seller to the consumer, as contained in the CSGD.¹⁰² This means that, for the entire period of the guarantee, the product is presumed to be faulty and it is for the seller to prove it is not. This should make it much easier and more attractive for consumers to seek repair. The main concern is that the proposal still considers replacement a remedy equal to repair.¹⁰³

In a 2018 Communication entitled '*A New Deal for Consumers*', the Commission stated that it is crucial to produce sustainable products and to encourage more sustainable consumption.

[Consumers] need to be empowered to make informed purchasing choices and have easy access to products that are environmentally friendly (...). The 'New Deal for Consumers' will benefit the environment, given that stronger enforcement and better opportunities for individual redress against unfair practices can deter false environmental claims or planned obsolescence practices, complementing the actions of the EU Circular Economy Action Plan.¹⁰⁴

It is our opinion that the New Deal, if it does contribute to sustainable consumption, does not go far enough to change the current paradigm. In Section 5, we put forward some ways to advance the paradigmatic shift.

C. Reflections on the need for a change of paradigm

Behaviour is not immutable. It is important to place today's overconsumption patterns in a historical perspective. The current patterns are indeed quite recent if we look back in human history. Consumption habits have changed radically in just half a century. Disposable and single-use items are very modern inventions, but their impact on the environment is already devastating.¹⁰⁵ Cheap, low-quality garments have allowed every person to accumulate clothes and renew their wardrobe whereas, only a few decades ago, people owned a small number of outfits that would be passed down through the generations. Generally, quantity appears to have outweighed quality in many purchasing decisions. Globalization and liberalization of markets seem to have been accompanied with a producers' right to design short-lived products and a right for consumers to make discretionary choices.

Environmental protection does not need to undermine consumer protection. The idea that sustainable consumption is at the expense of consumer wellbeing is just another outcome of the current paradigm under which material accumulation is considered consonant with personal happiness. A recent study published in the official scientific journal of the National Academy of Sciences concluded that buying goods had no effect on people's happiness whereas spending money on experiences (such as vacations) or meaningful gifts clearly produced happiness.¹⁰⁶

101. Commission Proposal, 'Proposal for a Directive on certain aspects concerning contracts for the online and other distance sales of goods', COM(2015) 635 final.

102. Ibid, Article 8(3).

103. Ibid, Article 9.

104. Commission Communication, 'A New Deal for Consumers', COM(2018) 183 final.

105. See e.g. E. Priestland, 'Single-use plastics and the marine environment: Leverage points for reducing single-use plastics', *Seas at Risk* (2017), www.seas-at-risk.org/images/pdf/publications/SeasAtRiskBackgroundreportSingleuseplasticsandmarineenvironment.compressed.pdf.

106. A. Whillans, 'Buying time promotes happiness', 114 *PNAS* (2017), p. 8523.

Could it be, then, that allowing consumers to make the best possible deal is not as important to the consumers themselves as allowing them to engage in sustainable consumption? Could consumers be happier if they were not overconsuming?

The purpose of the hierarchy of behaviour is not to create new morals and blame individuals for behaving improperly. The aim is to shift the balance from the current – and relatively recent – paradigm according to which human flourishing depends on economic growth to one that places environmental preservation as the one non-negotiable condition.

Current consumption behaviour is not, we suggest, anchored in people. It is the result of a change in society, a change in paradigm that was driven by industry and mainstream economics following the Industrial Revolution. There are no reasons why that paradigm could not be changed again to promote more qualitative and sustainable consumption habits. Just about 50 years ago, it was widely accepted that people could smoke in public spaces and around children. Today, all European countries have banned smoking in public spaces and almost nobody would argue that passive smoking is not a health hazard. The change of paradigm took place through changes in hard law and awareness campaigns. The same could be true of overconsumption and throwaway habits. This requires, among other actions, challenging existing consumer policies that maintain consumers' right to unrestricted choice and to make a good deal. The paradigm shift, we argue, could begin with introducing the hierarchy of consumption behaviour as a governing principle of the EU's coming legal consumer framework.

5. Possible legal pathways to advance the hierarchy at EU level

It appears clearly that the market – and market actors – is not able to promote product durability and repair as it does not fit with current market logic, policies or consumption patterns. Markets, policies and consumption patterns have evolved together such that the various elements strengthen each other, but this indicates how hard it will be to change things without political action. For instance, if a mobile phone manufacturer makes money primarily by selling more phones, they have little reason to make them durable and upgradeable. Consumers get used to new models with new functions and are geared to changing models often. Further, providers of broadband and mobile phone services also want a steady stream of new phone models because they attract customers to the store and widen their opportunity to sell new services.¹⁰⁷ Political intervention is therefore necessary.

The regulation of guns, drugs, cigarettes and, more recently, micro plastics may point to one way forward: we need to regulate more products and materials. We need to question the very existence of some products and materials. Cheap, low-quality products are not only unsustainable because of their short lifetime, but also because they are not easy to recover. For example, the potential for remanufacturing furniture¹⁰⁸ and IT products¹⁰⁹ is significant, but only for high-quality products. There is no (or only limited) incentive to remanufacture an inferior sofa and re-sell it, whereas the economic case for remanufacturing top-class furniture is much larger. Thus, we need to buy high-quality products as a starting point. Although this may prove more expensive

107. See C. Dalhammar, 'It is never too late to give up, or is it? Revisiting policies for sustainable consumption', in O. Mont (ed.), *Research Agenda for Sustainable Consumption Governance* (Edward Elgar, forthcoming).

108. M. Öhgren, *Lund University MSc Paper* (2017).

109. K. Whalen, 'Bridging the gap: Barriers and potential for scaling reuse practices in the Swedish ICT sector', 135 *Resources, Conservation and Recycling* (2018), p. 123.

upfront, it will reap the returns in terms of longer-lasting repairable and/or upgradeable products and socioeconomic benefits from products getting a second life. The latter benefits may be realized by persons other than the original purchaser. Because we cannot realistically expect all consumers to purchase more expensive products based on remote benefits and durability claims, policies and laws must be put in place to address two main aspects, that is to ensure that (i) as many quality products and as few low-grade products as possible are placed on the market; and (ii) consumers are encouraged to and feel confident about making the more sustainable choice. Here, we focus on the second.

One of the recent legal experimentations towards more sustainable consumption took place in France in 2015. An amendment to the French consumer code required professional sellers to disclose any information they received from manufacturers or importers of products about the availability of essential spare parts.¹¹⁰ Upon request from the seller or any repairer, those spare parts are to be made available, within 2 months, during the period that was advertised.¹¹¹ The law, which aimed to help consumers make enlightened choices and incentivise producers to provide for the reparability of their products, does not seem to have lived up to its promise. The law's lack of clarity resulted in confusing information. For example, producers used different dates to establish the start of the availability period of the spare parts, confusing consumers and making comparative analysis impractical.¹¹² A French consumer association reports that a large majority of retailers are not abiding by the law and that even when the information is available, it is lost in an array of other product specifications.¹¹³ Yet, where the information was available, it showed significant differences from one brand to another.¹¹⁴ Besides, we identify two important limitations of the French law: first, it relies on the goodwill of producers broadly to provide information that could alter their business models. An illusory hope. Second, it depends on one country enforcing a rule that affects the entire EU market. The gloomy results of the French policy should not lead to the conclusion that it was impractical or inopportune, but rather that it was not daring enough and that we must aim at adopting EU-wide measures.

In practice, changing consumption patterns will usually require a policy mix that addresses the product itself and the behaviour of the consumer at the same time. For example, prolonging the lifetime of consumer electronics is a very effective way of reducing life-cycle impacts, as most environmental damage is associated with the extraction of the raw material and production phases.¹¹⁵ However, consumers are ever-more likely to discard goods early and purchase new ones, negating any potential benefits from making goods more resistant and repairable.¹¹⁶ In such a situation, an effective policy mix would need to address the main barriers noted in the previous sections and focus on all relevant stakeholders, notably producers, consumers and repairers.

110. Code de la consommation (version consolidée au 18 mai 2019), article L. 111-3.

111. Ibid.

112. Some producers used the date of production, others the end date of production, the date of the sale to the retailer or the date of the sale to the consumer. See Parliamentary report n° 4139 of 19 October 2016 on the application of the law n° 2014-344 on consumption.

113. UFC-Que Choisir, www.quechoisir.org/action-ufc-que-choisir-duree-de-disponibilite-des-pieces-detachees-une-panne-d-information-a-corriger-d-urgence-n12335/.

114. Ibid.

115. See S. Prakash, 'Timely Replacement of a Notebook under Consideration of Environmental Aspects', 45 *Umweltbundesamt* (2012), <https://www.umweltbundesamt.de/sites/default/files/medien/461/.../4317.pdf>.

116. A. Andersson, Circular Economy: Research into the Availability and Willingness to Repair Consumer Electronic Products, Lund University.

A good policy mix could include the following: (i) Ecodesign requirements for manufacturers to make durable quality products that are easy to repair and disassemble;¹¹⁷ (ii) requirements to inform consumers about the expected lifetime and reparability of products at the time of purchase; (iii) introduction of a right for any repairer to access to spare parts and repair tools at a reasonable cost; (iv) extension of legal guarantees and shifting the burden of proof onto producers to help consumers to have their goods repaired; (v) conditioning of consumer choice of legal remedy in favour of repair. (vi) removal of barriers to repair in competition and IP legislation (for example, copyright and patent restrictions); (vii) VAT reductions for the repair sector; (viii) tax deductions for consumers who choose to repair their products; (ix) support for do-it-yourself activities and other relevant initiatives to encourage consumers to repair their own goods (for example, repair cafés); (x) consumer awareness campaigns about environmental impacts and the environmental gains from repair.

In this section, we discuss four of those policies (in bold in the list above) more closely and suggest how they can be translated into legislation. They are, in our view, a perfect example of complementary policies that, if properly drafted, can form a powerful and valuable mix fostering the realization of the highest hierarchy priorities, namely avoid, maintain and repair.

A. Information requirements about durability and reparability

The first policy goal to be translated into law is to encourage consumers to choose longer-lasting quality products over short-lived inferior products by informing them about the products' lifetime and reparability. It is hoped that by receiving this information upon purchase, consumers will opt for the more sustainable option. If they are to be properly empowered, consumers must be given clear, reliable and comparable information and the tools to understand it.¹¹⁸

The direct impact of information availability on consumer decision making may not be tremendous in light of the above-mentioned barriers such as 'irrational' behaviour or influence of mainstream markets, but information requirements are nonetheless meaningful. This is because providing information requires acquiring and paying attention to it, and because once information is out there, it is accessible to all, not only consumers. It is not given that producers know their products' lifetime or even their reparability. This is, in any case, what certain businesses claim: they care mainly about production costs, visual appearances, performances, not necessarily durability or disassembly.¹¹⁹ Disclosing such information involves actively considering these particular features and hopefully working to enhance them. This is especially so if they can gain comparative advantage against lesser-performing competitors.

Information requirements are not new to EU law. The most accomplished example of mandatory obligations is the Energy Labelling Regulation 2017/1369 (ELR), which recently repealed Directive 2010/30.¹²⁰ The Regulation lays down a framework for the labelling of energy-related

117. This is crucial as it is often a malfunctioning battery that kills the whole product; making it easy to replace the battery is important.

118. C. Montalvo, 'A Longer Lifetime for Products: Benefits for Consumers and Companies', *European Parliament Directorate-General for Internal Policies* (2016), [www.europarl.europa.eu/RegData/etudes/STUD/.../IPOL_STU\(2016\)579000_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/STUD/.../IPOL_STU(2016)579000_EN.pdf).

119. For example, Apple justified encasing batteries based on the fact that it allowed slimming equipment, improving protection against damage and boosting capacity.

120. Regulation (EU) 2017/1369 setting a framework for energy labelling (ELR) and repealing Directive 2010/30/EU, [2017] OJ L 198/1.

products. The information provided may relate to energy efficiency, noise levels, the consumption of energy and other resources during use, and supplementary information that would enable customers to choose more efficient products.¹²¹ Durability and reparability requirements could possibly be developed under this existing scheme. This option would have the advantage of benefiting from a well-established and well-running scheme that is backed by political institutions, businesses and civil society. Moreover, current discussions about developing ecodesign requirements on durability would directly benefit the labelling scheme. The Ecodesign Directive and ELR are indeed working as two sides of the same coin. The disadvantages of the ELR are that it is a slow process and its scope is limited to energy-related products.

Alternatively, specific legal requirements could be introduced in consumer legislation. The two proposed directives currently debated by the European legislators¹²² offer such an opportunity. The main advantage here is clearly that discussions are underway and there is political willingness to review the existing legal scheme. It is a small window of opportunity, however, and reaching consensus on the current proposals is already proving complicated.¹²³ Also, it is uncertain whether provisions adopted in this context would have the necessary impact. So far, information requirements imposed through consumer directives have not translated into clear and useful information, unlike, for example, energy labels.

Another possibility could be to develop entirely new regulations on durability and reparability, including setting up a specific labelling scheme. The new instrument could be based on Article 114 TFEU, which gives the EU competence to act to approximate legislation for the achievement of the internal market. This provision is the legal basis of a number of environmental regulations, such as the Ecodesign Directive. Clearly, the main disadvantage of this solution is its political feasibility. An advantage, which is not to be underestimated, is to start from a clean slate that allows establishing a scheme adapted to the objective, possibly with a wider scope than the ELR.

Concretely, the legal provisions should require, at least, that: (i) access to the EU market is conditional upon the full availability of the requested information; and (ii) the information is passed on to consumers in a clear and intelligible manner prior to the sale.

With regards to the specific information requirements, they should include: (i) the expected lifetime of products (from sale); (ii) the availability of spare parts in time (from sale); and, (iii) the possibility to disassemble the product, and if so, whether it requires the use of special tools.

Durability and reparability labelling should address the product as a whole as well as key parts, such as the battery, cables and connectors. It could use colour codes similar to energy labels to facilitate consumer understanding. Developing labelling rules for durability is a complex task as discussed above (Section 2.C.1), but a necessary complementary measure to enable and promote enlightened consumer choice.

Providing information is not the end of the road, however, but a first step to the introduction of other legal requirements. To ensure consumers purchase the more durable products, they must also be confident they will be able to keep and use those products over the longer term. This requires

121. *Ibid.*, Article 1(1).

122. Commission Proposal, 'Proposal for a Directive as regards better enforcement and modernisation of EU consumer protection rules', COM(2018) 185 final; Commission Proposal, 'Proposal for a Directive on certain aspects concerning contracts for the online and other distance sales of goods', COM(2015) 635 final.

123. A. Biard, 'Collective redress in the EU: a rainbow behind the clouds?', 19 *ERA Forum* (2018), p. 189.

two things; first, that the product can be repaired and, second, that the cost of repair will not effectively restrain the option.

B. Availability and access to spare parts

The second policy is meant to strengthen the first by guaranteeing the longer-lasting product can effectively be repaired should a defect occur. With the French experience in mind, we argue for the adoption of mandatory requirements about the availability and provision of spare parts at EU level to ensure the effectiveness of the measures and avoid trade distortions. Article 114 TFEU could therefore be an appropriate legal basis for the adoption of a new legal instrument. Alternatively, Article 194 TFEU (the energy legal basis) could be used if the legislation was – as the ecodesign rules – limited to energy-related products. Following this path could allow for the adoption of a framework directive that could draw the contours of the law and mandate the Commission to develop specific requirements for particular products in delegated acts.¹²⁴ Those acts could specify for each product group which parts are essential and should be made available for a certain period. In other words, producers would have to produce requisite spare parts. As part of the delegation, other aspects could be established, such as the minimum time of availability of the parts, their maximum sales price (in any case lower than the price of the whole product – potentially a percentage of that price) and the minimum durability of those parts.

Other options, already mentioned in the previous section, could be either to modify existing consumer legislation or develop new regulations based on Articles 114 or 194 TFEU.

Concretely, the legal measures should contain at least the following: (i) essential spare parts must be made available to the consumer or any repairer (also independent) upon request within a maximum 2-month period during the time advertised by producers following information requirements recommended above; (ii) the availability of these parts in time cannot be less than the expected lifetime of the original product; and, (iii) infringements are punished by appropriate sanctions.

In connection with the above, we note that new ecodesign requirements for dishwashers and refrigerators shall include notably: (i) design for easier dismantling for recycling, material recovery and depollution purposes; (ii) declaration on spare part availability; (iii) information requirements about maximum delivery time for spare parts; and (iv) access to repair and maintenance information for independent repairers with reasonable and proportionate fees.¹²⁵ This is a positive development although we regret in particular the absence of information requirements about durability and the limitation of spare parts availability to professional repairers.

C. Guarantee for the lifetime of products

The third policy aims to bring the consumer one step closer to making the more sustainable choice by guaranteeing the performance of the products for the entire period of their expected lifetime. According to the fitness check performed by the Commission, consumer protection rules such as

124. Article 290 TFEU.

125. See Annex II draft Commission Regulation (EU) laying down ecodesign requirements for household dishwashers pursuant to Directive 2009/125/EC of the European Parliament and of the Council amending Commission Regulation (EC) No 1275/2008 and repealing Commission Regulation (EU) No 1016/2010.

guarantees are fit for purpose and merely require better information and enforcement.¹²⁶ The proposed Online Sales Directive does not provide for an extension of the minimum 2-year guarantee put forward in the CSGD. It does, however, propose setting aside the 6-month reversal of the burden of proof. In practice, this 6-month period often means the product is presumed to be faulty only if the fault arises during those first months after purchase; after this, the consumer must prove that the defect was pre-existing, which is often complicated and requires expert advice. A legal guarantee without the reversal of the burden of proof would considerably strengthen consumer rights and confidence in pursuing remedies.¹²⁷

Some Member States have gone beyond the 2-year guarantee period established by the CSGD. Four of them, plus Norway, have established longer periods from 3 to 6 years,¹²⁸ and two are taking into account the expected lifetime of the product.¹²⁹ The Finnish consumer law stipulates that with regards to durability and otherwise, the goods shall ‘correspond to what a consumer ordinarily may expect in the purchase of such goods’.¹³⁰ If this is not the case, the goods are considered defective. The expected lifespan of the product is, in practice, very much dependent on the product category. The generosity in terms of duration of the guarantee is somewhat counter-balanced by the fact that the burden of proof passes to the consumer after 6 months.¹³¹

In a case brought before the Finnish Consumer Dispute Board, the lifespan of a boiler was deemed to exceed 3 years (the period claimed by the buyer) and to fall under the legal guarantee.¹³² In a recent case of a dishwasher, the Board was more stringent and reminded the consumer that she bore the burden of proving the error pre-existed the sale.¹³³ In addition, and this is where the consumer lost her case, the Board stressed that consumers should be prepared for the fact that household appliances may need to be fixed after a few years of use, without this being considered as a defect (for which a seller would be responsible).¹³⁴

With this last consideration, the Board raised an important issue: the inevitable wear and tear of a product with use and the need to perform repairs or upgrades regardless of the good’s condition upon sale. This problem is particularly crucial for durable products that are meant to be used time and again over several years. If consumers are made responsible, also economically, for normal maintenance and repair, the attractiveness of products with a longer lifetime might decrease accordingly. Should, then, producers bear these costs? This is, in effect, the solution adopted by

126. Commission Staff Working Document, ‘Fitness Check on Consumer and Marketing Law’, SWD(2017) 208 final.

127. See K. Tonner and R. Malcolm, ‘How an EU Lifespan Guarantee Model Could Be Implemented Across the European Union’, *Study for the European Parliament* (2016), [www.europarl.europa.eu/RegData/etudes/STUD/.../IPOL_STU\(2017\)583121_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/STUD/.../IPOL_STU(2017)583121_EN.pdf).

128. Three years in Sweden, five in Iceland and Norway for goods with a longer expected lifespan, and six in Ireland. The United Kingdom has two different periods: six years in England, Wales and Northern Ireland, five years in Scotland.

129. Finland and the Netherlands; see also K. Tonner and R. Malcolm, ‘How an EU Lifespan Guarantee Model Could Be Implemented Across the European Union’, *Study for the European Parliament* (2016), [www.europarl.europa.eu/RegData/etudes/STUD/.../IPOL_STU\(2017\)583121_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/STUD/.../IPOL_STU(2017)583121_EN.pdf).

130. Finnish Consumer Protection Act (38/1978), Article 12(2)(5).

131. *Ibid.*, Article 15(2).

132. Finnish Consumer Disputes, ‘Lämmivesivaraajan kauppa. Tuotteen kestoikä’ [Water boiler trade. Product lifetime] (2000) decision no 99/37/1505, www.kuluttajariita.fi/fi/index/kuluttajariitalautakuntaratkaisut/kuluttajariitalautakuntaratkaisu/1378909459077.html.

133. Finnish Consumer Disputes, ‘Astianpesukoneen Kauppa. Tavarán Virhe. Kestoikä’ [Dishwasher trade. Failure of goods. Lifetime] (2018) decision no 5685/32/2015, www.kuluttajariita.fi/fi/index/kuluttajariitalautakuntaratkaisut/kuluttajariitalautakuntaratkaisu/1523692802386.html.

134. *Ibid.*

product-service business models whereby producers remain the owners of the product that is rented to consumers. Any maintenance or repairs are born by the producers, not the consumers. Why, then, could producers not bear the costs that naturally arise from using a product over a long period of time?

Guaranteeing products for their entire expected lifetime requires amending consumer law. Such new provisions should, in our view, provide that: (i) legal guarantees shall cover the entire expected lifetime of the product and not less than 2 years; (ii) the burden of proof is born by the producers/sellers for the entire guarantee period; and, (iii) the guarantee covers defective products as well as wear and tear that naturally occurs from normal use.

D. Condition consumer choice of remedy

Finally, the fourth policy aims to constrain the choice of the consumer – and of the producer/seller – if that choice should affect the environment negatively and contradict the objectives of the CE. This is currently the case with regards to remedies offered by EU consumer law. As discussed in Section 4 above, the existing paradigm that places consumer choice as the irrefutable basis of consumer law needs, in our opinion, to be challenged whenever it conflicts with the hierarchy. This is the case when consumers are free to choose between repair and replacement of a defective product, except where the costs are excessive to the seller.¹³⁵ In terms of environmental impact, those two options are not equivalent as replacement is much more resource intensive and wasteful, particularly if it involves replacement with a new product.

This proposition to alter the remedies offered to consumers will directly affect consumer choice and certainly be met with strong opposition from consumer protection associations. We argue that the consumer's right to redress does not amount to a right to obtain a newly manufactured product. Consumers have the right to obtain a product whose characteristics and performance are equal to what they aimed to buy. Repaired or remanufactured goods are not of lower quality or performance than new ones per se. There are, however, undoubtedly more sustainable alternatives.

It may happen, however, that repair is not a valid option, either because the product cannot be repaired, because the consumer cannot wait for their product to be repaired (for example, if their livelihood depends on using that product), or because the repair cost would be unreasonable for the seller/producer. Although they are valid arguments, they should not be used to circumvent the purpose of the rule. In particular, many today could genuinely claim that they cannot perform their work without their smartphone or laptop. This should not, however, mean that repair is not feasible or unreasonable. Sellers should make a similar product available to consumers during the period of repair. Should that not be sufficient, consumers could get their defective products replaced with repaired or remanufactured products of equal quality. With regards to sellers, the concept of 'disproportionate costs', which is already known in EU consumer legislation, should be interpreted strictly and properly justified. This last issue would be worth discussing in more detail, in particular how to avoid abuse in practice, but falls outside the scope of this article.

In sum, we recommend amending consumer legislation, that is, the current CSGD and the proposed Online Sales Directive, with regards the choice of redress as follows: (i) consumers shall be entitled to have their goods brought into conformity free of charge by repair, and borrow equipment while repairs are ongoing; (ii) if repair is not feasible or would entail unreasonable

135. Article 3(2) CSGD.

costs, consumers are entitled to replacement with another repaired or remanufactured good of equal quality; and, (iii) if replacement with remanufactured goods is not available, consumers are entitled to replacement with a new product.

6. Summary and discussion

In this article, we have described the need for a hierarchy of consumption behaviour in line with the CE whose first priority is to encourage consumers to avoid purchasing single-use, low-quality products, followed by maintenance and repair of existing products, sharing, lending, purchase of second-hand goods, purchase of high quality, durable and energy-efficient products and finally recirculation (namely, hand-in for re-use, remanufacturing, recycling). This hierarchy is based on the ‘average’ environmental impacts associated with each practice and thus aims at promoting the best choice from an ecological perspective. The global acceleration of ecological degradation we are currently witnessing¹³⁶ – which is very much associated with resource consumption – requires us to reconsider old concepts like ‘markets’ and ‘consumer choice’, and to question ideas underpinning various legal fields. Although we cannot in practice coerce consumers to adhere to the hierarchy in all situations, and this would of course be very controversial, we can implement a number of legal changes that make new consumption practices more economically attractive, or as discussed in the case of consumer redress: we can change the ‘default’ option from replacement with new product to repair. In some cases, we should also dare to be more radical and ban certain products or materials altogether, as exemplified by the recent ban in several jurisdictions on micro plastics in some applications.

This will involve, of course, a larger process that spans several legal fields. We have recommended four legislative innovations that could serve as a starting point, which by their complementarity would usefully contribute to promote the top priorities of the hierarchy. Further research is needed to see how we can advance work on existing and new laws with a view to reinforcing the policy mix. Examples of other policies include economic incentives (such as tax reductions for undertaking repairs, as have already been implemented in Sweden), development of producer responsibility schemes to promote repair and remanufacturing, controlling and restricting advertising access and exposure (notably to children) and developing commercial-free zones (in particular within urban limits).

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136. W. Steffen et al., ‘The trajectory of the Anthropocene: The Great Acceleration’, 2 *The Anthropocene Review* (2015), p. 81.