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IMPACT ASSESSMENT

Accompanying the document

Proposal for a Regulation of the European Parliament and of the Council

establishing a framework for setting ecodesign requirements for sustainable products and repealing Directive 2009/125/EC

{COM(2022) 142 final} - {SEC(2022) 165 final} - {SWD(2022) 81 final} - {SWD(2022) 83 final}

Annex 7: Problem Definition

Glossary

Acronym	Definition
ADCO	Administrative cooperation
BAT	Best available technology
BAU	Business as usual
BEV	Battery electric vehicles
BNAT	Best not yet available technology
CBM	Circular Business Model(s)
CEAP	Circular Economy Action Plan
CEI	Circular Electronics Initiative
CEN	European Committee on Standardization
CLP	Classification, Labelling and Packaging
CO_2	Carbon dioxide
CO_2-eq	Carbon dioxide-equivalents
CPR	Construction Products Regulation
CSRD	Corporate Sustainability Reporting Directive
CWP	Commission Work Programme
DKK	Danish Kroner
DMC	Domestic material consumption
DRC	Democratic Republic of the Congo
EAN	European Article Number
EAP	Environmental Action Plan
EBAE	European Business Awards for the Environment
ECA	European Court of Auditors
ECHA	European Chemicals Agency
ED	Ecodesign Directive

EEA	European Environment Agency
EEB	European Environmental Bureau
EEE	Electrical and Electronic Equipment
EEI	Energy Efficiency Index
EEN	Enterprise Europe Network
EF	Environmental footprint
EIB	European Investment Bank
EIC	European Innovation Council
EIPRO	Environmental Impact of Products
EIT	European Institute of Innovation & Technology
ELV	End-of-life Vehicles
EMAS	Eco-Management and Audit Scheme
EP	European Parliament
EPR	Extended Producer Responsibility
EPREL	European Product Database for Energy Labelling
EREK	European Resource Efficiency Knowledge Centre
ETS	European Emissions Trading System
EU DPP	European Digital Product Passport
EUPCN	European Product Compliance Network
FTE	Full-time equivalent
GCI	Green Claims Initiative
GDP	Gross Domestic Product
GHG	Greenhouse gas
GPA	Government Procurement Agreement
GPP	Green Public Procurement
IA	Impact Assessment
ICSMS	Information and Communication System on Market Surveillance
ICT	Information and Communication Technologies

IED	European Industrial Emissions Directive
ILO	International Labour Organisation
IO	Input-output
IPCC	Intergovernmental Panel on Climate Change
IPR	Intellectual Property Rights
ISG	Inter-service group
ISO	International Organization for Standardization
ISSG	Inter-Service Steering Group
IT	Information technology
JRC	Joint Research Centre
JUST	Directorate-General for Justice and Consumers
KIC	Knowledge and Innovation Communities
LCA	Life-cycle assessment
LCC	Life cycle costing
LCIA	Life cycle impact assessment
LLCC	Least Life Cycle Cost
LULUCF	Land use, land use change & forestry
MEERP	Methodology for ecodesign of energy-related products
MS	Member State
MSA	Market Surveillance Authorities
NGO	Non-government organisation
OECD	Organisation for Economic Co-operation and Development
OEF	Organisation Environmental Footprint
PB	Planetary boundaries
PEF	Product Environmental Footprint
PEFCR	Product Environmental Footprint Category Rules
PO	Policy option
PPWD	European Packaging and Packaging Waste Directive

PRTR	European Pollutant Release and Transfer Register
PV	Photovoltaic
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
REFIT	European Commission's regulatory fitness and performance programme
RSB	Regulatory Scrutiny Board
SCIP	Substances of Concern In Products
SCP	Sustainable consumption and production
SDG	Sustainable Development Goal
SIP	Sustainable Industrial Policy
SITRA	Finnish Innovation Fund
SKU	Stock Keeping Unit
SME	Small and medium-sized enterprise
SPI	Sustainable Product Initiative
SUP	Single-use plastic
SVHC	Substances of Very High Concern
TCO	Total Cost of Ownership
TFEU	Treaty on the Functioning of the European Union
TRIS	Technical Regulation Information System
UBA	Umweltbundesamt (German Environment Agency)
UK	United Kingdom
UN	United Nations
USB	Universal Serial Bus
VAT	Value-added tax
WEEE	Waste from Electrical and Electronic Equipment
WFD	Water Framework Directive
WTO	World Trade Organisation

WHAT IS/ARE THE MAIN PROBLEM(S)?

The main problem: consumption and production are not sustainable and not adequately addressed by existing EU product and internal market rules, leading to increasingly divergent national rules on the sustainability of products

Despite the fact that there is no internationally agreed definition of a sustainable product, sustainable production and consumption[1] products in a sustainable manner is likely to involve[2]:

- minimal use of natural resources and toxic materials during the product's production and use phase;
- minimal pollution and minimal generation of waste over the product's life cycle;
- design allowing for products and product materials to be kept in use for as long as possible (the circularity element);
- production, use or end of life not negatively impacting on quality of life and human dignity (i.e. impacts on health, deterioration of social conditions, violation of human rights, including labour rights);
- Minimal compromise of a product's functionality and safety as a result of the above[3].

While there are some examples of products in the EU that meet such criteria[4], many products do not. Moreover, evidence show that a large amount of imported goods are not compliant with chemical legislation[5]. Rather, evidence that **resources are still being used too inefficiently and** that **environmental impacts of the consumption of an average EU citizen are outside the safe operating space for humanity** for several impacts[6], compounded by the fact that the **EU economy remains largely 'linear' by design**[7], provides strong indication that current production, consumption and use of products is unsustainable.

According to latest UN projections, the global population could grow to around 8.5 billion in 2030 and 9.7 billion in 2050. The equivalent of almost three planets would be required to provide the natural resources needed to sustain current lifestyles[8].

Despite the annual global extraction of materials being projected to grow at a slower pace than in the past (where extraction tripled between 1970 and 2017), it continues to grow[9], posing a major environmental risk at global level. Natural resource extraction and processing generate about half of

[1] Consumption includes the use phase of products
[2] See for example: https://sustainabledevelopment.un.org/topics/sustainableconsumptionandproduction
[3] Though this point is not included in the above-cited reference, it nevertheless follows naturally that products produced and consumed in a sustainable manner should remain fully functional and safe.
[4] E.g. a legging for children by ManyMonths (FI). Materials: 100% organic, GOTS-certified wool, Knee patches delaying wear at a vulnerable spot, foldable ends for adaptation to size growth, manufactured under good working conditions.
[5] REACH and CLP enforcement report: up to **28**% of imports are not compliant with REACH and the Classification, Labelling and Packaging (CLP) Regulation, CEFIC (European Chemical Industry Council) report 2020: 80 % of non-compliant articles, containing banned or restricted chemicals comes from outside the EU/EEA , Commission Communication on Chemicals Strategy for Sustainability Towards a Toxic-Free Environment : almost 30% of the alerts on dangerous products on the market involve risks due to chemicals, with almost 90% of those products coming from outside the EU
[6] Sala, S. et al., Indicators and Assessment of the Environmental Impact of EU Consumption, Joint Research Center Science for Policy Report 2 (2019); and Sala, S. and Sanye Mengual, E., Consumption Footprint: assessing the environmental impacts of EU consumption, European Commission, (2022), https://publications.jrc.ec.europa.eu/repository/handle/JRC126257
[7] https://circulareconomy.europa.eu/platform/sites/default/files/circular_by_design_-_products_in_the_circular_economy.pdf
[8] https://www.un.org/sustainabledevelopment/sustainable-consumption-production/
[9] OECD projects that global materials use will be more than double from 79 Gt in 2011 to 167 Gt in 2060. See https://www.oecd.org/environment/waste/highlights-global-material-resources-outlook-to-2060.pdf

the total greenhouse gas (GHG) emissions and more than 90% of water stress and biodiversity loss[10]. As can be seen below, European trends in this respect are a cause for concern: if they persist in this way, the European Green Deal goals of reaching zero net emissions of greenhouse gases by 2050, and of decoupling economic growth from resource use, will become difficult to meet.

Decoupling economic growth from resource use[11]

Decoupling economic growth from resource use occurs when resource use or pressures on the environment grow at a slower rate than the activity causing it (relative decoupling) or decline while the economic activity continues to grow (absolute decoupling). Absolute decoupling in high-income countries like EU Member States can lower average resource consumption, and maintain a high quality of life. Figure 1 links EU GDP with Domestic Material Consumption (DMC)[12].

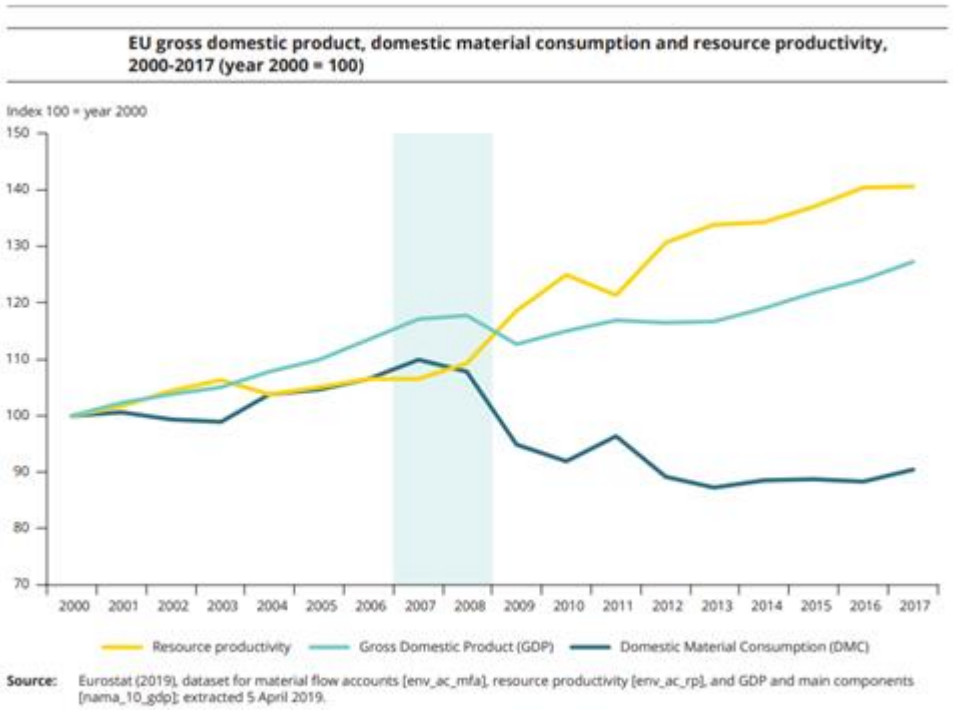

Figure 1 EU Gross Domestic Product, domestic material consumption and resource productivity

In the 2000 – 2017 period, EU GDP grew by 18 %, while DMC declined by 12 %. This means that the EU economy has done more with less, in other words an absolute decoupling of economic growth from resource use. However, **a closer look tells a different story**: the economic crisis of 2007/2008 (marked by the blue bar) significantly influenced the trend. Between 2000 and 2007, total DMC for the EU increased by 10 % and GDP grew by 17 %, resulting in a 7 % growth in resource productivity (the ratio of GDP to DMC). **In this period, the use of resources and economic growth went hand in hand, corresponding to the long-term historical trend**.

After 2008, the use of materials declined rapidly, with a 17 % decrease in total DMC between 2007 and 2017, due to the sharp decline in key sectors, in particular construction. Meanwhile, after a sharp fall in GDP in 2008/2009, it rebounded, reaching the same pre-crisis level by 2013. The result is that

[10] Global Resources Outlook 2019: Natural Resources for the Future We Want: The International Resource Panel.

[11] As set out in the introduction, this features amongst the six the priorities of the Commission's proposal for the 8th Environmental Action Plan, https://ec.europa.eu/environment/strategy/environment-action-programme-2030_en

[12] DMC measures of the materials consumed in an economy. It does not include the environmental impacts linked to consumption of those materials, but it can be consider a proxy for the pressures generated by their consumption.

resource productivity went up from 2007 to 2013, a period of absolute decoupling. Since 2013, the use of material resources in the EU has been increasing again (4 % in 2013-2017), outpaced by the increase in GDP (9 %). As a result, the resource productivity continued to increase, entering a phase of relative decoupling[13].

Beyond resources decoupling, a JRC study[14] analysed **environmental decoupling** by assessing the trends of the environmental impacts of domestic production and consumption, and of consumption activities (considering also traded goods) (see Figure 2). While considering only DMC regarding resource extraction might lead to a conclusion of positive effects along time, this would reflect **only a partial perspective on environmental impacts trends**, which can be more comprehensively evaluated in the domestic footprint and consumption footprint indicators.

While domestic activities showed absolute decoupling along the considered timeframe, consumption decoupling is not happening because of the large environmental impacts associated to trade (with higher relevance of imports compared to exports). **This highlighted the EU as a net importer of embedded environmental impacts in traded goods**. Moreover, as shown below, despite the fact that decoupling is occurring in relation to EU domestic production (resources use and emissions to the environment), this is not enough to remain within planetary boundaries, which are transgressed by up to 10 times (e.g. for climate change).

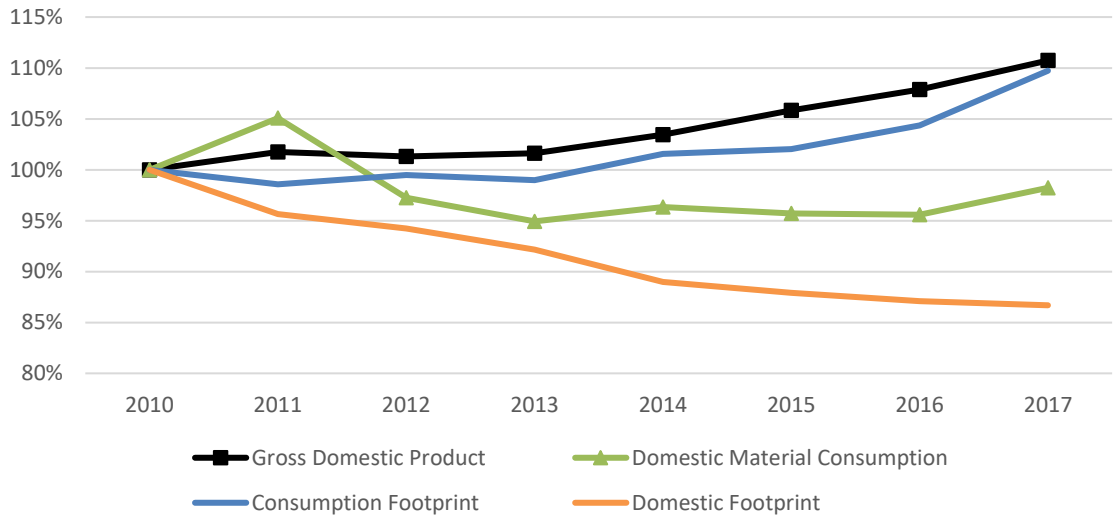

Figure 2 Environmental impacts of EU domestic activities (Domestic Footprint) and consumption (Consumption Footprint) for the period 2010-2017, compared to GDP and DMC

The **Domestic Footprint** is a life cycle assessment-based indicator that evaluates the environmental impacts of EU domestic activities by compiling statistical data on resource extraction and emissions to the environment in EU countries, for goods produced in the EU. The indicator is evaluated with the Environmental Footprint method which includes 16 impact categories[15], which can be normalized and weighted into a single score. The evaluation of the Domestic Footprint as a single score showed an absolute decoupling, where environmental impact is decreasing while economic growth keeps increasing (Figure 2). However, it is important to assess environmental decoupling extending to all the impact categories. In this case, it is possible to observe the diverse behaviour of different

[13] EEA, Resource efficiency and the circular economy in Europe 2019 — even more from less.
[14] Sanyé-Mengual, E., Secchi, M., Corrado, S., Beylot, A., & Sala, S. (2019). Assessing the decoupling of economic growth from environmental impacts in the European Union: A consumption-based approach. Journal of cleaner production, 236, 117535.
[15] Human toxicity, cancer; Human toxicity, non-cancer; Particulate matter; Photochemical ozone formation; Ionising radiation; Water use; Ecotoxicity, freshwater; Climate change; Resource use, fossils; Ozone depletion; Eutrophication, marine; Eutrophication, freshwater; Land use; Eutrophication, terrestrial; Acidification; Resource use, mineral and metals.

environmental issues (Figure 3) over the period 2000-2018. For example, when compared to GDP trend, climate change impact shows an absolute decoupling with a decreasing trend along time. However, climate change impact cannot be considered a proxy for the other categories, since some of them showed a relative decoupling and increased trend (such as land use or mineral resource depletion), while others (such as ozone depletion or acidification) presented a larger degree of absolute decoupling over time.

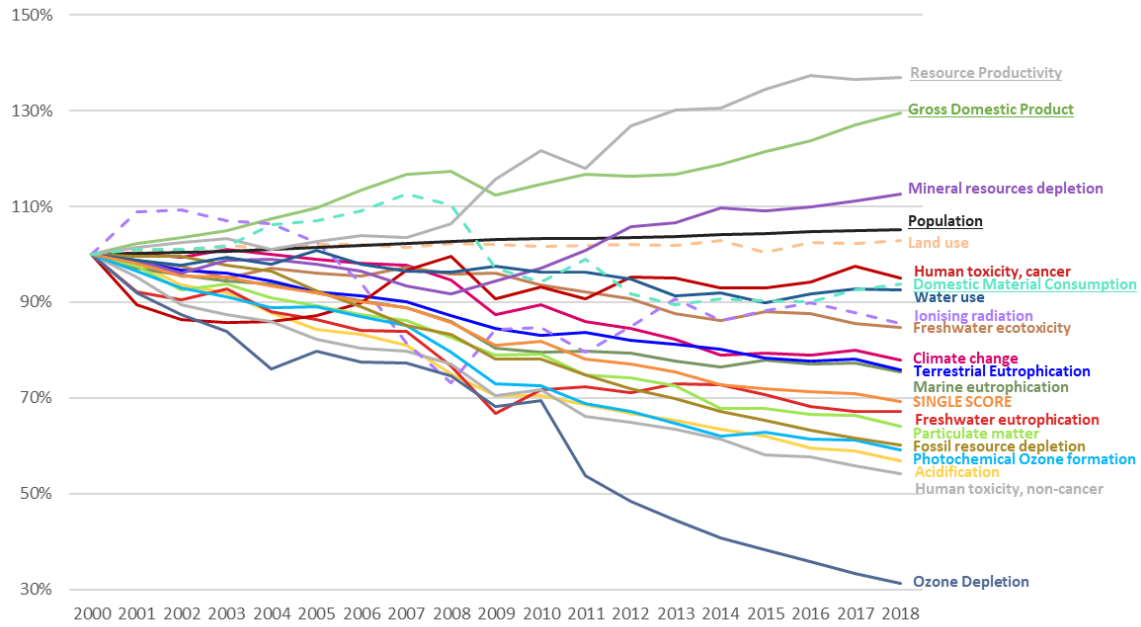

Figure 3 Environmental of EU domestic footprint time, compared to population, GDP, DMC and resource productivity[16,17]

Note: Results for 2000 are reported as 100%, and results for the other years are rescaled accordingly.

Despite the fact that decoupling is observed when domestic impacts are analysed, the product related supply chains are affecting the environment beyond EU country boundaries. Hence, a production perspective should be compared with a consumption perspective, so as to take account of the entire supply chain within and beyond EU.

The domestic footprint could be then compared to a consumption footprint. The **Consumption Footprint** is a life cycle assessment-based indicator that evaluates the environmental impacts of EU consumption by assessing five areas of consumption, namely food, mobility, housing, household goods and appliances. When presented as single score, the consumption footprint is showing a relative decoupling from GDP, this means the consumption footprint is increasing at a slower pace than the economic growth (GDP), differently from the slight decrease of DMC (absolute decoupling) (Figure 4). As for the Domestic Footprint, the assessment of the individual impact categories show different patterns and intensity of decoupling along the assessed period. **For almost all the impact categories, decoupling is not occurring.** Due to delocalisation of production of a number of goods, increasing import, increasing international transport etc., there are categories with relevant impact increase (e.g.

[16] Sala S., Beylot A., Corrado S., Crenna E., Sanyé-Mengual E, Secchi M. (2019) *Indicators and Assessment of the environmental impact of EU consumption. Consumption and Consumer Footprint for assessing and monitoring EU policies with Life Cycle Assessment,* Luxembourg: Publications Office of the European Union, ISBN 978-92-79-99672-6, doi:10.2760/403263

[17] Sanyé Mengual, E; Tosches, D; Sala, S, (2021), *Domestic Footprint of the EU and Member States: methodology and 2010-2018 results,* Luxembourg: Publications Office of the European Union.

ozone depletion, mainly due to international cold chains transport; land use, due to increase of bio-based materials as input to different sectors, including textile, furniture etc.)

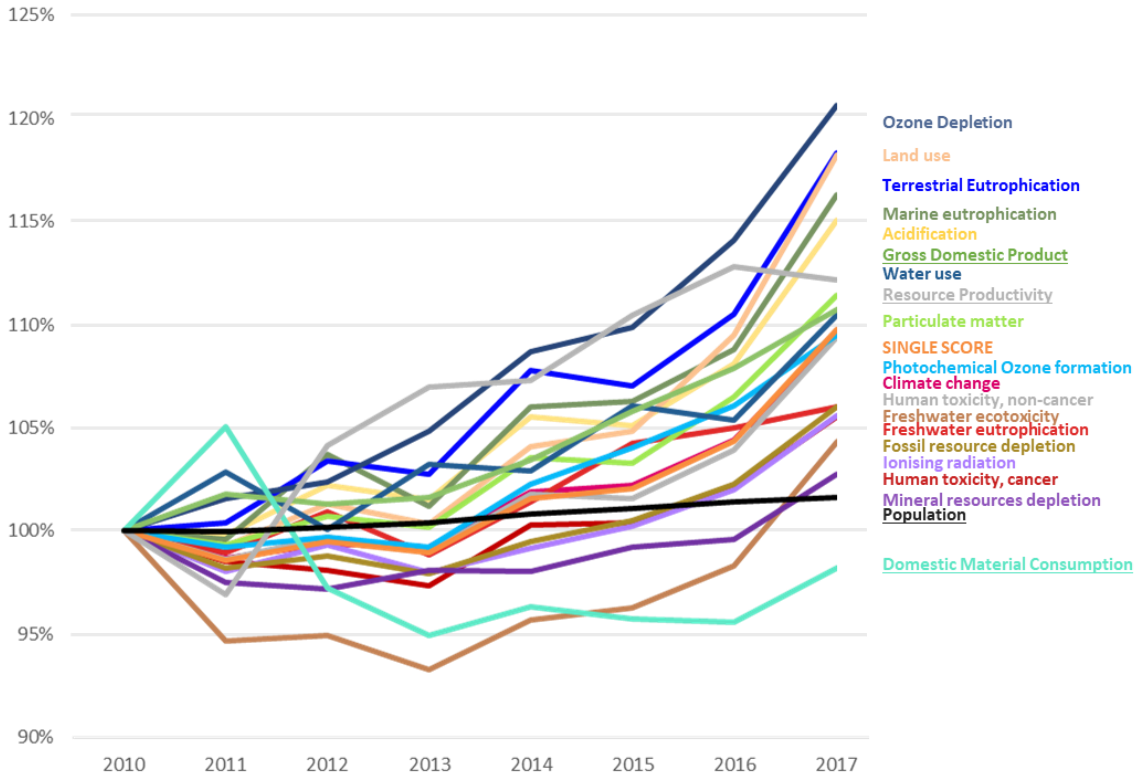

Figure 4: Environmental impacts of EU consumption footprint along time, compared to population, GDP, DMC and resource productivity[18]

Given the relevance of traded goods, another JRC study has focused on the **environmental footprint of traded goods**[19], illustrating the main contributors of impacts (Figure 5) and the fact that the impacts of import and export showed an overall increase along the timeframe evaluated although at a different pace.

[18]Consumption Footprint Platform: https://eplca.jrc.ec.europa.eu/ConsumptionFootprintPlatform.html

[19] Corrado, S., Rydberg, T., Oliveira, F., Cerutti, A., & Sala, S. (2020). Out of sight out of mind? A life cycle-based environmental assessment of goods traded by the European Union. Journal of cleaner production, 246, 118954.

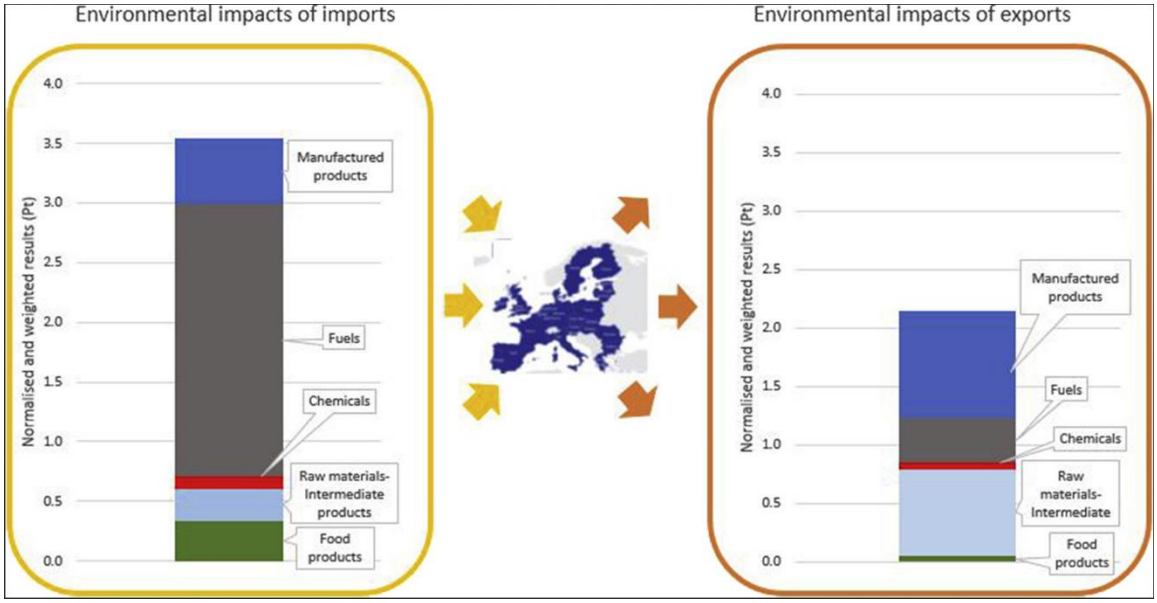

Figure 5: Impact index of import and export by type of products

This is confirmed as well when comparing LCA-based, and input output-based results[20] (Figure 6), where there is an increased impact of trade in almost all the impact categories.

[20] Beylot, A., Corrado, S., & Sala, S. (2020). Environmental impacts of European trade: interpreting results of process-based LCA and environmentally extended input–output analysis towards hotspot identification. The International Journal of Life Cycle Assessment, 25, 2432–2450.

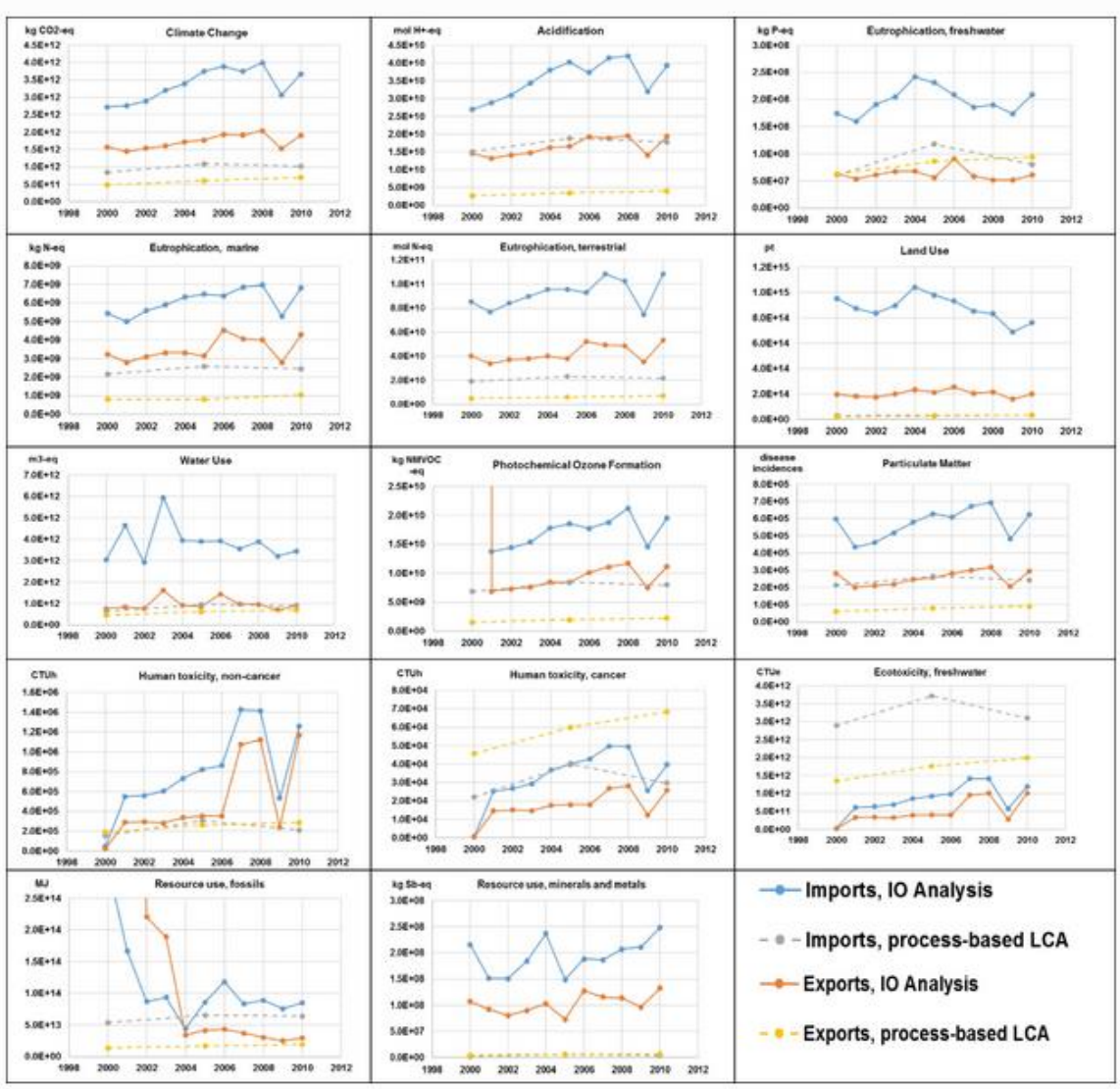

Figure 6: Environmental impacts of EU trade considering Input-Output (IO) analysis (referring to years from 2000 to 2010) and process-based LCA (years 2000, 2005, and 2010), distinguishing 14 impact categories

In Figure 6, the impacts of import and export showed an overall increase along the timeframe evaluated, which is confirmed for both process-based LCA and input output-based results[21]. There is an increased impact of trade in almost all the impact categories, although at a different pace. This means that impact categories associated with the product groups with the largest presence in imports and exports are more sensitive to changes in trade trends. For example, the economic crisis of 2008 led to a decrease in trade in the following years, and this affected some impact categories (e.g. freshwater ecotoxicity) more drastically than others (e.g. water use).

[21] Beylot, A., Corrado, S., & Sala, S. (2020). Environmental impacts of European trade: interpreting results of process-based LCA and environmentally extended input–output analysis towards hotspot identification. The International Journal of Life Cycle Assessment, 25, 2432–2450.

Whereas in general a decoupling of resources use and economic growth is envisaged, in some cases the boosting of highly innovative and sustainable technologies could cause an increase and potential dependency on certain materials. This is the case of Critical Raw Materials (CRMs)[22] that are essential to the functioning and integrity of a wide range of industrial ecosystems and for whose supply the EU is largely relying on imports[23]. For example, renewable energy technologies or high-tech applications depend on the availability of a number of CRMs (such as rare earths, gallium, or indium), which are mainly mined outside the EU[24].

EU Consumption and Planetary Boundaries

As seen above, decoupling is occurring in some impact categories at domestic level, and not occurring at consumption level. However, decoupling is not enough to ensure that production and consumption are within ecological boundaries. The planetary boundaries (PBs) is a concept addressing Earth system processes which are affected by environmental boundaries in order to define a "safe operating space for humanity", as a precondition to achieve sustainable development. It is based on scientific evidence that human actions since the Industrial Revolution have become the main driver of global environmental change and that ecosystems' carrying capacity is limited. According to the paradigm, "transgressing one or more planetary boundaries may be deleterious or even catastrophic due to the risk of crossing thresholds that will trigger non-linear, abrupt environmental change within continental-scale to planetary-scale systems"[25]. In a recent study carried out by JRC[26], the impacts of production and consumption of the EU were assessed by means of life cycle assessment (LCA)-based indicators and compared with the PBs, addressing the 16 environmental impact categories used in the life cycle impact assessment (LCIA) of the EU Environmental Footprint. When assessing the overall environmental impacts of EU consumption compared to the global LCIA-based PBs, impacts of EU consumption related to **climate change**[27], **particulate matter**[28], and **fossil and mineral resources**[29] were close to transgressing or had already transgressed the global boundaries. However, in all the other impact categories a negative environmental impact is occurring, and therefore these should also be addressed. The EU, with less than 10% of the world population, was close to transgress the global ecological limits for these impacts. Moreover, when downscaling the global PBs and comparing the impacts per capita for an average EU citizen, the LCIA-PBs were significantly transgressed in many impact categories by up to 8 times the boundary (see Figure 7). The results of this study are helpful in defining the magnitude of the problem and the efforts needed to reduce the impacts of EU consumption.

[22] Economic importance and supply risk are the main factors for the assessment of CRMs. (for further details see https://ec.europa.eu/growth/sectors/raw-materials/specific-interest/critical_en).

[23] COM(2020) 474 final

[24] Raw Materials Scoreboard 2020, https://op.europa.eu/s/pita .

[25] https://www.stockholmresilience.org/research/planetary-boundaries.html

[26] Sala, S., Crenna, E., Secchi, M., & Sanyé-Mengual, E. (2020). Environmental sustainability of European production and consumption assessed against planetary boundaries. Journal of environmental management, 269, 110686.

[27] Staying within a climate change planetary boundary (such as the Paris Agreement goal of limiting global warming to well below 2°C and pursuing efforts to limit the increase to 1.5°C) requires reducing CO2 emissions to net zero globally, and achieving declining net non-CO2 radiative forcing. In pursuit of this, the European Climate Law has set the objective of balancing greenhouse gas emissions and removals in the EU regulated in Union law at the latest by 2050.

[28] This refers to adverse impacts on human health caused by emissions of Particulate Matter (PM) and its precursors (e.g. NO_x, SO_2). Usually, the smaller the particles, the more dangerous they are, as they can go deeper into the lungs. The potential impact of is measured as the change in mortality due to PM emissions, expressed as disease incidence per kg of $PM_{2.5}$ emitted.

[29] The amount of fossil resources or mineral (e.g. metals) use for the production and the consumption of goods

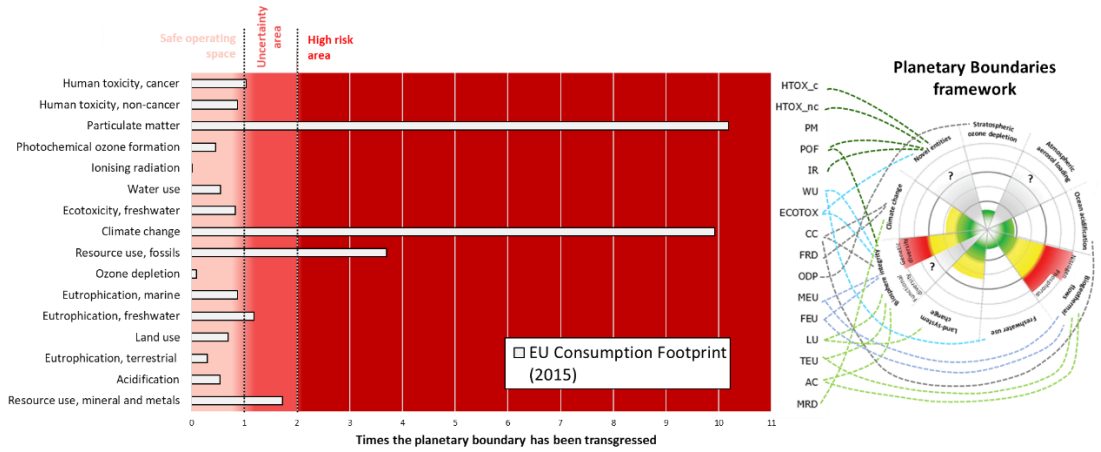

Figure 7: Assessment against the Planetary Boundaries of the EU Consumption Footprint (2015). Updated results based on the JRC study30, showing per capita impacts of EU consumption.

The overall impacts of EU consumption can be also broken down to the contribution of the different areas of consumption. Taking into account the impact categories for which the impacts were more prominent in Figure 7, it is possible to see the role of appliances, household goods and mobility (Figure 8). For example, for particulate matter and GHG emissions, housing, household goods and mobility are transgressing the planetary boundaries.

This granularity enable us to identify the areas with a larger role in these environmental impact categories. The areas of housing[31], mobility[32], household goods[33] and appliances[34] have a different role depending on the impact category. On an individual level, most of them are already transgressing the planetary boundary (safe operating space)[35]. This illustrates the need to expand the scope of environmental impact reductions to all of these sectors, each of which is already generating unsustainable impacts.

[30] Sala, S., Crenna, E., Secchi, M., & Sanyé-Mengual, E. (2020). Environmental sustainability of European production and consumption assessed against planetary boundaries. Journal of environmental management, 269, 110686.

[31] Housing includes not only the household infrastructure (from raw materials extraction to end of life management) but also water and energy consumption during the use phase.

[32] Mobility includes vehicles structure and use (incl. fuel production and consumption) associated to private and public transport

[33] Household goods include several product groups: detergents, personal care, sanitary products, furniture, footwear, clothes, bed mattresses, paper products, and plastic products.

[34] Appliances include different product groups: refrigeration, dishwashing, washing, electronics, lighting, air conditioning, domestic cooking appliances, cleaning appliances, and bathroom appliances. Note that the area of consumption of appliances covers partially the entire appliances market.

[35] The remaining impact of the consumption footprint is associated to food consumption, which is beyond the SPI scope.

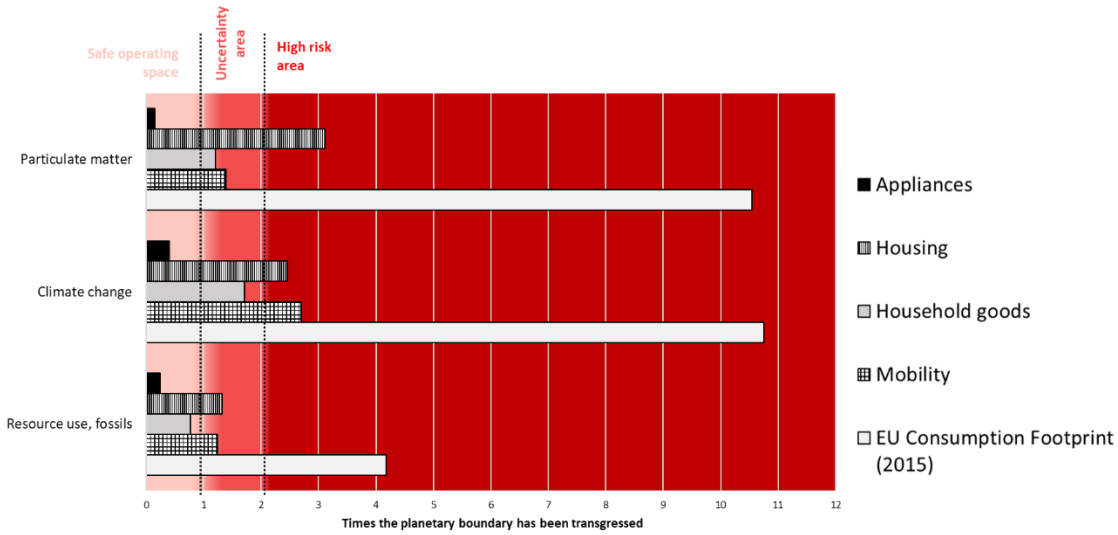

Figure 8: Assessment against the Planetary Boundaries (PB) regarding climate change, particulate matter and fossil resource use of the EU Consumption Footprint (2015) and associated areas of consumption

Results represent the impact of an average EU citizen compared with the PB per capita which are reported as dotted lines, where bars represent the impact per capita as the number of times of each specific PB.

The EU economy is still too "linear"[36]

The EU's industry has started the shift toward the green transition. Nevertheless, it still accounts for 20% of the EU's greenhouse gas emissions[37]. It remains too 'linear', and dependent on a throughput of new materials extracted, traded and processed into goods, and treated as waste. The overall level of circularity is limited, as illustrated in Figure 9, referring to the overall material flows in the economy in 2017.

[36] As set out in the introduction, accelerating the transition to a circular economy features amongst the six the priorities of the Commission's proposal for the 8th Environmental Action Plan, https://ec.europa.eu/environment/strategy/environment-action-programme-2030_en

[37] COM (2019), 640 final, p. 7.

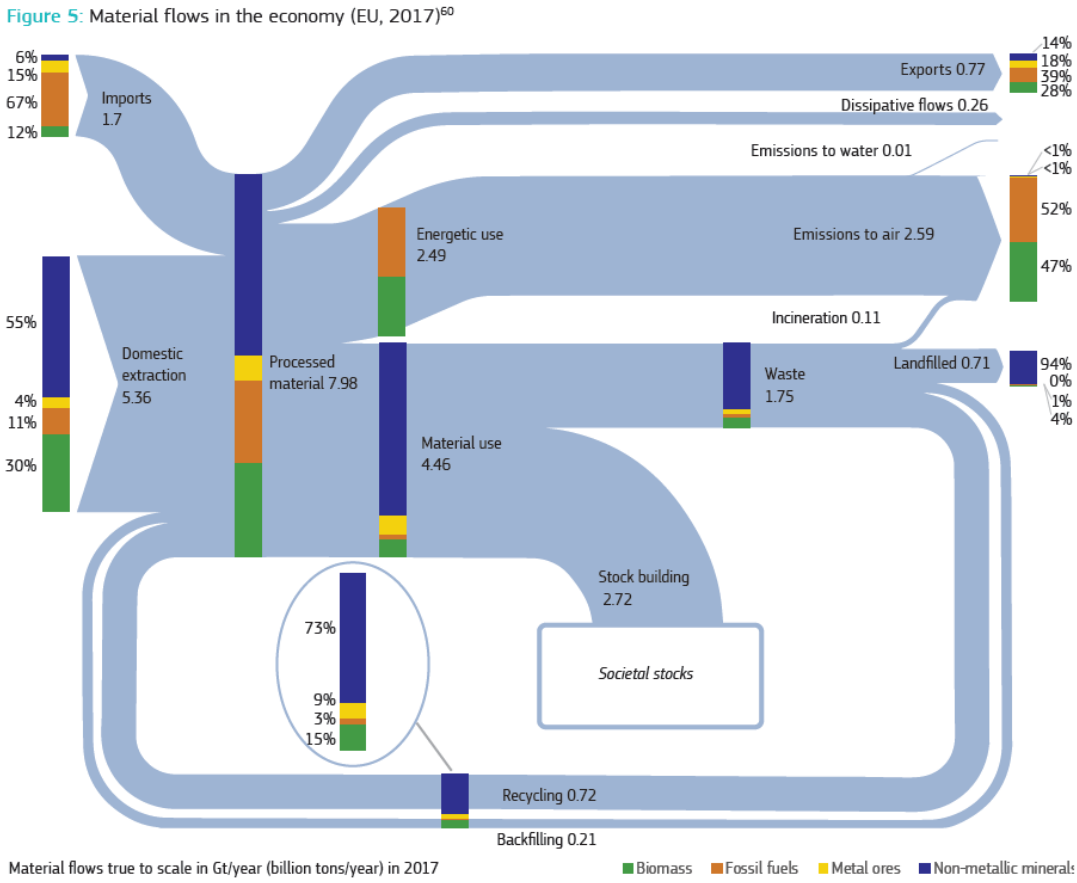

Figure 9: Material flow in the economy (EU, 2017)

Source: JRC analysis based on data provided by EUROSTAT on the circular economy material flows[38].

One important indicator gauging the level of circularity of the EU economy is the **circular material use rate**, which measures the share of material recovered and fed back into the economy - thus saving extraction of primary raw materials - in overall material use. It is defined as the ratio of the circular use of materials to the overall material use. The overall material use is measured by summing up the aggregate domestic material consumption (DMC) and the circular use of materials. The circular use of materials is approximated by the amount of waste recycled in domestic recovery plants minus imported waste destined for recovery plus exported waste destined for recovery abroad. A higher circularity rate value means that more secondary materials substitute for primary raw materials, thus reducing the environmental impacts of extracting primary material. As Figure 10 shows, the circular material use rate has been constantly growing (but at a very slow pace) from 8.2 in 2004 to 11.8 in 2019[39]. In terms of demand for recycled materials, Eurostat data for the years 2010-2018[40] show that although 7.85 billion tonnes of materials were processed, only 0.7 billion tonnes (i.e. 9.5%) of this were from recycled materials. In addition, there are stark differences in the share of market demand met by secondary materials: while in the cases of lead and copper, 75% and 55% of demand

[38] EC, 2021. European Commission, EIP on Raw Materials, Raw Materials Scoreboard 2021. DG Grow report. Luxembourg : Publications Office of the European Union, ISBN 978-92-76-23795-2 doi:10.2873/567799

[39] https://ec.europa.eu/eurostat/databrowser/view/cei_srm030/default/line?lang=en

[40] Eurostat Experimental Sankey Diagrams of material flows for the years 2010-2018; Eurostat (2018) Material Flow diagram for the EU-27 2018

respectively is covered by secondary materials, for plastics it is only 6%[41] (of which only 2% is represented by single-use plastics[42]), and for materials such as indium[43], used in the touchscreens of smartphones, it is well under 10%.

It is fair to say that at present the EU economy is still far from being circular and progress towards this goal remains slow. The European recycling industry has repeatedly pointed to the need to boost the market for secondary raw materials (including by stimulating the demand through incentives such as mandatory recycled content measures or green public procurement)[44] and to combat reluctance and misperceptions on the part of producers as to its reliability and quality potential.

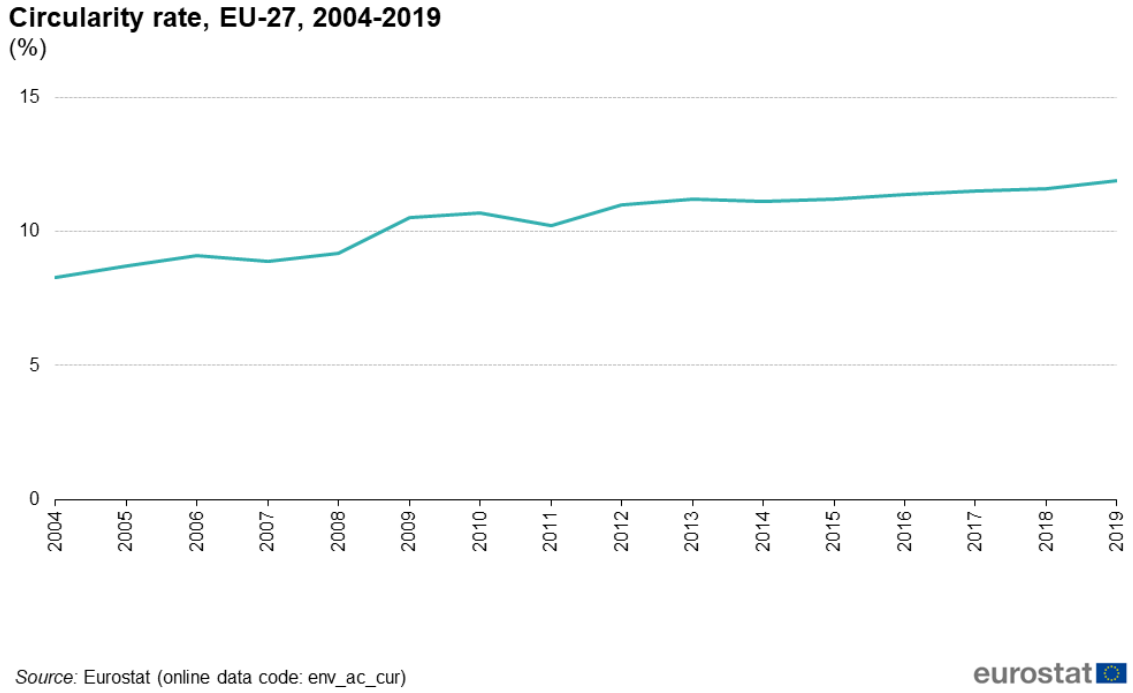

Figure 10: Circularity rate, EU-27, 2004-2019

Other studies show that over the whole life cycle of the products, **the use of resources is often suboptimal**[45]. Many products have characteristics that do not allow resource saving (e.g. energy and water) during their use and value retention activities at the end of their life, meaning that most products are discarded and their materials not sufficiently recycled, causing valuable resources to be wasted, including critical raw materials[46]. For instance, at the scale of the whole EU economy, the recycling rate of all waste excluding major mineral waste reached only 56% in 2016[47], so that conversely 44% of all the materials contained in waste is lost.[48] This performance indicator grows only very slowly (the EU recycling rate had already reached 54% in 2010, meaning a gain of only 2

[41] A European Strategy for Plastics in a Circular Economy, COM(2018) 28 final
[42] https://www.minderoo.org/plastic-waste-makers-index/
[43] Foresight on Critical Raw Materials for European Industry, March 2020, https://ec.europa.eu/info/sites/default/files/foresight_newsletters_collection_online_2020.pdf
[44] See for example joint open statement of EuRIC, FEAD and CEWEP, https://www.euric-aisbl.eu/position-papers/item/377-joint-open-letter-of-euric-fead-and-cewep-for-a-green-recovery
[45] See for example: www.eea.europa.eu/publications/circular-by-design or www.ellenmacarthurfoundation.org/publications/achieving-growth-within
[46] Report on Critical Raw Materials and the Circular Economy - Commission Staff Working Document SWD(2018) 36 final.
[47] Last available data. Eurostat: Recycling rate of all waste excluding major mineral waste [CEI_WM010] https://ec.europa.eu/eurostat/databrowser/view/cei_wm010
[48] Eurostat "Recycling rate of all waste excluding major mineral waste" [cei_wm010]

percentage points in 6 years), with large differences between Member States (from 10% in Estonia to 80% in Slovenia). Even for precious metals such as gold, a study in Germany and the United States reported that 90 % of the gold contained in mobile phones is dispersed and hence lost during the shredding taking place at the start of the recycling process[49]. This situation generates environmental impacts both in and outside the EU as well as unnecessary costs for industries. If we take the example of aluminium, using recycling scrap can save about 95% of the energy required to produce primary aluminium. This reduces processing and logistic costs as well as other important environmental impacts generated by both the mining of bauxite and transport between extraction, processing and fabrication.

Energy

The production and use of energy across economic sectors account for more than 75% of the EU's greenhouse gas emissions[50]. The global figure is 73% worldwide[51]. More than 43%[52] of the EU greenhouse gas emissions is due to energy used by products when consumed. However, even more energy is used for the production of these products (i.e. 'grey energy' or embedded energy) both in the EU and in the rest of the world, making products accountable for an even larger share of greenhouse gas emissions. Consequently, tackling the energy used for products is crucial for reducing greenhouse gas emissions in the short and medium term. Even in the long term perspective of 'green and carbon-free' energy, mastering the energy use, energy content and energy efficiency of products will remain essential in order to avoid creating undue supplementary energy demand that would have to be compensated by additional renewable energy sources. This would involve the use of even more products[53] (and therefore additional environmental impacts), or the (temporary) use of less clean source of energy.

Life-cycle social impacts of EU consumption

Products, including those consumed in the European Union, can be produced under conditions that violate one or several of the 8 Fundamental Conventions of the International Labour Organisation (ILO)[54], which address child labour, forced labour, freedom of association, the right to organise, collective bargaining, equal remuneration and discrimination.

These violations can take place along the global chain supplying the products sold on the EU Internal Market. In fact, social risks (of all natures) related to consumption of goods in the EU are heavily concentrated in the extra-EU part of the value chains that supply these goods: based on a social LCA

[49] Lee, H., Sundin, E. and Nasr, N., 2012, 'Review of end-oflife- management issues in sustainable electronic products', in: Sustainable Manufacturing, Springer.

[50] The European Green Deal, COM(2019) 640 final

[51] Our World in Data, Emissions by sector https://ourworldindata.org/emissions-by-sector

[52] Data from the Ecodesign Impact accounting (https://ec.europa.eu/energy/studies/ecodesign-impact-accounting-0_en?redir=1) and Eurostat (Eurostat Energy Balance nrg_bal_c, ed. February 2021) suggest that the products covered by Ecodesign, Energy Label, Energy Star (until it expired) and Tyre Label represented 57% of the total EU primary energy consumption, which itself is liked to 75% of the greenhouse gas emissions in the EU (The European Green Deal, COM(2019) 640 final). When adding non regulated products (either outside the scope, or with no implementing measures) that share will be even greater.

[53] energy production and storage products like PV panels, wind turbines, batteries and potentially products and materials for grid expansion and reinforcement

[54] The 8 Fundamental Conventions of the ILO are:
Freedom of Association and Protection of the Right to Organise Convention, 1948 (No. 87)
Right to Organise and Collective Bargaining Convention, 1949 (No. 98)
Forced Labour Convention, 1930 (No. 29) (and its 2014 Protocol)
Abolition of Forced Labour Convention, 1957 (No. 105)
Minimum Age Convention, 1973 (No. 138)
Worst Forms of Child Labour Convention, 1999 (No. 182)
Equal Remuneration Convention, 1951 (No. 100)
Discrimination (Employment and Occupation) Convention, 1958 (No. 111)

approach and on 2010 data, the majority of overall social risks in the 10 most impactful sectors are related to extra-EU trade[55], a large proportion of which are due to the occurrence of work-related injuries and fatalities (e.g. particularly in the garment sector[56]). Worryingly, however, some violations are also taking place within EU borders.

Table 20 Top ten sectors for single-score social risk (by % contribution to overall social risk) attributable to EU-27 imports in 2010 from extra- and intra-territorial trading partners considering cradle-to-producer gate life cycle social risk scores

	Extra-	Intra-	Total
Oil	17 %	0 %	17 %
Crops n.e.c.	8 %	0 %	8 %
Machinery and equipment n.e.c.	5 %	2 %	7 %
Metals n.e.c.	6 %	1 %	7 %
Chemical, rubber, plastic products	4 %	2 %	6 %
Textiles	5 %	1 %	6 %
Electronic equipment	4 %	1 %	5 %
Wearing apparel	4 %	1 %	4 %
Food products n.e.c.	3 %	1 %	4 %
Minerals n.e.c.	3 %	0 %	3 %
SUM	58 %	9 %	67 %

Global breaches of ILO conventions along supply chains

A 2021 report[57] of the ILO and Unicef on **child labour** indicates that the number of children in child labour rose to 160 million worldwide in 2020 (including 63 million girls and 97 million boys), an increase of 8.4 million children compared to 2016. This means that almost 1 child in 10 is affected worldwide. More worryingly, this report warns that these figures are rising again for the first time in 20 years after a continuous period of decline. The number of children aged 5 to 17 years in hazardous work – defined as work that is likely to harm their health, safety or morals – has risen by 6.5 million to 79 million since 2016 and represents close to 50% of the total number of children at work.[58] Between 28 and 43% of these child labourers contribute, directly or indirectly, to global supply chains.[59]

The cases of the worst forms of child labour were found in sectors that correspond to those with a high risk of contemporary forms of slavery occurring in supply chains, including some directly or indirectly linked to the products likely to fall within the scope of this initiative, such as agriculture (i.e. farming of raw materials such cotton), mining and quarrying, and garments and textiles.[60] In

[55] Pelletier, N., Ustaoglu, E., Benoit, C. et al. Social sustainability in trade and development policy. Int J Life Cycle Assess 23, 629–639 (2018). https://doi.org/10.1007/s11367-016-1059-z Table 1.B

[56] EC study on due diligence requirements through the supply chain, 2020, p. 215. In the past ten years, garment supply chains have seen horrific workplace accidents, such as the collapse of the Rana Plaza, https://op.europa.eu/en/publication-detail/-/publication/8ba0a8fd-4c83-11ea-b8b7-01aa75ed71a1/language-en

[57] International Labour Office and United Nations Children's Fund, Child Labour: Global estimates 2020, trends and the road forward, ILO and UNICEF, New York, 2021. https://data.unicef.org/wp-content/uploads/2021/06/Child-Labour-Report.pdf

[58] International Labour Office and United Nations Children's Fund, Child Labour: Global estimates 2020, trends and the road forward, ILO and UNICEF, New York, 2021. https://data.unicef.org/wp-content/uploads/2021/06/Child-Labour-Report.pdf

[59] Ending child labour, forced labour and human trafficking in global supply chains, ILO, OECD, IOM, UNICEF - Geneva,2019. https://www.ilo.org/wcmsp5/groups/public/---ed_norm/---ipec/documents/publication/wcms_716930.pdf

[60] ILO, "Implementing the Roadmap for Achieving the Elimination of the Worst Forms of Child Labour by 2016: a training guide for policymakers" (2013), p. 9.

Africa tens of thousands of children are reported to work in open-pit mines supplying niobium and tantalum to the global electronics industry[61].

A 2019 report of the ILO[62] on **forced labour and modern slavery** states that in 2016, over 40.3 million people were in a situation of modern slavery, including 16 million people in forced labour exploitation in the private economy (15% of which were employed in the manufacturing sector). Contemporary forms of slavery have often been cited as occurring in global supply chains of international brands in the garment and footwear sector.[63] Forced labour in the manufacturing of electronic goods has also been the subject of recent research.[64] In the garment sector, recent reports of the use of forced labour of Uyghurs in the cotton production in Xinjiang have revealed great risks of human rights violations. The Xinjiang province in China is said to produce almost 20% of global cotton supplies[65].

There is evidence that several labour rights (e.g. **freedom of association**, **right to organise** and **to collectively bargain**) are undermined across the world. The yearly Global Rights Index by the International Trade Union Confederation[66] on labour and human rights showed that in 2020, 80% of countries (115 of 144 countries) violated the right to collectively bargain (up from 62.5% in 2014), 74% of countries (109 of 144) excluded workers from the right to establish or join a trade union (up from 58% in 2014), and hence the freedom of association and the right to organise. Similarly, the number of countries which impeded the registration of trade unions, increased from 86 in 2019 to 89 countries in 2020. These violations of labour rights take place in third countries, but also in the European Union.

In addition, areas affected by (armed) conflicts often have an increased risk of social and human rights violations, including the ILO conventions. It occurs that products destined for the EU market include materials, often including minerals, which are commonly sourced from such areas.[67]

Despite growing international pressure for application of social codes of conduct throughout supply chains, an ILO survey[68] shows that working conditions are considered as selection criterion in only 36% of cases, whereas price is a criterion in 73% of cases and speed of delivery in 59% of cases (for example, a Eurostat survey of EU companies sourcing internationally[69] showed that their motivation lies, in 85% of cases, in reducing labour costs, and that the main reason EU businesses moved functions abroad between 2014 and 2016 or between 2015 and 2017 was to cut labour and other costs). In addition to these selection criteria, purchasing practices as they are currently designed and

[61] B. Vivuya, Equal Times, 16 October 2020: "As incremental efforts to end child labour by 2025 persist, Congo's child miners – exhausted and exploited – ask the world to "pray for us"", available at: https://www.equaltimes.org/as-incremental-efforts-to-end#.YLTEOagzY2w

[62] United Nations General Assembly: "Current and emerging forms of slavery - Report of the Special Rapporteur on contemporary forms of slavery, including its causes and consequences", July 2019, available at: https://www.un.org/en/ga/search/view_doc.asp?symbol=A/HRC/42/44

[63] See, for example, Centre for Research on Multinational Corporations and India Committee of the Netherlands, "Flawed Fabrics: the abuse of girls and women workers in the South Indian textile industry" (2014) (www.indianet.nl/FlawedFabrics.html); **Anti-Slavery International, "Slavery on the high street: forced labour in the manufacture of garments for international brands"** (2012) (www.antislavery.org/includes/documents/cm_docs/2012/s/1_slavery_on_the_high_street_june_2012_final.pdf).

[64] ILO referred to the response of a major United States electronics company to allegations of forced labour in factories in China in its publication *Combating Forced Labour: A Handbook for Employers & Business*, Good Practice Case Studies, Part 7 (2008), pp. 5–7. See also China Labor Watch, "Is Samsung Infringing Upon Apple's Patent to Bully Workers?" (2012) (www.chinalaborwatch.org/upfile/2012_9_4/Samsung%20Report%200904-v3.pdf) and "Beyond Foxconn: Deplorable Working Conditions Characterize Apple's Entire Supply Chain" (2012) (www.chinalaborwatch.org/upfile/2012_8_13/2012627-5.pdf); and Verité, "Forced Labor in the Production of Electronic Goods in Malaysia: A Comprehensive Study of Scope and Characteristics" (2014) (www.verite.org/sites/default/files/images/VeriteForcedLaborMalaysianElectronics2014.pdf).

[65] "Xinjiang cotton sparks concern over 'forced labour' claims". BBC, 13 November 2019, https://www.bbc.com/news/business-50312010

[66] International Trade Union Confederation, "2020 Global Rights Index", 2020. https://www.ituc-csi.org/IMG/pdf/ituc_globalrightsindex_2020_en.pdf

[67] See information and documentation on Conflict Affected and High-Risk Areas (CAHRAs) (responsiblemineralsinitiative.org).

[68] ILO, "Purchasing practices and working conditions in global supply chains: Global Survey results - INWORK Issue Brief No.10", June 2017, https://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---travail/documents/publication/wcms_556336.pdf

[69] The motivation of EU-based companies for sourcing production internationally lies, in 85% of cases, in the reduction of labour costs, In: Eurostat Motivational factors important for enterprises sourcing internationally (2014-2017) https://ec.europa.eu/eurostat/statistics-explained/index.php?title=International_sourcing_and_relocation_of_business_functions

implemented consist, according to this ILO survey, in: (1) an absence of written contracts, in 36% of cases; (2) a lack of specification of working conditions in 59% of cases; (3) insufficient lead times more than 30% of the time for 41% of respondents; (4) exerting market power, with the main customer taking over more than 50% of production in 24% of cases, to force taking up unrealistically challenging price and lead time.

The **example of textiles** is a case in point for illustrating how the above-mentioned risks, where the prevalence of highly competitive, mostly linear business models in the sector — both inside and outside Europe — can have detrimental social and human rights impacts, including poor rates of pay, poor working conditions and poor working environments in textile factories[70]. A study reports that the EU consumption of clothing, textiles and leather products have contributed in 2015 to around 375 fatal accidents and 21,000 non-fatal accidents due to poor working conditions in supply chains outside the EU[71]. Indeed, more than 70% of the textiles and clothing imported into the EU originate from third countries/regions[72] – in some of which clear breaches of worker rights have emerged, at times resulting in tragic incidents[73]. Given the high percentage of global cotton supplies that originate from the Xinjiang province (cited above) for example, it is likely that thousands of EU companies are using cotton produced from the forced labour of Uyghurs in their garment production[74]. According to European Coalition for Corporate Justice, textiles is not the only affected sector: supply chains feeding the EU toy manufacturing industry have been found to be exploiting worker and migrant workers' rights[75]. The EU automobile and cosmetic sectors have also been linked to forced labour in India and Madagascar, from which they solely source mica mineral[76]. For various materials, including some CRMs, the EU is depending on the supply from countries with low standards of governance[77]. This not only poses a supply risk for the EU, but may also exacerbate environmental and social problems, such as conflicts arising from (or aggravated by) access to resources.

Breaches within the EU

Indeed, within the EU itself, 610,000 are estimated to be victims of forced labour exploitation across a range of industries and economic sectors, including agriculture, manufacturing and construction (2012 figures[78]). As highlighted by the EU Fundamental Rights Agency (FRA), migrant workers in the EU are specifically vulnerable to forced labour and there are reports of some experiencing 'concentration camp conditions'[79]. Violations of labour rights and exploitation of workers, including migrant workers, have been documented and reported in many supply chains, including with headquarters

[70] https://www.eea.europa.eu/publications/textiles-in-europes-circular-economy

[71] SDSN, Social spillover effects in the EU's textile supply chains. October 2020; https://irp-cdn.multiscreensite.com/be6d1d56/files/uploaded/Social%20Spillover%20%20Effects%20in%20the%20EU%27s%20Textile%20Supply%20Chain.pdf

[72] https://www.europarl.europa.eu/RegData/etudes/ATAG/2017/603885/EPRS_ATA(2017)603885_EN.pdf

[73] https://www.ilo.org/global/topics/geip/WCMS_614394/lang--en/index.htm

[74] https://www.economist.com/business/2021/03/27/china-boycotts-western-clothes-brands-over-xinjiang-cotton

[75] Suppliers of an EU-based company were been revealed to have subjected their employees to exploitation and violating both Chinese labour laws and ILO Conventions. Findings revealed the prevalence of 11 hour shifts without breaks, absence of protection measures, violation of freedom of association, insufficient wages for covering basic living costs and exploitation of migrant workers. With China's toy industry producing 75% of the world's toys, risks of such violations are thus inherent to toy supply chains. ECCJ's "What if? Case studies of human rights abuses and environmental harm linked to EU companies, and how EU due diligence laws could help protect people and the planet"

[76] ECCJ's "What if? Case studies of human rights abuses and environmental harm linked to EU companies, and how EU due diligence laws could help protect people and the planet"

[77] COM(2020) 474 final

[78] ILO 2012 Global Estimate of Forced Labour – Regional Factsheet European Union. https://www.ilo.org/wcmsp5/groups/public/---europe/---ro-geneva/---ilo-brussels/documents/genericdocument/wcms_184975.pdf

[79] European Union Agency for Fundamental Rights, Protecting migrant workers from exploitation in the EU: workers' perspectives, 2019. https://fra.europa.eu/sites/default/files/fra_uploads/fra-2019-severe-labour-exploitation-workers-perspectives_en.pdf

inside the EU, particularly in the manufacturing industry[80] [81], telecommunication services[82], the agricultural sector[83] and the construction sector[84].

Sustainable Corporate Governance initiative (SCGI)

The SCGI is a company law initiative that aims to foster long-term, viable and responsible business models, which incorporate climate and environmental considerations and are in line with human rights. One element considered in the ongoing impact assessment is the possible introduction of a general due diligence duty for companies, covering both human rights and environmental aspects and related to all company activities (not a particular product). It would apply to companies of a certain size or generating a certain turnover in the EU. This would entail a general obligation for a company to put in place due diligence process including the mapping of its value chains, identification of risks (including risks covered by the ILO conventions) and risk mitigation.

This company-approach, given its broad nature and scope, will include due diligence steps applicable to a wide range of risks. Therefore, there may potentially be specific risks associated with specific products placed on the EU market to which the SCGI does not address rules tailored to the individual case (see also *Annex 14.1* for more details on the SCGI).

Risk of fragmentation of the internal market

Some Member States have recognised the problem and started putting some rules in place in order to address it. This gives rise to a risk of fragmentation of the internal market, as will be examined in more detail below (under the section on *What are the consequences?* below).

Sub-problem 1: Product design does not sufficiently take into account environmental impacts over the life cycle, including circularity aspects

Product design determines to a large extent the circularity potential of a product[85]. In the context of a circular economy, 'product design' must be understood in the broadest sense of the term, as encompassing all choices relating not only to a product's functionality, but also to its lifespan, reparability, recyclability, suitability for refurbishment or remanufacture as well as the choice of materials, the proportion of recycled and renewable content, the logistics, and the processes used to produce it[86]. It is the combination of these factors which, to a large extent, directly or indirectly determines a product's longevity and the overall environmental impacts along its life cycle (i.e. the impacts identified in the previous section). Indeed, it has been found that 80% of a product's environmental impacts is determined at the design phase.[87]

[80] Violations of labour rights and exploitation of workers, including migrant workers, have been documented in the EU manufacturing industry, https://corporatejustice.org/asi_eccj_report_final.pdf

[81] See the case reported on page 30 of ECCJ's "What if? Case studies of human rights abuses and environmental harm linked to EU companies, and how EU due diligence laws could help protect people and the planet"

[82] See page 33 of ECCJ's "What if? Case studies of human rights abuses and environmental harm linked to EU companies, and how EU due diligence laws could help protect people and the planet" on labour rights of telecommunication employees in Bangladesh, including violation of the right to freedom of association, with workers and union representatives subject to threats, harassment or unlawful dismissals

[83] See Alessandra Corrado "Migrant crop pickers in Italy and Spain", Heinrich Böll Foundation, June 2017; https://www.boell.de/sites/default/files/e-paper_migrant-crop-pickers-in-italy-and-spain_1.pdf#:~:text=In%20the%20Mediterranean%20basin%2C%20Spain%20and%20Italy%20are,restructuring%20processes%20it%20has%20experienced%20since%20the%20mid-1980s.

[84] Cases of exploitation of migrant workers in Qatar by Irish company in Amnesty International, "Unpaid and abandoned: the abuse of Mercury MENA workers", and by French company in BHRRC, "Vinci lawsuits (re forced labour in Qatar)"

[85] EEA Report No 6/2017, *Circular by Design: Products in the circular economy*, p.11

[86] Ibid

[87] "How to do EcoDesign?", a guide for environmentally and economically sound design edited by the German federal Environmental Agency, Verlag form, 2000

Designing products in a more circular way **can also help offset the negative environmental impacts of products more widely and 'close the loop' for different materials and products:** for example, the use of recycled materials in one product serves to simultaneously reduce the negative impacts of the original product(s), whose materials are being reused; the capacity to reuse a product's components through manufacturing reduces the impacts of the new products reusing these components, etc.

We are not yet there, however: the 2020 Circularity Gap report identified poor design of products as one of the chief contributory factors to continued linearity and reliance on virgin materials[88]. In the EU, product design does not yet sufficiently take into account environmental impacts over the product lifecycle, as can be inferred from data on several design-related dimensions, as set out below.

Durability and reparability

First, **products are not being designed to last long enough**: since the late 1980s, the lifespan of consumer products has generally decreased[89], and in recent years the lifespan of many types of products has become progressively shorter[90]. In France, the NGO "*Halte à l'obsolescence programmée – HOP*" measured a decrease in the lifetime of washing machines from 10 years in 2010 to 7 years in 2019, with strong differences between manufacturers (3.8 years for the worst performing and 10.3 years for the best performing)[91]. Another study investigated the lifetime of electric appliances in the Netherlands between 2000 and 2006, and concluded that, for all product categories except one, the lifetime has decreased over this period, from -1% to -20%[92].

While technological developments may account for some of this, and consumer choices and trends certainly play a role[93], this is not always the case: in the case of energy-related goods, **deficient mechanical and electronic robustness**, as well as **software-induced reasons** (including peripheral devices becoming obsolete) have been identified amongst the leading causes[94]. In the case of Information and Communication Technologies (ICT) products such as smartphones, for example, early failure issues (e.g. broken screens/USB-ports; non-durable components such as batteries; software update issues resulting in less upgradability/incompatibility with other devices) are an area of particular concern[95]. A study[96] for the Greens group in the German *Bundestag* also identifies more than 20 forms of technical deficiencies in products leading to major reductions in the lifespan, and *HOP* has analysed the technical features of inkjet printers[97], identifying 6 key parts that could be designed for better reparability or longer lifetimes. In the case of appliances, the German Environment Agency (UBA) found that increasing numbers fail within the first five years of their service life – for example household appliances[98].

[88] Circularity Gap Report 2020, p. 15, https://assets.website-files.com/5e185aa4d27bcf348400ed82/5e26ead616b6d1d157ff4293_20200120%20-%20CGR%20Global%20-%20Report%20web%20single%20page%20-%20210x297mm%20-%20compressed.pdf

[89] There are many drivers leading to a decreasing lifespan of products: the technological progress; economic factors (e.g. when the cost of repair or upgrading is higher than replacement; and psychological reasons, shaped by style, fashion or a perceived change in need). See Circular by design. Products in the circular economy (EEA, 2017).

[90] Öko-Institut in Germany, Prakash S. e.a., 2016. Also, EEB (2019) Coolproducts don't cost the earth -full report. www.eeb.org/coolproducts-report

[91] Report "Lave-linge : une durabilité qui prend l'eau ?" (2019)

[92] Wang F, Huisman J, Stevels A, Baldé CP. Enhancing e-waste estimates: improving data quality by multivariate Input-Output Analysis. Waste Manag. 2013 Nov;33(11):2397-407. doi: 10.1016/j.wasman.2013.07.005. Epub 2013 Jul 28. PMID: 23899476.

[93] https://www.oneplanetnetwork.org/sites/default/files/the_long_view_2017.pdf, p. 21

[94] Öko-Institut in Germany, Prakash S. e.a., 2016.

[95] BEUC, 2015: Durable goods: more sustainable products, better consumer rights.

[96] Geplante Obsoleszenz: Entstehungsursachen, Konkrete Beispiele, Schadensfolgen, Handlungsprogramm - Gutachten im Auftrag der Bundestagsfraktion Bündnis 90 / Die Grünen (2013)

[97] Report: "Imprimantes: cas d'école d'obsolescence programmée ?" (2019)

[98] UBA (2016) https://www.umweltbundesamt.de/sites/default/files/medien/378/publikationen/texte_11_2016_einfluss_der_nutzungsdauer_von_produkten_obsoleszenz.pdf

Citizens' experience ties in with the above: there is a general perception amongst citizens that products do not last as long as they should[99]. A survey based in one Member State indicated that respondents "want products to last considerably longer than they are currently used"[100], and in a 2018 public consultation, 83.4% responded that 'the EU should set rules to make sure products have a long lifetime'[101]. A platform developed by Belgian consumer organisation Test Achats/Test Aankoop to flag products that break too quickly received over 5,400 reports during its first 5 months[102].

A decisive factor for a product's lifespan is its capacity to be easily **repaired**, which in turn is influenced by its initial design[103]. In the EU, it appears that products are generally not designed with ease of repair in mind. In its report[104], the German UBA observed an increase to 36% of the share of permanently fitted batteries in smartphones in 2013. Indeed, the growing tendency to produce more integrated design in recent years has involved an increased use of adhesives (instead of joining mechanisms), making disassembly of parts more difficult: batteries in the best-selling smart-phones of 2019 (48% of the European market) were all fastened within the devices by means of adhesives, meaning that removal is not possible without the intervention of experienced repairers[105], which is likely to significantly increase the cost of repair. Another study found that the proportion of defective electrical devices being replaced by consumers grew from 3.5% in 2004 to 8.3% in 2012[106].

Recyclability, reusability and re-manufacturability

Design also plays a key role in determining the **recyclability, reuse and remanufacturing potential of a product**, in turn affecting its overall environmental impact. For example, compatibility of a product's materials, how easy they are to separate and the use of additives in a product all contribute to determining how recyclable it will be; how well a product's essential components hold up over time is key for reuse[107]; and features such as ease of disassembly and modular design determine a product's capacity to be remanufactured.

For **recycling**, increasingly complex product designs (including substances of concern) are creating barriers. In the case of plastics in products and packaging products, mixtures of different polymers or differing materials mean that recyclers are increasingly unable to separate components effectively, and the production of high quality secondary materials is being hampered[108]. In the case of waste electrical and electronic equipment (WEEE), the complex product compositions that can contain hazardous materials have been identified as among the main barriers to recycling[109]. In the case of textiles, in some instances the chemicals chosen during their production remain in the products throughout the use phase, with implications for possible recovery of the material content and potentially leading to persistent chemicals remaining in products made from recycled materials[110]. In addition, the growing usage of fibre blends in garments contributes to making recycling more

[99] The Long View: Exploring Product Lifetime Extension, 2017, p. 21 https://www.oneplanetnetwork.org/sites/default/files/the_long_view_2017.pdf

[100] H. Wieser, N. Tröger and R. Hübner, 'The consumers' desired and expected product lifetimes', proceedings of the PLATE conference – Nottingham Trent University, 17-19 June 2015

[101] SWD(2019) 91 final

[102] https://www.beuc.eu/publications/beuc-x-2018-057_premature_obsolescence.pdf

[103] It should be considered that the ease of repair is not only determined by the product design but also the willingness and affordability of repair for consumers.

[104] *Ibid.*

[105] Cordella, M.; Alfieri, F.; Clemm, C.; Berwald, A.; 2020, Durability of smartphones: A technical analysis of reliability and repairability aspects, p.7.

[106] https://www.oeko.de/en/press/press-releases/archive-press-releases/2015/reality-check-obsolescence/

[107] A recent paper concluded that, for electric and electronic equipment, it appears technologically feasible to reuse more than 22% of the total weight of in use stock and around 20% of waste according to available technology. See Estimating total potential material recovery from EEE in EU28, https://doi.org/10.1016/j.resourpol.2020.101785

[108] Plastics Recyclers Europe, https://www.plasticsrecyclers.eu/challenges-and-opportunities

[109] Trinomics, 2020, Emerging challenges of waste management in Europe, https://trinomics.eu/wp-content/uploads/2020/06/Trinomics-2020-Limits-of-Recycling.pdf

[110] Schmidt., A., Watson, D., Roos, S., Askham, C., Gaining benefits from discarded textiles: LCA of different treatment pathways, 2016

difficult. (Blends can be processed in mechanical fibre recycling processes, but this makes it difficult to control the material composition of the resulting recycled yarns. For chemical polymer recycling, technologies exist to separate blends as part of the recycling process, although separate steps are required, increasing costs significantly, and the processes are only feasible for materials that are used in large enough portions in the input material[111].) It is estimated that less than 1% of textiles worldwide are recycled into new textiles[112]. In the EU, figures suggest only around 15-20% of textiles are collected for recycling or reuse in Europe, whereas 75-80% are either landfilled or incinerated. For furniture, lower quality materials and poor design are contributing to the fact that[113], on reaching its end of life, it is estimated that most furniture in the EU ends up being landfilled[114].

Again in the case of furniture, recent moves towards lower quality materials are restricting the potential for **reuse and remanufacture** as products are often not robust enough to be easily moved, and are often not designed for disassembly, reassembly, or reconfiguration[115]. In addition, if a fire proofing label is attached in a way that it can be easily removed, subsequent reuse is rendered impossible in some cases[116]. In the case of textiles, studies suggest that the percentage that enters the reuse phase is very limited, with approximately 60% of discarded textiles ending up disposed of due to lack of quality or failures in the garment itself (e.g. pilling, colour fastness properties, tear strength, dimension stability, zipper quality, etc.)[117]. For electrical equipment, an increase in automated manufacture has led to products being designed with features that render remanufacture less likely[118], while in other cases, producers may purposefully design their products to make them difficult to remanufacture, including by embedding microchips[119]. Indeed, in a market study[120] under the Horizon 2020 programme, one of the main barriers to wider roll-out of remanufacturing activities identified by the European Remanufacturing Network was "*poor design for remanufacturing: Particularly where remanufacturing is not embedded within the OEM culture, remanufacturing can sometimes be inhibited by poor design*".

Poor product design also contributes to reducing the overall quality of **secondary raw materials**, in turn limiting the potential scope for their use in production, as seen in the main problem section above[121].

Low recyclability is also affecting several **CRMs** due to a number of reasons, such as[122]:

[111] Ellen McArthur Foundation "A new textiles economy: redesigning fashions' future", 2017, https://www.ellenmacarthurfoundation.org/publications/a-new-textiles-economy-redesigning-fashions-future

[112] ECOS, 2021, Durable, repairable and mainstream: how ecodesign can make our textiles circular, https://ecostandard.org/wp-content/uploads/2021/04/ECOS-REPORT-HOW-ECODESIGN-CAN-MAKE-OUR-TEXTILES-CIRCULAR.pdf

[113] EEA, 2017, Circular Economy Opportunities in the Furniture Sector, file:///C:/Users/murrapi/AppData/Local/Temp/1/Report-on-the-Circular-Economy-in-the-Furniture-Sector.pdf

[114] European Manufacturing Network Remanufacturing Market Study, 2015: "According to European Federation of Furniture Manufacturers (UEA) statistics, in the EU furniture waste accounts for more than 4% of the total municipal solid waste, of which 80-90% is incinerated or dumped in landfills, with10% recycled/.", p.80

[115] For example, move from solid wood and metal furniture to less expensive plastic, chipboard and medium-density fibreboard (MDF), particularly in flat-pack furniture; EEA, 2017, Circular Economy Opportunities in the Furniture Sector, p.15

[116] Ibid: the EU's General Product Safety Directive places a general duty on suppliers of consumer products to supply only products which are safe. Transposal of the Directive at Member State level has seen requirements introduced for retailers to ensure that a permanent fireproofing label is on products when they are supplied to the consumers

[117] ECOS, 2021, Durable, repairable and mainstream: how ecodesign can make our textiles circular, https://ecostandard.org/wp-content/uploads/2021/04/ECOS-REPORT-HOW-ECODESIGN-CAN-MAKE-OUR-TEXTILES-CIRCULAR.pdf

[118] Such as sealed electronics that need replacing as a whole at a cost comparable with the original price of the machine, see SWD(2019) 91 final, p.28

[119] This is the case of inkjets, and though the predominant reason is linked to preventing counterfeiting, the result inhibits remanufacturing. European Manufacturing Network Remanufacturing Market Study, 2015, P. 74, https://www.remanufacturing.eu/assets/pdfs/remanufacturing-market-study.pdf

[120] Remanufacturing Market Study (Horizon 2020) European Remanufacturing Network et al (2015), https://www.remanufacturing.eu/assets/pdfs/remanufacturing-market-study.pdf

[121] *Geyer, R.; Kuczenski, B.; Henderson, A. (2016). "Common Misconceptions about Recycling". Journal of Industrial Ecology. 20 (5): 1010–1017.*

[122] JRC Technical Report - Critical raw materials and the circular economy (https://op.europa.eu/s/vT2H)

- lower amounts of CRMs (compared to other 'bulk' materials, as steel or copper) are dispersed in several components (e.g. electronics), making them difficult to be dismantled at the end-of-life;
- dissipative uses of CRMs in certain applications (e.g. in pigments, lubricants, soldering, braking pads);
- sorting and recycling technologies for many CRMs are not fully developed yet at competitive costs;
- the use of CRMs is relatively new in several applications (including long lasting applications as in renewable energy plants), with few of them already reaching the end-of-life.

Moreover, we lack complete information on the amount of raw materials contained in products (and their exact location in product's components), in extractive tailings and in waste landfilled, representing potential available sources for future recovery, including recycling. As a result, secondary production of CRMs (i.e. production of these materials from waste recycling) is currently only marginally contributing to meet the internal demand[123].

Environmental impacts

The net result of the above is that products are being replaced more frequently than before, involving significant energy and resource use in order to produce and distribute new products and dispose of old ones[124]. Indeed, though the **embedded emissions of products' *non-use phases*** – resource extraction, manufacturing, logistics, and end-of-life treatment etc. – are often overlooked, they account for a large part of products' negative environmental impacts: a study by the European Environmental Bureau (EEB) found that extending the lifetime of all washing machines, notebooks, vacuum cleaners and smartphones in the EU by just one year would save around 4 million tonnes of carbon dioxide (CO2) emissions annually by 2030 – the equivalent of taking over 2 million cars off the roads for a year (See Table below)[125]. It also concluded that the active use lifetime of smartphones is far below the optimal lifetime they should have to compensate the environmental impacts of their entire lifecycle phase, and that in the case of the four products it examined, repair is always preferable to replacement from the point of view of environmental impact[126].

[123] Raw Materials Scoreboard 2020, https://op.europa.eu/s/pita
[124] EEB, 2019, Cool Products Don't Cost The Earth, https://mk0eeborgicuypctuf7e.kinstacdn.com/wp-content/uploads/2019/09/Coolproducts-report.pdf
[125] Ibid
[126] Estimated to lie between 25 and 232 years. (EEB, 2019)

Table 21 Sample findings of EEB study on product lifespan and related impacts on the environment of two electrical products[127]

	Annual climate impact of use and non-use phase (in tons of CO2 equivalent)	**% climate impact that manufacturing, distribution and disposal count for**	**Expected lifetime**	**Annual EU sales**	**Total EU stock**	**1 year extension of lifetime estimated to equal**
Smart phones	14.12	72%	3 years	210,800,000 units	632,400,000 units	2.1 Mt CO2 per year by 2030; i.e. **over a million cars taken off the roads**
Washing machines	17.62	25%	11.5 years	13,518,000 units	202,000,000 units	0.25 Mt CO2 per year by 2030; i.e. **130,000 cars taken off the roads**

Note: Figures for smartphones refer to the region Western Europe (for the year 2018). This may include non-EU countries.

Private sector data does not contradict this: research put forward by the Ericsson company found that over the lifecycle of a smartphone, raw material acquisition and production were the most impactful with regards to toxicities and other environmental impacts, and that the production processes of the different parts were responsible for over 80% of the device's global warming potential associated with climate change[128].

These trends are also reflected in other sectors: clothing, footwear and household textiles is the EU's fifth highest pressure category for greenhouse gas emissions[129], and its production and handling consumed within the EU-28 generated emissions of 654 kg CO2 equivalent per person in 2017. A quarter of this was due to production and handling that took place inside the EU-28[130].

[127] EEB, 2019, Cool Products Don't Cost The Earth, https://mk0eeborgicuypctuf7e.kinstacdn.com/wp-content/uploads/2019/09/Coolproducts-report.pdf

[128] https://www.ericsson.com/en/reports-and-papers/research-papers/life-cycle-assessment-of-a-smartphone

[129] Higher than that of the recreation and culture, beverages, health, restaurants and hotels, and communication categories; EEA, 2019, Textiles and the environment in a circular economy

[130] Ibid

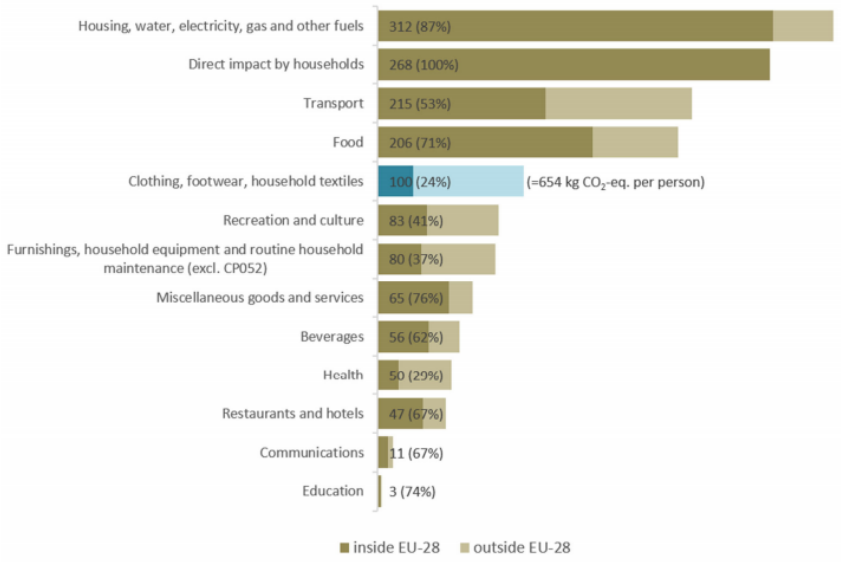

Figure 11 Estimated greenhouse gas emissions in the upstream supply chain of EU household consumption domains, indexed values with textile consumption equalling 100, 2017 (Source: European Environment Agency - EEA, 2019, Textiles and the environment in a circular economy)

In conclusion, there are many studies and analyses showing that **most of the environmental impacts related to products come from life cycle stages other than that of the use stage**[131]. A first consequence of such evidence is that, in order to tackle some global environmental issues like climate change, the focus of the policy action should not be limited to direct emissions but address effectively and consistently the most relevant emissions taking place along the entire value chain. While the relative relevance of the different life cycle stages may change for the various impact categories, similar trends have been reported for all the industry sectors for which such an analysis has been carried out. This seems to **confirm the importance of the "design" phase**, understood as the possibility to holistically manage the value chain fostering the different actors to create synergies and operate **to minimise the total environmental impact of products**. This could require a change of design, a change of raw materials, a change of suppliers, a change of logistic solutions, a change of "usage models", a change of maintenance approaches, or a mix of different solutions. By focusing on a single life cycle stage, or a single impact, the industry ecosystem would not have the right incentives to create the required synergies to optimise the value chain management.

Sub-problem 2: Too difficult for economic operators and citizens to make sustainable choices in relation to products

It is still too difficult for economic operators and citizens to make sustainable choices in relation to products given that relevant **information and affordable options** to do so are lacking.

A recent assessment found that 56% of consumers[132] would use information on environmental characteristics to buy "more environmentally friendly products". However, the level of information

[131] E. Hertwich, and R. Wood, "The growing importance of scope 3 greenhouse gas emissions from Industry", Environ. Res. Lett. 13 (2018) 104013

[132] This is in line with the findings from the consumer survey conducted in preparation of the empowering the consumers for the green transition, with between 42% and 60% of respondents (depending on the products category) reporting that they would be willing to pay about 5% of the price of a product to receive information on the environmental characteristics of the product. European Commission, *IA*

available on **product environmental characteristics** is considered unsatisfactory: a 2019 open public consultation[133] found that 85% of respondents were unsatisfied or only partially satisfied with the product sustainability information available to them. Indeed, despite actively looking for information about the environmental characteristics of products[134] (such as their environmental impacts or performance, greenhouse gas emissions, water use etc.) a large number said that the existing information is insufficient[135, 136]. The other categories do not fare much better: information on the 'expected **lifespan**' of products (i.e. years of life, hours of use, number of cycles etc.) is hardly ever made available to consumers[137], and a majority of consumers find it difficult to find information on product **reparability**[138].

The above factors may in particular discourage undecided **consumers** (i.e. those who do not usually buy environmentally-friendly products but intend to/are considering doing so) from making more sustainable product choices. Indeed, in particular for this category of consumers, **the ease with which a sustainable product can be differentiated from other products appears to play a role in encouraging sustainable product choice**[139].

For **economic actors along the supply chain**, considerable gaps exist between suppliers, producers, and waste management operators in relation to information and communication on composition, recyclability and toxicological characteristics of product materials (including for both primary and secondary product materials)[140,141]. This can be traced to a combination of factors, including traditional confidentiality accompanying commercial transactions and, in the case of complex value chains (such as textiles), the proliferation of indirect commercial relationships (e.g. lack of one-to-one relationships between supply chain actors)[142]. The magnitude of the problem is such that European industrial representatives have cited lack of available data (and the resultant inability to compare the green properties of embedded materials or intermediate inputs in certain products) as the single biggest non-cost inhibitor to higher demand and market competition for lower carbon and climate neutral production inputs[143]. In addition, "*lack of technical information on third party products…*[where] *the knowledge necessary to remanufacture products effectively is not readily available to non-OEMs*" has been identified by remanufacturers as one of the main barriers to wider roll-out of remanufacturing business models[144].

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supporting study, forthcoming. Binninger, A.S., Robert, I., Ourahmoune, N., *Etiquettes environnementales et consommation durable: des relations ambiguës en construction*. Revue de l'organisation responsable 9, 2014, p. 5-24.

133 See SWD(2019) 92 final, p. 66

134 European Commission, *Consumer Market Study on Environmental claims for non-food products*, 2014, p. 75.

135 60% of consumers found it difficult to determine the environmental impact of products, mostly because the information was not available or not clear or that consumers were unaware that such information existed.
European Commission, *Flash Eurobarometer 367*, 2013, p. 73.

136 European Commission, *Sustainable Products in a Circular Economy - Towards an EU Product Policy Framework contributing to the Circular Economy*, 2019, p. 66.

137 Around 82 % of respondents agreed, or tended to agree, that it is difficult to find information about how long a product will last. European Commission, *Behavioural Study on Consumers' engagement in the circular economy*, 2018, p 82.

138 European Commission, *Behavioural Study on Consumers' engagement in the circular economy,* 2018, p. 81.

139 *Flash Eurobarometer 367*, p. 6: "Respondents who do not buy environmentally-friendly products but intend to, are significantly less likely to believe that environmentally-friendly products are easily available compared with those who sometimes buy them (42% versus 54%). This suggests that environmentally friendly products should be more carefully presented so that they could be more easily differentiated from other products."

140 Circular Business Models: Overcoming Barriers, Unleashing Potentials (squarespace.com)

141 Nicolli F, Johnstone N, So¨derholm P (2012) Resolving failures in recycling markets: the role of technological innovation. Environ Econ Policy Stud 14:261–288

142 The first element of data enabling this traceability is the identity of the players involved in the supply chain. This information is available to the general public only for 2.5% of the companies subject to the Non-Financial Reporting Directive. Alliance for Corporate Transparency: 2019 Research Report, p.76
http://www.allianceforcorporatetransparency.org/assets/2019_Research_Report%20_Alliance_for_Corporate_Transparency.pdf

143 Sartor, O. (Agora Energiewende), Whittington, E., Markkanen, S. (University of Cambridge Institute for Sustainability Leadership (CISL)): Tomorrow's market today: Scaling up demand for climate neutral basic materials and products, 2021, https://www.corporateleadersgroup.com/files/cisl-clg-agora_tomorrows_markets_today_report.pdf

144 Remanufacturing Market Study (Horizon 2020) European Remanufacturing Network et al (2015), https://www.remanufacturing.eu/assets/pdfs/remanufacturing-market-study.pdf

This lack of availability of high quality information on products and their material composition is leading to **missed opportunities for sustainability and reducing the likelihood that value-retaining operations can be performed**. Repair is a case in point: independent repair networks commonly cite inability to understand how product repair should be carried out as a reason for unsuccessful repair[145], and lack of maintenance information is contributing to the fact that establishing maintenance services is mainly perceived as a burden and financial risk[146] (see also *sub-problem 1* as well as the section *What are the consequences?* below). Lack of information or available data on product materials is also creating a barrier to mechanical recycling processes and reducing the amount of material ultimately being recycled[147]. Indeed, imperfect information has been identified as a fundamental cause of market failure in recycling markets[148]: given that waste needs to be sorted before recycling takes place, and screening techniques are not usually capable of detecting intentionally/unintentionally added chemicals or contaminants in materials[149] (which could inhibit recycling), the absence/lack of access to clear information on material composition means that some materials with recycling potential continue to be overlooked and treated through disposal, causing their value not to be retained. One study[150] points to an 'almost systematic gap' in information flows relating to substances of concern in products and materials from the supply chains to the waste sector: even for the few goods[151] for which more binding and comprehensive documentation requirements exist, the information is not necessarily sufficiently accessible for the purpose of informing the waste sector (including e.g. because it is documented only on paper, because IT-systems are incompatible, or because confidentiality rules do not allow to the information to be disclosed to all parties). This lack of information also impedes the early detection of materials that should not be recycled, for instance due to the presence of harmful chemicals, which end up polluting otherwise safe waste streams. All of this in turn is **reducing the availability of high-quality recycled content, and therefore the uptake of such content in product design**.

Linked to this, in contrast to virgin materials, **possessing and transferring information on the quality of secondary materials appears crucial for ensuring uptake**: indeed, given that the quality of such materials is considerably more difficult to assess (e.g. presence of unwanted substances), the likelihood that customers will continue to opt for virgin over secondary materials increases if adequate information and guarantees on the characteristics of the latter are not in place[152]. In addition, in the absence of more granular information, waste material is likely to continue to be considered as contaminated and structurally deficient *by default* – in turn decreasing its potential to be used to form high quality secondary raw material[153].

The continued lack of/insufficient product information is also **affecting demand and market competition for more sustainable products and materials**. As mentioned, lack of available data has

[145] https://www.ellenmacarthurfoundation.org/assets/downloads/ce100/Empowering-Repair-Final-Public.pdf

[146] acatech/Circular Economy Initiative Deutschland/SYSTEMIQ (Eds.), 2020, Circular Business Models: Overcoming Barriers, Unleashing Potentials, https://static1.squarespace.com/static/5b52037e4611a0606973bc79/t/608a9b723926032d9f74aea2/1619696523596/GM_Gesamtbericht+EN

[147] acatech/Circular Economy Initiative Deutschland/SYSTEMIQ (Eds.), 2020, Circular Business Models: Overcoming Barriers, Unleashing Potentials, https://static1.squarespace.com/static/5b52037e4611a0606973bc79/t/608a9b723926032d9f74aea2/1619696523596/GM_Gesamtbericht+EN

[148] Nicolli F, Johnstone N, Söderholm P (2012), Resolving failures in recycling markets: the role of technological innovation. Environ Econ Policy Stud 14:261–288

[149] https://chemsec.org/app/uploads/2021/02/What-goes-around_210223.pdf

[150] JRC, 2020, Information Flows on Substances of Concern in Products From Supply Chains to Waste Operators, ET0219141ENN.en (1).pdf

[151] Such as airplanes, machine tools or medical devices; Ibid.

[152] Circular Business Models: Overcoming Barriers, Unleashing Potentials (squarespace.com)

[153] Nicolli F, Johnstone N, So¨derholm P (2012) Resolving failures in recycling markets: the role of technological innovation. Environ Econ Policy Stud 14:261–288

been identified by industrial representatives as a major barrier to the above[154]. The report also identifies the lack of reliable and comparable data as a particularly significant obstacle for downstream operators: instead of being able to reliably select the best performing suppliers and market their products accordingly, they are often obliged to presume higher carbon values to avoid legal/liability challenges, and/or rely on average emissions (at national or sectoral level) to evaluate the impacts of embedded materials in products. This inhibits their ability to market the sustainable properties of their products to consumers.

Lack of data may also be inhibiting the adoption of more sustainable business practices in general: generating high quality information on environmental characteristics of products has been identified as a useful tool for revealing new circular revenue streams or methods for cost reduction, and generally propelling businesses in the direction of greater circularity[155,156]. Failure to do so on a more widespread basis is therefore leading to missed opportunities: for optimising environmental performance of products and businesses, as well as for cost savings.

The above example also underlines how clarity and ease of access to relevant environmental information is crucial for fostering more sustainable decisions by supply chain actors. A major obstacle today is that, where certain sets of information on the environmental characteristics of products do exist – whether due to legal requirements or voluntary measures – **they have no consistent delivery format and are stored in many different places**. Instead, as alluded to above, a variety of formats are used, including physical (e.g. paper/hard copies) and digital (though websites etc.).[157]

Market actors often feel they have limited or no access to trustworthy information on environmental performance of products and organisations. Some of that information exists for certain environmental impacts or processes (e.g. EU energy label) and for specific products. Companies can choose to apply the EU Ecolabel or national/regional schemes (e.g. Nordic Swan, Blue Angel, etc.), to products in product categories covered by these "best-in-class" schemes that comply with criteria. However, information provision for the vast majority of the products on the market remains limited. Studies analysing environmental claims[158] for products show that half of explicit claims are misleading. Whilst such voluntary green claims will be addressed by other initiatives more directly, they show that even for products where in theory information is available, this is often not the case or the information is not correct. Initiatives addressing the reliability of voluntary claims will however not necessarily lead to an increase in the availability of information.

In addition (as set out below in the section on *Market failures*), the number of businesses capable of making truly sustainable offers in relation to products remains low due to the **low overall market penetration of circular business models** (CBM): for example, in sectors such as furniture and electronics/ICT, CBMs represent only 3% and 4% of the market respectively[159], and the overall market share of business models offering reuse, repair, remanufacturing/refurbishing, and upgrading/upcycling in the EU remains limited - Eurostat statistics since 2005 show that there has only been a slight but steady increase in the number of businesses in rental and leasing services, while

[154] Sartor, O. (Agora Energiewende), Whittington, E., Markkanen, S. (University of Cambridge Institute for Sustainability Leadership (CISL)): Tomorrow's market today: Scaling up demand for climate neutral basic materials and products, 2021, https://www.corporateleadersgroup.com/files/cisl-clg-agora_tomorrows_markets_today_report.pdf

[155] Adisorn, T.; Tholen, L.;Götz, T. Towards a Digital Product Passport Fit for Contributing to a Circular Economy.Energies2021,14,2289. https://www.mdpi.com/1996-1073/14/8/2289

[156] Some companies have used data from product life cycle assessment to identify environmental focal areas or improve circularity along the supply chain (See Philips or Levi Strauss) while others report significant cost avoidance secured though comparative life cycle assessment (see Unilever reports over €700m of cumulative cost avoidance since 2008 through measures focussing on water, energy, waste and materials, and a media company reached over €30m cost avoidance through a comparative life cycle assessment of packaging focussing on greenhouse gas emissions only)

[157] Ibid

[158] *Environmental claims in the EU – inventory and reliability assessment,* European Commission 2020. *Consumer Market Study on Environmental Claims for Non-Food Products,* European Commission 2014.

[159] REF consultant's supporting study to SPI IA, Task 5

repair services have been declining since 2014. This in turn is reducing the ability and ease with which citizens can access the products and services that result from circular business processes.

Another element making it difficult for economic operators and citizens to purchase more sustainable products in the market is the **price gap** vis-à-vis conventional, less sustainable products. Sustainable products are in some cases intrinsically more costly, given that the more numerous the requirements placed on a product and the sourcing of its materials, the smaller the space of feasible technical solutions, and hence the higher the cost[160]. More sustainable products are normally characterised by a longer lifetime compared to alternatives. However, counteracting and delaying naturally occurring breakdown requires a more robust design, in order to resist the multiple events over its extended lifetime. It also often implies reversible assembly methods (e.g. screws) which are more labour-intensive than the irreversible alternatives (e.g. glue, clipping) as these reversible assembly methods facilitate maintenance and repair. All of these aspects can contribute to the prolongation of a product's lifetime, but they can also increase the complexity of the design phase and as a consequence the costs of design and (often) production. In addition, more sustainable products tend to use materials sourced from suppliers respecting human rights, and for that purpose have put in place costly due diligence processes to assess their supply chain. As a result, more sustainable products can be more expensive than their alternatives in the market[161], but higher upfront costs can be offset by extended product lifetime and/or lower usage costs. Price is a strong signal in the market and it influences significantly purchasing choices of economic operators and consumers. Often consumers state that they would **pay more for environmentally-friendly products** (if confident about the product's credentials)[162]. However, it should be acknowledged that there is a difference between stated preferences and what consumer actually do (revealed preferences): very often stated preferences are biased towards "desirable" behaviours. As a result, the sale of more sustainable products is just a relatively small fraction in most product groups placed on the EU market (see the section on *Market failures* below) because sustainable products are inherently more expensive to design and produce, and unsustainable products are too cheap due to a lack of internalisation of external costs. When looking at waste management, for instance, many sectors do not pay for the costs they incur at the end-of-life[163]. Lately there is growing attention for the problem of textile waste, but in most countries the manufacturers and importers of textile products do not need to pay for the treatment of the textile waste nor for the costs of the environmental damage done at the end-of-life stage (i.e. pollution and GHG emissions).

The aforementioned market failure is exacerbated by the fact that the EU market is a very open market, with streams of imported products from countries with weaker environmental and social legislation, compounded with weaker enforcement of this already lax legislation. Where prices of European products have part of the environmental and social costs internalised into the product price, such internalisation is often smaller for imported products. This is does not only lead to bad environmental and social outcomes, but it also harms the competitiveness of the European industry due to a lacking level playing field.

[160] As an illustration, the RoHS Directive prohibited the usage of lead in soldering of electronic components, which was a low-tech, low-cost solution, and led to the usage of more expensive lead-free soldering (e.g. with bismuth / tin / silver alloys).

[161] A. Yenipazarli, A. Vakharia, Pricing, market coverage and capacity: can green and brown products co-exist? European Journal of Operational Research, 242 (1) (2015)

[162] For instance, 77% of respondents said they were willing to pay more for environmentally-friendly products if confident about the products' credentials, *Flash Eurobarometer 367*, 2013, p. 8.

[163] See for example examination of the 'polluter pays' principle in ECA, Special report 12/2021: "The polluter pays principle: inconsistent application across EU environmental policies and actions".

Sub-problem 3: Sub-optimal application of the current Ecodesign legislation

Although the Ecodesign Directive is generally considered successful[164] and can in principle address all stages of the product life cycle, evaluations and stakeholder consultations have highlighted that **its full potential was not systematically realised**.

The 2009/125 Ecodesign Directive extended the scope of products that could be subject to Ecodesign measures from the previous scope of "Energy using products"[165] to "Energy related products"[166] on the account that energy using products were "only responsible for 31-36% of the environmental impacts"[167] that had been studied. New energy using products have been regulated under Ecodesign at a constant pace from 2009 to 2015, followed by the adoption of a package of measures in 2019, bringing the total of product groups covered through implementing regulations to 29. Nonetheless, a number of energy related products have not yet been regulated, for a limited portion because the potential for improvement was considered not significant enough[168] but for a larger part because they have not yet been fully assessed by the European Commission.

Thus, if the Ecodesign Directive has indeed prioritised the most relevant products, accounting for the greatest household energy consumption and more than half of energy consumption in the industrial and services sectors[169], **a number of products remain unregulated**, despite falling under the scope of the Directive. Generally, the focus has stayed on energy using products, with the result that so far there are no implementing measures for energy related products that would not qualify as energy using products.

For those products that are regulated, some stakeholders have claimed that **not all significant environmental impacts of the regulated products were tackled**, as implementing regulations have had energy efficiency as a primary objective. The 2012 evaluation of the Ecodesign Directive noted that "while it is broadly recognised that the energy efficiency aspects of the SCP/SIP Action Plan[170] and of EU resource efficiency policy can be served by the Ecodesign Directive and the implementing measures, it is also suggested by some Member State representatives and by environmental NGOs that there have been missed opportunities as a result of the limited coverage in implementing measures of other environmental aspects"[171]. The evaluation concluded that "there may have been non-energy improvements that have not been addressed as a result of the product scope, policy choices or the underlying technical analysis".

In its 2020 Special Report on EU action on Ecodesign and Energy Labelling, the European Court of Auditors found that in its most recent proposals the European Commission increased the focus on resource efficiency. For example, "the audit found that the studies carried out to review the legislation on electronic displays and refrigerators considered several environmental aspects other than energy, such as waste management, the presence of critical and rare materials, recyclability, reparability and durability"[172].

[164] See, e.g. ECOS "Ecodesign is one of the greatest success stories of the EU climate policies in the last decades" (https://ecostandard.org/news_events/2021-resolution-the-eu-must-advance-ecodesign-upgrades-to-reach-its-climate-objectives/) and Energy Efficiency Policies around the World: Review and Evaluation, p. 48, World Energy Council 2008. ECOS calls

[165] A product which "is dependent on energy input (electricity, fossil fuels and renewable energy sources) to work as intended, or a product for the generation, transfer and measurement of such energy".

[166] "any good that has an impact on energy consumption during use"

[167] SEC(2008)2115

[168] For example during preliminary studies to establish the Ecodesign Working Plan or, later in the process, after more extensive preparatory study.

[169] Ecodesign Impact Accounting – Overview report 2018, p. 8, VHK, January 2019.

[170] Communication on the Sustainable Consumption and Production and Sustainable Industrial Policy Action Plan, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52008DC0397

[171] CSES, p.19

[172] ECA(2020), p. 23

The two reports noted that there is progress in how other aspects than energy efficiency are tackled under ecodesign. However, this progress is a slow learning process that could benefit from being accelerated.

The 2014 evaluation of the Energy Labelling Directive and specific aspects of the Ecodesign Directive[173] concluded that the level of ambition of Ecodesign implementing regulations was sometimes too low: "most stakeholder groups agree that while for some product groups implementing measures and labels have shown the right ambition level, many other groups have shown levels of ambition that are too low compared to what is technically and economically feasible". The **evaluation team itself concluded that the ambition level was either correct or too low, but never too high**. The level of ambition achieved in the end is a balance between technical and economic feasibility at European level and positions of EU Member States as expressed during the comitology process.

The ECA report also pointed to significant **delays** in the adoption of new product regulations, stemming both from a regulatory process twice as long as the theoretical process and a package approach to their adoption, which, was found by the ECA to lead "to delays for those product groups that are ready earlier, until the full package is ready to be adopted, leading to further delays in an already lengthy process"[174].

As argued by (which) stakeholders[175], these delays lead to missed opportunities to exploit significant energy saving potentials as soon as possible and risks adopting requirements that are outdated by the time they come into force.

Finally, **lack of compliance** with existing rules represents a further sub-optimal application of the Ecodesign Directive and its implementing regulations. By definition, providing a precise figure on the environmental impact of non-compliance is impossible. However, experts estimate that only around 0.6% of the products placed on the market are verified yearly and some 10 to 25% of products are found non-compliant with ecodesign requirements[176].

The share of non-compliance itself does not provide an indication of the environmental impact as non-compliance can be limited to documentary elements, "marginal" non-compliance with some requirements or more serious issues. However, there is a general agreement that the problem is non-negligible and the general estimate is that, for energy efficiency alone, around 10% of envisaged energy savings are being lost due to non-compliance[177].

[173] http://www.energylabelevaluation.eu/eu/home/
[174] ECA(2020), p. 20
[175] Save the Ecodesign energy-labelling package. Joint letter to the European Commission; Joint Industry Letter on Ecodesign; The Ecodesign Directive (2009/125/EC) European Implementation Assessment, European Parliamentary Research Service, November 2017.
[176] See Annex 14 for more information on levels of non compliance.
[177] Ecofys, Evaluation of the Energy Labelling Directive and specific aspects of the Ecodesign Directive: Background report I: Literature review, December 2013, p.9.

WHAT ARE THE CONSEQUENCES?

The central problem identified by this impact assessment – that life cycle environmental and social impacts of products placed on the EU market are not sustainable – gives rise to several inevitable and negative consequences, including for the **planet**, for **citizens** and for **markets**.

For the Planet

Inefficient use of resources

As levels of high quality recycling and uptake of secondary materials remain low, overall resources are being used inefficiently: unless action is taken, OECD predicts that global materials use will more than double from 79 Gt in 2011 to 167 Gt in 2060[178].

At macro level, the secondary raw materials present in the EU Internal Market are very inefficiently being used to cover the demand (see *section 0 What is/are the main problem(s)?* above, including the discussion on the contribution of recycled materials to raw materials demand).

Negative environmental impacts, including on climate

As mentioned, the consumption footprint of products consumed in the EU internal market per capita is outside the safe operating space for humanity for several categories of impacts (climate change, particulate matter, resource use i.e. fossil fuels minerals and metals)[179]. This footprint has been rising by 6% on average between 2010 and 2015, for all these categories of impacts, with a peak at +9% for resource use – minerals and metals.[180]

These environmental impacts have a damage on both human health and ecosystem quality, which leads to biodiversity loss. An analysis of the environmental impacts of EU consumption revealed the contribution of different environmental issues to the overall damage to biodiversity loss (Figure 12). Among the different impacts, land use and climate change showed the largest role on biodiversity loss. Climate change was the most relevant impact category for all of the areas of consumption, apart from food in which land use showed the largest impact.

[178] https://www.oecd.org/environment/waste/highlights-global-material-resources-outlook-to-2060.pdf

[179] Sala, Serenella, et al., Indicators and Assessment of the Environmental Impact of EU Consumption, Joint Research Center Science for Policy Report 2 (2019), figures 58 and 70b.

[180] JRC (2019), Sala S., Benini L., Beylot A., Castellani V., Cerutti A., Corrado S., Crenna E., Diaconu E., Sanyé-Mengual E., Secchi M., Sinkko T., Pant R (2019) Consumption and Consumer Footprint: methodology and results. Indicators and Assessment of the environmental impact of EU consumption. Figures 54 and 55.

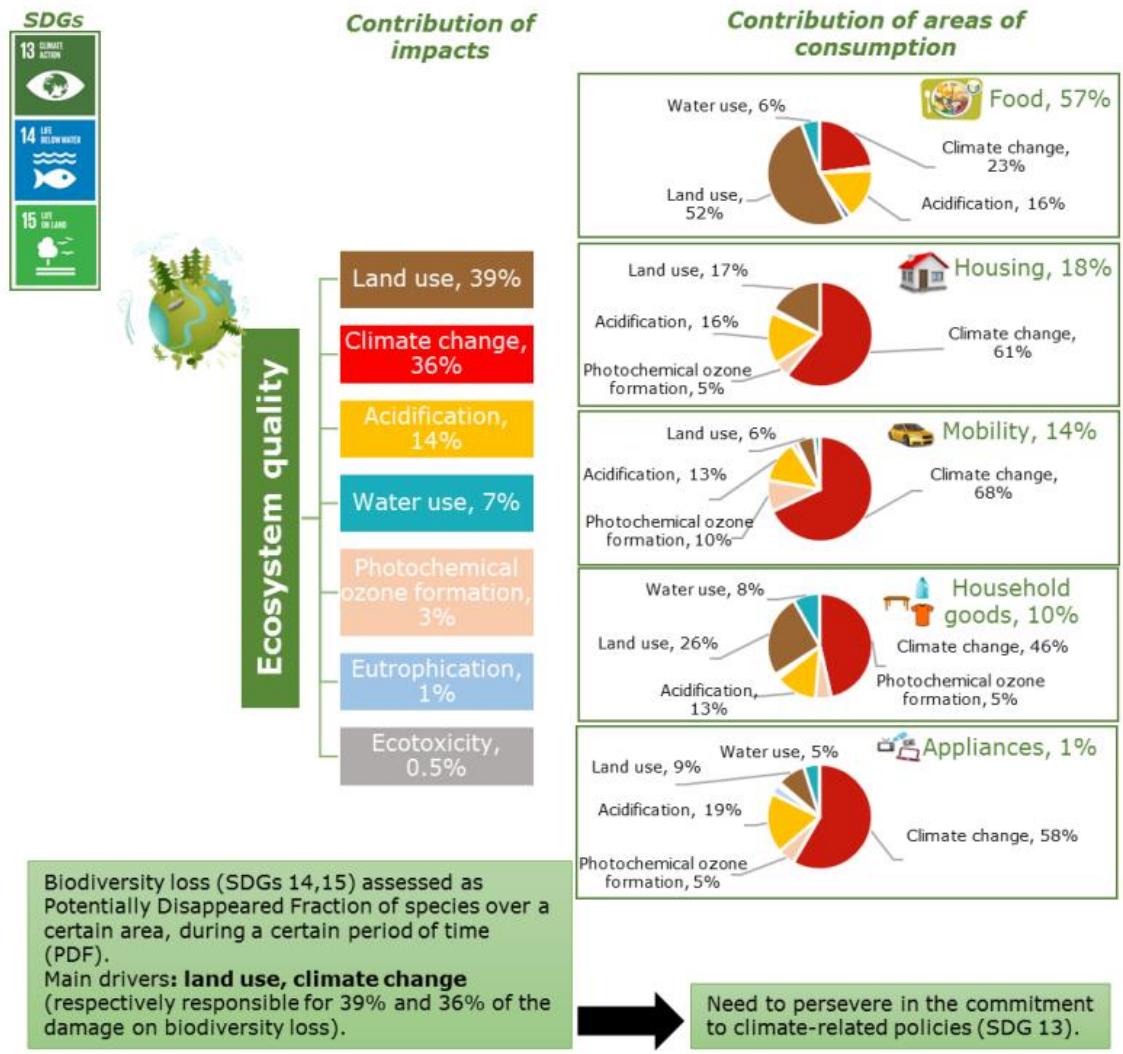

Figure 12 Damage on ecosystem quality generated by EU consumption (2010) by impact category and area of consumption[181]

While much emphasis is placed on the critical role of renewable energy and energy-efficiency measures in combatting climate change, **the substantial contribution to greenhouse gas emission levels made by the production, processing, transport, use and disposal of goods** (close to 60%[182]) is often overlooked. For example, 10% of global greenhouse gas emissions are caused by clothing and footwear production[183]. In addition, significant pollution is being generated – in particular at the production stage of products and along the supply chain[184].

[181] Sala S., Beylot A., Corrado S., Crenna E., Sanyé-Mengual E, Secchi M. (2019) Indicators and Assessment of the environmental impact of EU consumption. Consumption and Consumer Footprint for assessing and monitoring EU policies with Life Cycle Assessment, Luxembourg: Publications Office of the European Union, ISBN 978-92-79-99672-6, doi:10.2760/403263, JRC114814.

[182] Calculations of Fraunhofer ISI based on World Resources Institute (2020): World Greenhouse Gas Emissions: 2016. https://www.wri.org/resources/data-visualizations/world-greenhouse-gas-emissions- 2016; International Transport Forum (2019): ITF Transport Outlook 2019. OECD Publishing. Paris. https://doi.org/10.1787/transp_outlook-en-2019-en.

[183] https://www.europarl.europa.eu/news/en/headlines/society/20201208STO93327/the-impact-of-textile-production-and-waste-on-the-environment-infographic

[184] E.g.see https://ec.europa.eu/environment/enveco/resource_efficiency/pdf/studies/issue_paper_digital_transformation_20191220_final.pdf

Waste Generation

The generation and the management of waste can have negative impacts on human health and the environment. Though EU legislation[185] to tackle the problem of waste generation is in place, and has led to progress in recent years[186], the fact remains that **Europe is generating more and more waste**: **total waste generation increased from 2.2 to 2.3 billion tons from 2010 to 2018** (this equates to 5.0 and 5.2 tons per capita respectively.[187]

In terms of individual sectors, worrying trends can be perceived:

1. The amount of **waste electronic and electrical equipment** (WEEE) is one of the fastest growing waste streams in the EU, with current annual growth rates of 2%.[188].
2. The average per capita apparent consumption in EU-27 lay at 12.3 kg/capita in 2018, which is an increase of 20 % compared to the 10.1 kg/capita in 2003[189]. It is estimated that between 1.7 and 2.1 million tonnes of used textiles are collected annually throughout the EU, with the majority of the remaining 3.3 to 3.7 million tonnes thought to be discarded in mixed household waste, with a much smaller amount being stored in increasing stockpiles in households[190]. According to European Federation of Furniture Manufacturers (UEA) statistics, **80-90% of EU furniture waste is incinerated or sent to landfill**, with only 10% being recycled. Reuse activity in the sector is considered to be low[191].

[185] Of particular relevance in this respect are: Directive 2008/98/EC on waste (Waste Framework Directive); Directive 94/62/EC on packaging and packaging waste; Directive 2012/19/EU on waste electrical and electronic equipment (WEEE); Directive 2017/2102 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS).

[186] 2018 Report on the implementation of EU waste legislation, including the early warning report for Member States at risk of missing the 2020 preparation for re-use/recycling target on municipal waste, COM(2018) 656 final

[187] Eurostat. Generation of waste by waste category, hazardousness and NACE Rev. 2 activity [ENV_WASGEN]

[188] COM/2020/98 final

[189] JRC, 2021, Circular Economy Perspectives in the EU Textile sector, file:///C:/Users/murrapi/AppData/Local/Temp/1/jrc125110_ce_perspectives_for_eu_textiles_tr_10.06.2021_final.pdf

[190] Ibid

[191] Furn36 (2017). Circular Economy in the furniture industry: Overview of current challenges and competences needs, https://circulareconomy.europa.eu/platform/sites/default/files/circular-economy-in-the-furniture-industry.pdf

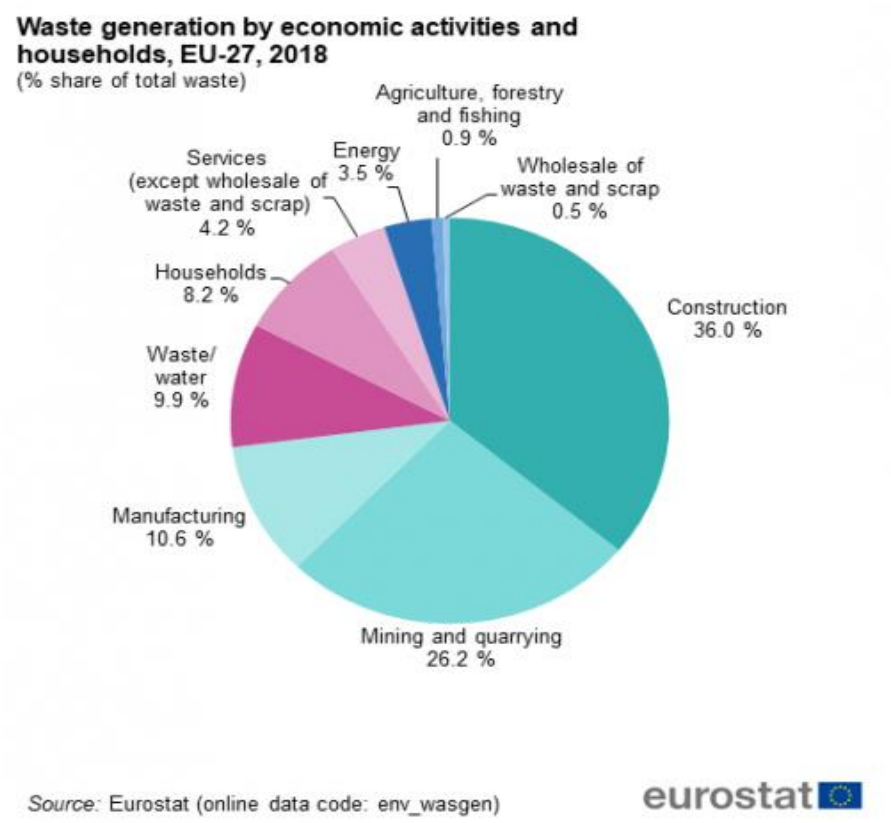

Figure 13 Waste generation by economic activities and households, EU-27, 2018

For Citizens

Products break too quickly and cannot be easily repaired

A product's **lifespan** is usually defined as the period from product acquisition to its disposal by the final owner (Murakami et al., 2010). The period includes any repair, refurbishment or remanufacturing and periods of storage when the product is no longer in use (Bakker et al., 2014).

As further elaborated in under *sub-problem 1* above, since the late 1980s, the lifespan of consumer products has generally decreased[192], and in recent years the life span of many types of products has become progressively shorter[193]. The European Environmental Bureau computed the optimal life duration that a product would need to have to compensate the GHG emissions incurred during production, considering improvements in energy consumption of products. They conclude that, even under optimistic assumptions regarding technical progress, this optimal lifetime is 1.5 to 8 times above the one achieved[194]. New tendencies in product design (e.g. design becoming more miniaturised, integrated, encapsulated, and complex; increased use of adhesives etc.) also means that more and more products are not adapted for repair and longevity.

[192] There are many drivers leading to a decreasing lifespan of products: the technological progress; economic factors (e.g. when the cost of repair or upgrading is higher than replacement; and psychological reasons, shaped by style, fashion or a perceived change in need). See Circular by design. Products in the circular economy (EEA, 2017).

[193] Öko-Institut in Germany, Prakash S. e.a., 2016. Also, EEB (2019) Coolproducts don't cost the earth -full report. www.eeb.org/coolproducts-repor

[194] EEB (2019) Coolproducts don't cost the earth - full report. www.eeb.org/coolproducts-report

Citizens are perceiving these tendencies, which in turn – in the absence of other incentives – is decreasing the likelihood that they will engage with repair activities. Though improved information on product reparability could act as one such incentive, as outlined in *sub-problem 2* above, this information is not always readily available: a European Commission behavioural study[195] found that about 36% of consumers do not generally repair defective products, and that **not knowing how to repair them/where to get them repaired** (i.e. due to lack of repair manual and information about the availability of repair services) influences the decision not to do so, as did lack of availability of spare parts. In addition, **high repair costs** are a major obstacle to consumer engagement in repair[196], especially if the cost of repair is near or comparable to the cost of purchasing a new product. Perception by consumers that products have been **intentionally manufactured with low quality materials** in order to last for a shorter time also discourages repair attempts[197].

A combination of the above issues is contributing to the need for consumers to replace products sooner than expected, leading to indirect additional costs as well as to increased 'hassle costs' related to the need to frequently replace products[198].

Citizens are willing to engage in sustainability but are unable to fulfil their green ambitions

More and more citizens are willing to engage in circular practices and product choices[199]. A 2020 survey[200] found **that the majority of consumers believe they have a role to play in tackling environmental issues**, and that for certain product groups, environmental impact of companies' products has overtaken brand recognition in consumer buying decisions.

As things stand however, citizens are prevented from fulfilling their green ambitions and, in certain cases, are instead making sub-optimal choices. As previously mentioned, one of the factors contributing to this is lack of information. In a 2019 public consultation, a majority of consumers[201] expressed broad dissatisfaction with environmental information on products: They also highlighted that:

- Environmental information on products is generally not sufficient to support consumer decision-making;
- More **information about specific product themes**, including the product's entire life-cycle, information on post-consumer (i.e. waste) impacts, and information on the durability of products, should be provided;
- Where it is provided, information is often **too difficult to understand**, in particular making it too **difficult to compare** products.

[195] The most important reasons for not repairing products is the high price of repairs, followed by the preference for a new product, and the feeling that the old product was simply obsolete or out of fashion.
Depending on the product type, between 5 and 10% of consumers surveyed did not repair the product because they did not know where to get it repaired and between 1 and 7% because of the unavailability of spare parts.
European Commission, *Behavioural Study on Consumers' engagement in the circular economy,* 2018, p. 86.
[196] LE Europe, VVA Europe, Ipsos, ConPolicy and Trinomics: "Behavioural Study on Consumers' Engagement in the Circular Economy - Final Report" (2018), https://op.europa.eu/en/publication-detail/-/publication/5de64de7-f9d3-11e8-a96d-01aa75ed71a1/language-en/format-PDF .
[197] Nazli Terzioglu, 2020
[198] BEUC, 2015
[199] European Commission, *Behavioural Study on Consumers' engagement in the circular economy,* 2018, p. 10. In addition, see more information in section on *Consequences*.
[200] https://www.ingwb.com/media/3076131/ing-circular-economy-survey-2020-learning-from-consumers.pdf
[201] 85% of consumers. SWD(2019) 92 final, p. 66

Indeed, the fact that information about products' environmental characteristics is sometimes not at all provided, or provided in an inconsistent way, prevents consumers from taking it adequately into account in their decision-making process[202].

Similarly, as information on the lifespan of products is regularly not available to consumers[203], they often **use other indicators** (e.g. price or brand[204]) to gauge the durability of the goods. This often leads to consumers associating more expensive goods with longer lifespans[205], despite the fact that consumer organisations point out that "in non-transparent markets high purchase prices are not always good indicators for the durability of products"[206]. Ultimately, the lack of information on a product's durability can lead to sub-optimal purchase choices[207], with consumers unknowingly purchasing goods that are potentially more difficult to repair or that have worse software update/upgrade policies than the available alternatives, in turn leading to increased 'hassle costs' (e.g. related to efforts and expenses with organising repair or replacing the good).

For Markets

Markets are resulting in a sub-optimal consumption of sustainable products

As seen in the previous section, EU consumers are increasingly willing to engage in sustainable practices and purchase more sustainable products. However, markets in general are distorted and biased against sustainable products, for the reasons described in *section 0 Market failures* below. The EU Internal Market is arguably one of the "greenest", however it is not an exception to this trend: a study carried out in 2018 by *Umweltbundesamt* (the German Environmental Agency) has analysed the market share of products carrying an official eco-label (see Figure 14) in Germany (the largest consumer market in the EU[208]). The results demonstrated that environmentally friendly products occupy still a niche in their respective product groups investigated, with on average a 7.5 % market share.

[202] Wrap.org, *The Effectiveness of Providing Labels and other Pre-Purchase Factual Information in encouraging more Environmentally Sustainable Product Purchase Decisions: Expert Interviews and a Rapid Evidence Assessment*, 2019, p. 36.

[203] Around 82 % of respondents agreed, or tended to agree, that it is difficult to find information about how long a product will last. European Commission, *Behavioural Study on Consumers' engagement in the circular economy*, 2018, p 82.

[204] Cox, J., Griffith, S., Giorgi, S., & King, G., *Consumer understanding of product lifetimes*. Resources, Conservation and Recycling, 79, 2013, p. 21-29.

[205] European Commission, *Behavioural Study on Consumers' engagement in the circular economy*, 2018, p. 116.

[206] BEUC, *Durable Goods: more sustainable products, better consumer rights*, 2015, p. 10.

[207] The more durable good generally has a lower total consumer cost compared to a standard option, mostly due to avoiding the purchase of the replacement appliance, with the exception being when the price is very low.
European Commission, *Study on the durability of products*, 2015, p. 157-158.

[208] "Household final consumption expenditure (current US$) | Data". data.worldbank.org

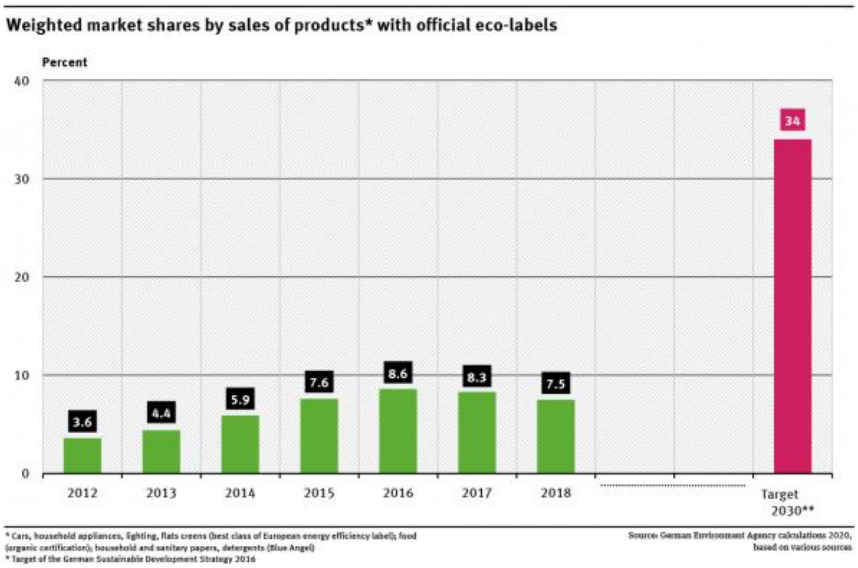

Figure 14 Weighted market shares by sales of products with official eco-labels[209]

Widening the analysis to the entire EU Internal Market, the EU Ecolabel[210] can offer a potential lens through which the current sustainability levels of EU products can be gauged. EU Ecolabel criteria have now been established for 24 product categories (including some identified as priority value chains in the CEAP). As of March 2021, the total number of EU products (which in the context of the EU Ecolabel include goods and services) awarded an EU Ecolabel amounted to 78,071. Though this is a substantial achievement, it represents those goods and services that tend to be within the top 10-20% of the most environmentally friendly within their category[211]. This suggests that **a majority of products sold in the Single Market remain below these performance levels.** In addition, uptake under the product groups covered has been very uneven – including at geographical level, where product awards range from one in some Member States to thousands in others. There are several examples in Member Sates of under-internalisation of externalities at product level as well as at sector level. For instance, for the Danish apparel sector, impacts are dominated by GHG emissions, air pollution and water. Should the sector have to internalise the natural capital costs (i.e. the externalities) of indirect land use change, water consumption, air and water pollution and GHG emissions, the total cost would be DKK 3,390 m, equivalent to 11.7% of total revenue for the sector[212].

Increasing market fragmentation

An increasing number of initiatives are emerging at national level in the EU, with the aim of promoting the sustainable production and consumption of products (see section on *Drivers*). While this is positive proof of Member States' increasing willingness to engage with circular economy practices, the existence of different provisions across Member States risks hindering operations facing

[209] German Environment Agency, https://www.umweltbundesamt.de/en/data/environmental-indicators/indicator-environmentally-friendly-consumption#assessing-the-development

[210] The EU label of environmental excellence that is awarded to products and services meeting high environmental standards throughout their life-cycle, from raw material extraction, to production, distribution and disposal. https://ec.europa.eu/environment/ecolabel/index_en.htm

[211] https://eeb.org/work-areas/resource-efficiency/eu-ecolabel/

[212] Danish apparel sector natural account, https://www2.mst.dk/Udgiv/publications/2015/01/978-87-93283-07-7.pdf https://www2.mst.dk/Udgiv/publications/2015/01/978-87-93283-07-7.pdf https://www2.mst.dk/Udgiv/publications/2015/01/978-87-93283-07-7.pdf https://www2.mst.dk/Udgiv/publications/2015/01/978-87-93283-07-7.pdf

different requirements and is becoming a cause for concern for businesses operating at cross-border level. This emerged clearly in the consultations carried out in the preparation of the Impact Assessment (*please see further details in the table below).*

If left unchecked, such diverging approaches are likely to create further difficulties for businesses and act as a disincentive to their continued investment in innovation and sustainable product development – in turn reducing the number of sustainable products on the market and increasing prices.

Table 22 Examples of responses from businesses/business associations (alphabetical order). Sources: feedback on the Inception Impact Assessment or, where linked, published by organisations themselves.

	Name of entity	Excerpt supporting SPI in the context of EU internal market
1.	American Chamber of Commerce to the EU	"*Design is a crucial phase to improving product sustainability and we take note of the need to extend the scope of the Ecodesign Directive. A harmonised and broadened eco-design framework is an important contribution to a level-playing field for the assessment of different products and material applications. Diverging eco-design product rules amongst Member States represent a barrier to intraEU trade and makes it harder for consumers to access and for companies to offer products crossborder.* ***The Commission must take decisive action in line with the principles established by the Single Market Transparency Directive (EU) 2015/1535 to avert a fragmentation of EU product rules****."*
2.	APPLiA - Home Appliance Europe	"***European legislation should be the preferred option over national legislation*** *APPLiA supports legislation harmonised at EU level.* ***Lack of harmonisation at EU level increases burden on industry. National legislation initiatives should not impede the free circulation of goods in the internal market. EU measures facilitate a more harmonised single market with incentives for more sustainable and innovative products across the whole EU. This provides strong economic potential for both EU and non-EU operators that offer sustainable products by reducing market fragmentation due to individual Member State initiatives****. A key example is the law recently approved in France which sets specific technical modifications for washing machines from 2025 onwards and de-facto creates a barrier to trade for European manufacturers. There are also ongoing discussions on national green deals in other countries (such as Italy, Germany, and Luxembourg) which APPLiA's General Principles for Sustainable Product Policy 2 www.applia-europe.eu APPLiA Home Appliance Europe may also have potential measures in their scope which could impact the internal market. When regulation is relevant and needed, it must be tackled at European level and subject to thorough impact assessment*".
3.	BusinessEurope	"*An effective Sustainable Products Policy should start from a set of key general principles that can be transversally applied to all the different market segments. Additionally, specific sustainability principles can only be developed at the product group level to capture the peculiarities of different product categories.* ***It will be***

		extremely important to ensure a harmonized and coherent development at European level, to avoid different approaches at Member States' level that can potentially hinder a smooth transition towards an EU circular economy market*. An appropriate level of market surveillance should accompany new sustainability requirements*."
4.	Closed Pallet Pooling Coalition	"***Cross-border circular business models and sustainable production processes should be further promoted by ensuring a high-level of harmonization of rules at EU level. The different interpretation and application as well as the lack of guidance of EU legislation at national level can hamper the development of sustainable circular business models*** *if they fail to properly recognize the importance and the specific challenges of this sector*".
5.	DIGITALEUROPE	"*When it comes to enforcement,* ***we strongly believe any risk of fragmentation of the Single Market should be avoided****, the burden on companies be relieved and fair competition protected. Therefore, we call for enforcement to be consistent across all Member States and products to be covered equally to avoid discrepancies and margins for interpretation, with product specificities taken into account. Based on our experience from the Ecodesign Directive, we have witnessed the need to provide guidelines to MSAs to facilitate the understanding of multiple policies covering very complex value chains. Likewise, national legislations should aim at strengthening the Single Market to put the EU as a whole at the forefront of the green transition.* (…) *Hence,* ***we support initiatives that avoid fragmentation of the single market such as EU-wide voluntary commitments and information requirements****, taking product specificities into account. Such information and commitments should be based on standards to ensure fairness, consistency, transparency, and comparability*."
6.	Ecopreneur.eu – European Sustainable Business Federation	"*We strongly advise the European Commission to make the Sustainable Product Initiative coherent with other regulatory initiatives and revisions, such as the sustainable textiles and chemicals strategies, policies regarding construction products, ecodesign and energy efficiency labelling, and waste regulation, for example, to make sure EU Legislation is coherent and supports the principle of free movement of goods within the Common Market.* ***To avoid market fragmentation, the Initiative should also strive toward harmonisation of policies at EU national level, especially those accelerating the transition towards a circular economy, such as harmonised EPR schemes***."
7.	Eurima - European Insulation Manufacturers Association	"***Eurima welcomes the Commission's intention to harmonize and set a baseline of principles for a market of sustainable products in Europe.*** *We support the objectives of the Circular Economy Action Plan in this regard as it will contribute to a*

		fairer market and allow for a better valorisation of the more sustainable products in the construction sector".
8.	European Bedding Industry	"***A harmonised set of rules and a really functioning Internal Market to ensure a level-playing field throughout the European Union is essential***".
9.	European Federation of the Parquet industry	"***We need harmonised rules and a really functioning Internal Market to ensure a level-playing field throughout the European Union (and beyond)****. The principles of the "Sustainable Products Initiative", such as circularity, should be translated in (existing) standards and there is already a platform for doing it: the European Committee for Standardization, CEN (and the International Organization for Standardization (ISO) to go beyond EU borders*)".
10.	European Furniture Industries Confederation	"*Harmonised circular economy rules at EU level, involvement of standardisation bodies and harmonised implementation of rules in the EU and globally* *- Sustainability principles for products and services are only partially addressed in EU legislation. The sustainable products initiative has the potential to expand requirements under EU legislation, when appropriate, and to contribute to a more complete and harmonised framework at EU level.* ***With the upcoming initiative we see an opportunity for strengthening the internal market, avoiding that national initiatives address the same issue in different ways****. It is important that requirements at EU level are streamlined, clear and detailed enough to avoid misaligned implementation of EU rules at national level*".
11.	Orgalim, Europe's Technology Industries	"*We would value a cooperation between policy makers and industry to create a sound framework,* ***preferably a harmonised EU one. If not, barriers for more circularity beyond manufacturers' control will continue to exist and doubts will block further market introduction***".
12.	PlasticsEurope	"***The Sustainable Products Initiative must preserve the integrity of the Single Market and ensure the competitiveness of the European economy***. ***One clear and consistent framework for products across the EU Single Market remains critical to European industrial competitiveness and the industry's ability to innovate at scale and provide solutions to deliver on the EU Green Deal***. *PlasticsEurope believes that the future policy developments must preserve the integrity and well-functioning of the EU Single Market and welcomes the European Commission's intention to adopt the initiative based on Article 114 TFEU (…)* ***In addition, the European Commission should maintain ownership in the implementation process, including monitoring and follow-up processes with Member States. This will enhance legal certainties for economic operators and will prevent any fragmentation of the internal market***. *Any necessary guidance or*

		implementation plan must be foreseen and delivered well in advance of the deadline for transposition by the Member States. Furthermore, to safeguard not only competitiveness among the Member States but also of the whole EU economy vis-a-vis third countries, the European Commission should consider the adoption of measures aimed at ensuring that the same sustainability requirements apply to products imported from outside the EU. Market surveillance should therefore be reinforced."
13.	Plastics Recyclers Europe	"***The industry, however, must be aided with harmonized and transparent rules that are implemented at the EU level***".
14.	Swedish Association of Engineering Industries	"*Through the experience we have until today, a well-functioning internal market will be the basis for circular business models to function internationally.* ***The New Legislative framework should be applied to all product legislation and rules must be harmonized within the EU. A harmonized regulatory framework within the EU makes it easier for companies to sell products as a service, in order to better reuse and renovate recycled material****. Partnerships and collaborations between different actors also benefit from a common regulatory framework in the internal market. Rules that mean that national borders within the EU give different requirements lead to increased bureaucracy and special requirements. This damages the market and hinders the growth of the circular economy*".
15.	TEKO - Swedish textile and clothing industry organisation	"*As much as possible shall be regulated in as few laws as possible****. The single market has contributed to an improved prosperity and more opportunities for European citizens and businesses. Therefore, it is crucial to ensure a harmonized approach throughout the EU of the various circular economy measures. If not, it will damage the market and hinder the growth of the circular economy***".

Loss of resources

Even though the generation of **secondary raw materials** has increased in recent years (for example more than 50% of some metals such as iron, zinc, or platinum are recycled and they cover more than 25% of the EU's consumption) much progress has still to be made. Many materials, especially those needed in renewable energy technologies or high-tech applications such as rare earths, gallium, or indium, secondary production makes only a marginal contribution to EU's consumption[213]. This is a loss of potential value to the EU economy and a source of strain on the environment and climate. As a result, valuable materials end up in landfill. In general, the contribution of recycled materials to raw materials is low: only 6% for plastics[214].

[213] Foresight on Critical Raw Materials for European Industry, March 2020, https://ec.europa.eu/info/sites/default/files/foresight_newsletters_collection_online_2020.pdf

[214] A European Strategy for Plastics in a Circular Economy, COM(2018) 28 final

The fact that some basic materials are not recycled, can also be an indication that the cost of recycling is high compared with the cost of virgin resources. These resources are therefore not 'valuable' enough to be recycled at current prices. However, there are a number of proportionate measures that can be taken to enable recycling at lower cost, therefore changing the economic viability of recycling and ensuring that resources are not lost to the economy.

Low recycling levels can sometimes be due to impurities that reduce the potential applications of the recycled material, a phenomenon known as downcycling (e.g. steel from cars being re-used in construction due to excessive copper impurities[215]). In addition, large amounts of potentially recyclable resources leave Europe in the form of waste and scrap[216]. As a consequence, despite relatively high rates of waste being collected for recycling, only a fraction of this material flow is being effectively re-used, thus compromising the development of the recycling industry and the circular economy in general. Aluminium is a good example: since 2002 the EU has been a continuous net exporter of aluminium scrap (Figure 15)[217].

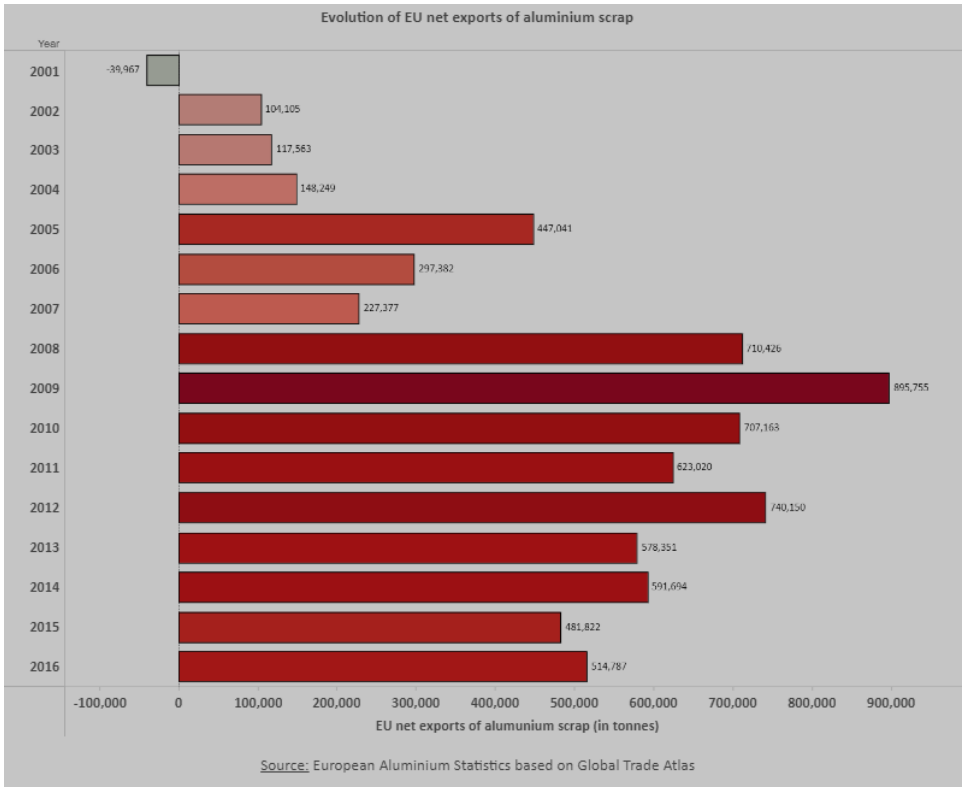

Figure 15 Evolution of EU net exports of aluminium scrap

In 2020, exports of recyclable raw materials – which include recyclable waste and scrap as well as secondary raw materials – from the EU Member States to non-EU countries amounted to 38.4 million tonnes[218]. The volume of these exports has been on an upwards trend since 2004, reaching a peak in 2020 (a 70% increase compared with 2004). On the other hand, imports of recyclable raw materials from non-EU countries into the EU amounted to 44.7 million tonnes in 2020, a slight decrease

[215] Savov, L.; Volkova, E.; Janke, D. (2003). "Copper and tin in steel scrap recycling" (PDF). RMZ - Mater. Geoenviron. 50 (3): 627–640
[216] Foresight on Critical Raw Materials for European Industry, March 2020, https://ec.europa.eu/info/sites/default/files/foresight_newsletters_collection_online_2020.pdf.
[217] https://www.european-aluminium.eu/data/recycling-data/recycling-eu-net-exports-of-aluminium-scrap/
[218] https://ec.europa.eu/eurostat/web/products-eurostat-news/-/ddn-20210429-1

compared with 2019 (45.0 million tonnes) and an increase of about 2% compared with 2004 (43.7 million tonnes)[219].

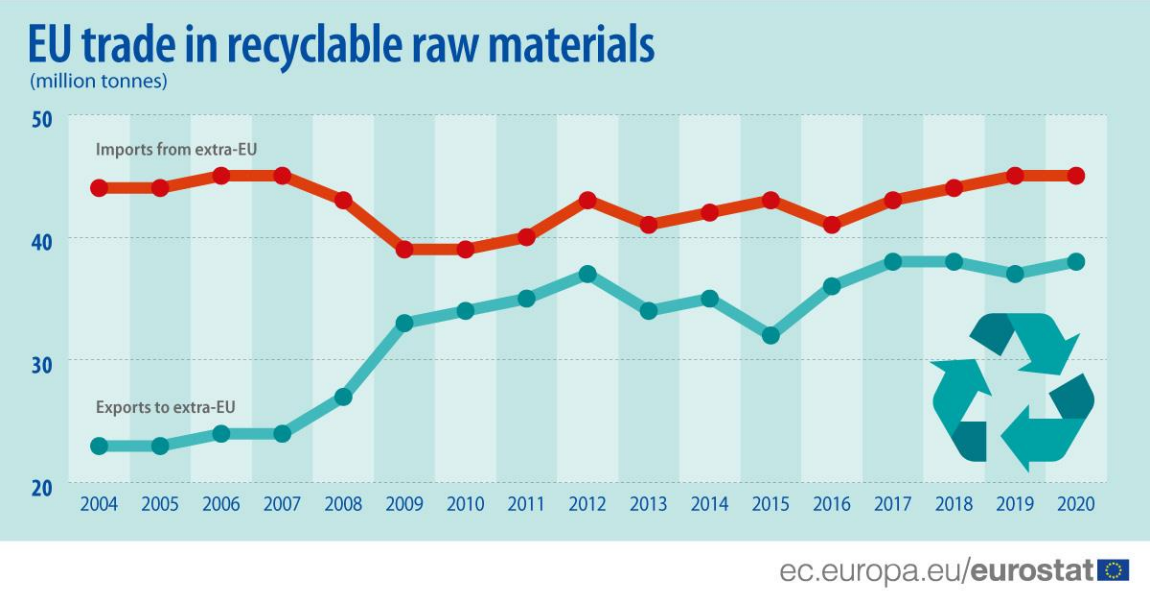

Figure 16 EU trade in recyclable raw materials

There is a loss of valuable economic resources whenever products that could be designed for a long duration of use are actually designed and manufactured for single use, thereby reaching the shortest possible usage duration. According to the Circular Gap Report by the Dutch NGO Circle Economics, around 31% of the materials entering the global economy are being used by society as short-lived non-food products, lasting less than one year.[220] Focusing on plastics, globally 300 million tonnes of plastic are produced each year[221]. It has been estimated that about 100-150 million tonnes of this are for single use products[222].

This is not efficient from an economic point of view and generates negative environmental impacts: in the EU, between 50% and 70% of marine litter, measured as beach litter counts, is made of single-use plastic items[223]. World-wide, 5 to 13 million tonnes of single-use plastic ends up in the ocean[224].

Another example of loss of valuable economic resources is the destruction of unsold consumer products. This phenomenon has been highlighted by very visible cases, such as the destruction of millions of unsold durable goods in France by a major online retailer[225] in 2019[226]. The Impact

[219] https://ec.europa.eu/eurostat/web/products-eurostat-news/-/ddn-20210429-1?redirect=%2Feurostat%2Fweb%2Fmain%2Fhome

[220] Circle Economics, "Circularity Gap Report 2020", https://www.circularity-gap.world/2020

[221] https://www.nrdc.org/stories/single-use-plastics-101#:~:text=We%20produce%20300%20million%20tons,is%20for%20single%2Duse%20items.&text=Left%20alone%2C%20plastics%20don't,what%20are%20known%20as%20microplastics.

[222] https://plasticoceans.org/the-facts/

[223] Joint Research Centre, Top Marine Beach Litter Items in Europe , 2017. https://ec.europa.eu/jrc/en/publication/top-marine-beach-litter-items-europe and Impact Assessment of the "Reducing Marine Litter: acting on single-use plastics and fishing gear" SWD(2018) 254

[224] Jambeck J et al. 2015, 'Plastic waste inputs from land into the ocean', Science, vol. 347, no. 6223, pp. 768-771. Available from: https://science.sciencemag.org/content/347/6223/768; Pew Charitable Trusts and SYSTEMIQ 2020, Breaking the Plastic Wave. Available from: https://www.pewtrusts.org/-/media/assets/2020/10/breakingtheplasticwave_mainreport.pdf; Ryberg M et al. 2018, Mapping of global plastics value chain and plastics losses to the environment, United Nations Environment Programme. Available from: https://wedocs.unep.org/handle/20.500.11822/26745

[225] M6, "Capital" enquiry of January 2019 on Amazon: https://www.rtl.fr/actu/debats-societe/video-capital-quand-les-salaries-d-amazon-detruisent-des-tonnes-d-invendus-7796192959

[226] Despite the visibility of the case, the same online retailer has been the purpose of identical criticism two years later (2021) in the United Kingdom, following an enquiry that revealed the destruction of several hundreds of thousands of unsold goods per week in a single online sales warehouse in the United Kingdom, with less than one quarter of this volume being donated. ITV News Investigation "Amazon destroying millions of items of unsold stock in one of its UK warehouses every year", June 2021,

Assessment[227] of the French law (n°2020-105)[228] prohibiting the destruction of unsold durable goods, based on a study on gifts of durable goods[229], states that "*out of EUR 140 billion consumed by households in non-food consumer durables, EUR 6 billion represent the gross amount of unsold goods. These unsold goods can then be sold through different distribution channels such as private sales, discounters or wholesalers. The share of unsold goods remaining after using these distribution channels (the net amount) represents 0.6% of non-food durable consumer goods consumed by households, or EUR 800 million. Of this EUR 800 million of unsold goods, nearly EUR 630 million are destroyed each year and only EUR 140 million are donated. Textiles and shoes, for example, account for EUR 49 million of this destruction. For household appliances, the share of destruction represents EUR 10 million and for hygiene and beauty products, it represents EUR 180 million.*"

Though the above figures suggest that the destruction of unsold consumer products may be a comparatively minor phenomenon (i.e. when compared to the total consumption volume), its absolute magnitude remains considerable – in particular taking into account that it may be linked to the rapid growth of online sales in recent years (as the visible cases cited above may suggest).

WHAT ARE THE PROBLEM DRIVERS?

Market failures

Product-related externalities are not fully internalised

There is a market distortion in the shape of uncorrected externalities: environmental, health, or other impacts generated by a product and not reflected in its price. Policy can respond to these externalities, for example, through regulation of the characteristics of externality-generating products or activities. An alternative approach is to use economic incentives, such as subsidies, taxes, or fees, to "internalise" these products' externalities, so it is reflected in their market price. This approach uses competitive market forces to determine efficient prices, quantities and product characteristics instead of attempting to estimate and regulate outcomes.

The general background

The Functioning of the European Union (TFEU) states that: *"Union policy on the environment (…) shall be based on the precautionary principle and on the principles that preventive action should be taken, that environmental damage should as a priority be rectified at source and that the polluter should pay".*

Policymakers can use this principle to curb pollution and restore the environment, and make sure that markets operate efficiently. By applying it, polluters are incentivised to avoid environmental damage. In economic terms, this constitutes the "internalisation" of "negative environmental externalities". When the costs of pollution are charged to the polluter, the price of goods and services increases to include these costs. Consumer preference for lower prices will thus be an incentive for producers to market less polluting products.

The European Green Deal stresses that only by making full use of pricing and well-designed tax reforms can Europe meet its environmental objectives in an efficient and just way. Reflecting the

https://www.itv.com/news/2021-06-21/amazon-destroying-millions-of-items-of-unsold-stock-in-one-of-its-uk-warehouses-every-year-itv-news-investigation-finds

[227] French Senate, "Étude d'impact. Projet de loi relatif à la lute contre le gaspillage et à l'économie circulaire". NOR : TREP1902395L/Bleue-1, July 2019, accessible at: https://www.senat.fr/leg/etudes-impact/pjl18-660-ei/pjl18-660-ei.pdf

[228] LOI n° 2020-105 du 10 février 2020 relative à la lutte contre le gaspillage et à l'économie circulaire, accessible at: https://www.legifrance.gouv.fr/loda/id/JORFTEXT000041553759/

[229] Agence du don en nature, "Etude du potentiel de dons non alimentaires – rapport d'étude", 2014, available at: https://www.adnfrance.org/medias/publications/rapport-etude-potentiel-dons-non-alimentaires-2014.pdf

European Green Deal, the European Commission is working to strengthen the implementation of the Polluter Pays Principle in European Union law.

Evidence on externalities

The cost of pollution can be valued by considering the pathways via which it leads to impacts, then calculating a figure for the cost of those impacts. An ongoing study[230] estimates the degree of internalisation for pollution of air, water, and land and finds that there is a systematic failure to internalise externalities. This means that markets are distorted, with consumption biased towards products with environmental impacts.

For example, for air pollution, it suggests that the degree of internalisation is around 44% with unpriced externalities of around EUR 400 billion per annum.

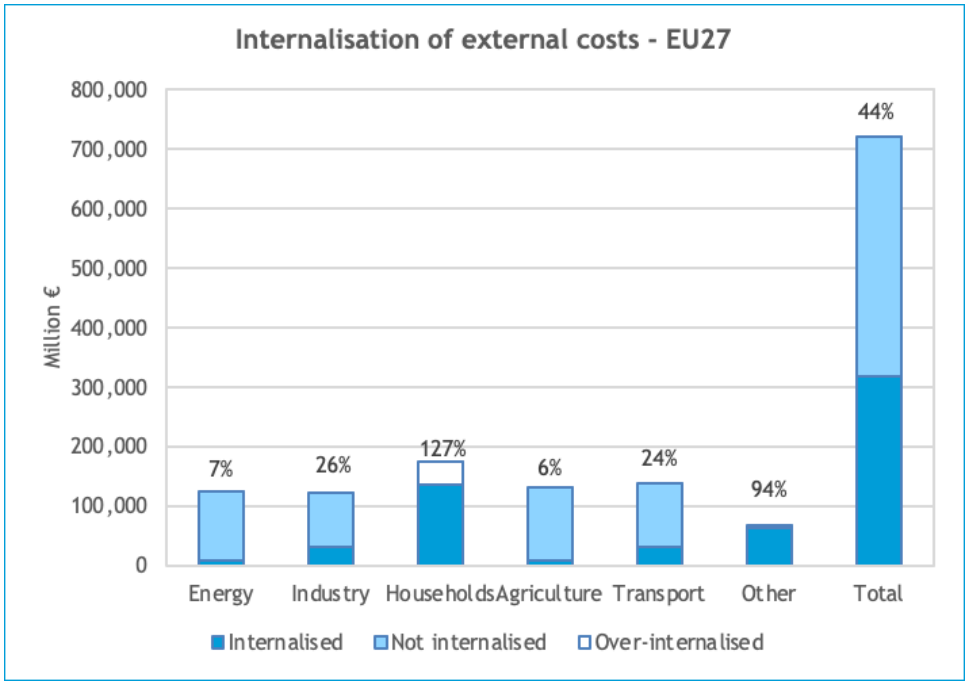

Figure 17 Extent to which air pollution costs are internalised in the EU27, 2017

This general conclusion that externalities are only partially internalised is confirmed by the European Court of Auditors Special Report: "The Polluter Pays Principle: Inconsistent application across EU environmental policies and actions"[231]. It finds that "Overall, we found that the Polluter Pays Principle is reflected and applied to varying degrees in the different EU environmental policies and its coverage and application was incomplete." It recommends that the European Commission "assess the scope for strengthening the integration of the Polluter Pays Principle into environmental legislation".

Markets for Circular Business Models are not fully developed

The limited development of markets for Circular Business Models (CBM) is directly linked to sub problem 2 (Too difficult for economic operators and citizens to make sustainable choices in relation to

[230] "Green Taxation and other economic instruments: Internalising environmental costs to make the polluter pay", IEEP et al, 2021 (forthcoming, will be published before the Summer)

[231] ECA, Special report 12/2021: "The polluter pays principle: inconsistent application across EU environmental policies and actions".

products). Product design is driven by sales revenue, with concern and responsibility for post sales performance defined mostly by warranties, guarantees, liability, brand value and reputation. In the absence of regulatory requirements, standards of information requirements, product design briefs do not consider the costs (or lost savings) to consumers and society of poor performance, durability, reparability and recyclability.

A circular business model can be defined as "a business model in which the conceptual logic for value creation is based on utilising the economic value retained in products after use in the production of a new offering"[232]. CBMs are designed to create, deliver and capture value whilst optimising resource usage and striving towards complete cycling of materials. This implies reduced input costs through improved resource efficiency, but also a shift in goals from making profits through the sale of products or artefacts to making profits through the flow of resources, materials, and products over time, including providing access to goods through services, reusing goods, and recycling resources.

Notably, CBMs are a subset of business models in general, and they can have overlaps with other types of sustainable business models, although not always. Some CBMs might also lead to value destruction in ecological and social terms and hence do not contribute to sustainability, for example, because of rebound effects due to efficiency gains or negative effects on supply chain partners. Within the scope of this study, we focus on CBMs that are also sustainable[233].

CBMs are varied, and can be adopted by incumbent (primarily linear) businesses, or by new market entrants and disruptors. In some cases, the business opportunity lies in delivering circular processes (e.g. a repair shop, symbiosis scheme or recycler), operating on the fringes of linear value flows. In other cases, it can involve an existing business in adapting its product design, sourcing or post-sales services, and in others it can involve applying an integrated circular approach.

New types of circular models appear all the time as a result of business model innovation, but they have been categorised as[234]:

1. Circular supplies: A business model based on industrial symbiosis[235] in which the residual outputs from one process can be used as feedstock for another process.
2. Resource value: A business model based on recovering the resource value of materials and resources to be used in new forms of value.
3. Product life extension: Those business models that are based on extending the working life of a product. This includes **Maintenance, Repair, Re-furbishing, Re-manufacturing**[236], used

[232] Linder, M.; Williander, M. Circular Business Model Innovation: Inherent Uncertainties. Bus. Strategy Environ. 2015, (p.2)

[233] **A sustainable CBM** is a business model that strives for one, or ideally several, of the following goals: 1) Employing fewer materials and resources for producing products and/or services; 2) Extending the life of current products and assets through for example design for durability, re-use, maintenance, repair, refurbishment, repurposing and remanufacturing and through producer retained ownership; 3) Increasing intensity of use of products and assets through for example sharing, symbiosis and products-as-a-service; 4) Closing the loop of products' lives by for example component harvesting, upcycling and recycling. Thus, CBMs reduce environmental and societal costs, but also boost profits and competitiveness through efficiencies, and value capture, creation and delivery.

[234] A Conceptual Framework for Circular Design; Mariale Moreno, Carolina De los Rios, Zoe Rowe and Fiona Charnley Centre for Competitive Creative Design (C4D), Cranfield University (2016) at ResearchGate

[235] **Industrial symbiosis** is the process by which wastes or by-products of an industry or industrial process become the raw materials for another. Examples of industrial symbiosis are wide ranging and include the use of waste heat from one industry to warm greenhouses for food production, the recovery of car tyre shavings for use in construction materials, and the use of sludge from fish farms as agricultural fertiliser. It can also comprise shared use of warehousing, machinery and office space. Symbiosis tends to happen within geographical clusters, but requires matchmaking and servicing to happen.

[236] **Remanufacturing** is an industrial scale process to disassemble used products, replace worn parts, test and return them to use "as new", normally with a full warranty. It typically results in emissions and cost reductions of 80-90% compared to a new product using virgin materials. With €30bn sales across the EU, currently, remanufacturing employs around 190,000, 90% in the business to business (B2B) sector. It is estimated that in 9 sectors the market has potential to expand from €7.4 bn today to €100bn by 2030[1], generating between 450,000 and 600,000 jobs. Remanufacturing is generally carried out either by OEMs directly (eg: Dell Computers, Renault), under licence or by spin-outs from OEMs (eg: Syncreon for Lexmark), or by independent companies. In the latter case SMEs need to deal with OEM intellectual property rights and branding issues. Remanufacturing usually requires significant capital investment, from basic machine tools to high tech, and it requires guaranteed flow of core (used equipment and components).

products or product parts are disassembled, improved or replaced, to be use "as new". Such activities can be supported by **Reverse logistics**[237].

4. Extending product value: Those business models based on offering product access and retaining ownership to internalise benefits of circular resource productivity. This includes **product-as-a-service**[238] or servitisation, where buyers do not necessarily buy a product but rather services associated to the product.
5. **Collaborative- or Sharing economy**[239] models where individual/private use of products and services turns into shared usage on a temporary basis, facilitated by online platforms and open marketplaces

To these can be added **Recycling activities**[240] which convert waste into secondary raw materials, sometimes to higher value products through **Upgrading** or **Upcycling**. However, although an important element of the circular economy, recycling activities are rather a sector of activity than a circular business model as such, and are concerned with dealing with the end-of-life phase when a product becomes waste. Nevertheless, the quality, quantity and viability of recycling businesses is highly dependent on product design.

Current situation and forecast

There are CBM examples that illustrate the strong business case of a circular economy across many different industries and that show the many environmental and social benefits circular practices yield.[241] **The market share of CBM is relatively small**, despite the rapid growth in some known platforms, with future environmental impacts likely to remain small-scale when compared to the overall economy. CBM and traditional business models are however expected to converge. Numerous studies point to the untapped potential of CBMs.[242]

[237] CBMs for **Reverse Logistics (RL)** support take-back, maintenance, repair, refurbishment, and remanufacturing. Reverse material flows are a prerequisite for various CBMs. Newer approaches also connect reverse flows and stock overruns with new markets, for example for second-hand retailing.

[238] In CBMs based on **Product-service system (PSS)**, buyers do not necessarily buy a product but rather services associated to the product. Different degrees of servitisation, from product-related services to product-replacing services distinguish different types of PSS patterns. Major mechanisms of these patterns are a shift in incentives towards more efficient resource use and moving away from the notion of ownership. This includes use-oriented services, where the product is still central, but its ownership remains with the provider and the product is leased, shared, rented or pooled. It also includes result-oriented services, where payment is by pre-defined and agreed result, i.e. pay per service unit delivered. For example, purchasing x hectares of pest-free fields for x years instead of purchasing a predefined volume of pesticides.

[239] **Collaborative- or sharing economy (CSE)** are models where individual/private use of products and services turns into shared usage on a temporary basis, facilitated by online platforms and open marketplaces. Collaborative or sharing models generally increase the use-intensity of the product or asset, compared to user-ownership, leading to reduced costs, and improved access, while leading to environmental gains. It is estimated that the collaborative economy can save up to 7% of household budget spending and reduce waste by 20% if the market operates under favourable conditions[239].The collaborative economy is particularly active in transport (car sharing (vehicle-renting), ride-sharing and rides on demand), tourist accommodation (sites such as AirBnB) and consumer durables (thus, instead of buying a power drill, you rent one). It is often associated with design for durability, as the owner remains the actor putting the product on the market, but more intense use leads to shorter absolute product lifetimes.

[240] **Recycling activities** convert waste into secondary raw materials. Waste regulations aim to ensure steadily increasing and separated feedstocks of various waste types, but investment gaps persist[240] despite available Structural Funds. Confidence in stable future demand and prices need to be enhanced, and relative costs of landfill and incineration need to be progressively increased. For example a legal obligation to separately collect municipal biowaste (by 1st January 2024) will bring on tap far higher amounts of this feedstock. If not treated properly it will lose value and emit methane; if treated properly it will provide valuable fuel and fertiliser. Bio-refineries can capture the value of organic waste and by-products by extracting energetic or non-energetic products including biochemicals and nutraceuticals, nitrogen, phosphorus and potassium (NPK) 133, returning nutrients to soils and developing markets for biomethane. In the EU27, current capture of food waste is 9,5 million tonnes p.a. (MTPA), just 16% of the theoretical potential, estimated at 60 MTPA.

[241] *SITRA 2021 The winning recipe for a circular economy (sitra.fi)*

[242] Consultant's supporting study to SPI IA, Task 5; Material Economics, 2019; Material Economics, 2018; SITRA 2020; SITRA 2021

Market penetration per sector

Overall, the market penetration of new circular business models remains limited, with considerable potential remaining for scaling up such models in many sectors. The degree of market penetration varies depending on sector and depending on type of CBM concerned[243]. The sectoral distribution (using the Eutopia Green database) of a sample of CBMs is depicted in Figure 18 below. The energy sector reports having the largest amount of CBMs, followed by construction material and works, and means of transport (with an aggregated value of 66% of all BMs in the sample). Sectors such as furniture, high impact intermediary products (cement, chemicals, steel) and electronics & ICT have far lower CBM market penetration: 3%, 4% and 4% respectively.

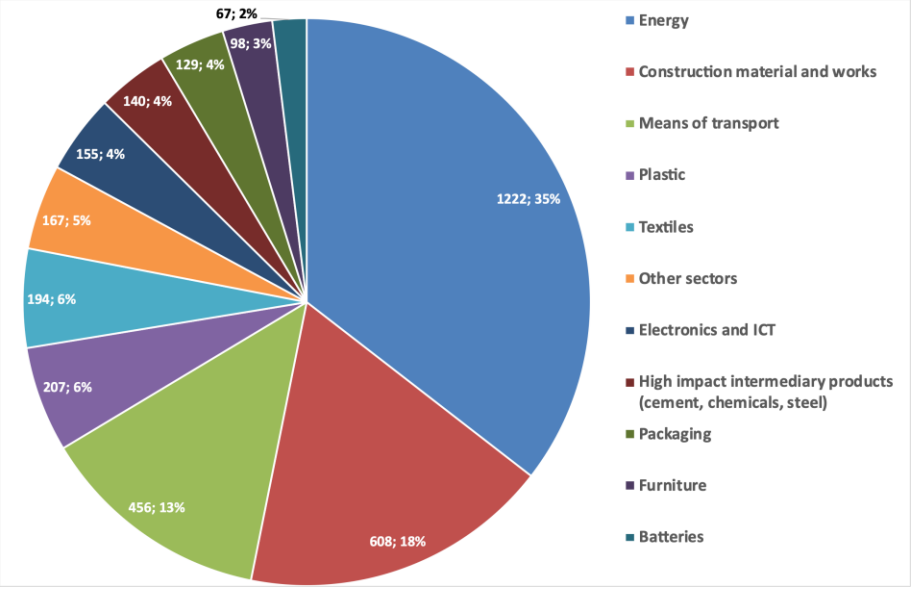

Figure 18 Sectoral distribution of 2380 European companies with CBMs in the study to support this initiative

The results from the survey collected as part of the impact assessment (see Annex 2: Stakeholder consultation) provide some additional indication on the level of market penetration of CBMs. The survey found that most **SMEs were more or less equally familiar with the different new as well as established CBMs presented**. One model did not stand out in particular. Respondents considered that the EU is best placed to enable and regulate product service systems (66%), reverse logistics (55%), the collaborative economy (47%) and on demand production (41%).

The survey results indicate that the two main drivers for the uptake of circular business models for sustainable products in Europe were predominantly regulations and incentives to foster innovation in sustainable products (50% agree, 20% strongly agree). Regulations and incentives also deemed to enable circular business models (52% agree, 17% strongly agree).

Barriers and drivers

Diaz Lopez et al. (2019)[244] explore relationships between Circular Economy business model changes, and implementation barriers in 143 cases. They adopt a categorisation of implementation barriers into institutional, market, behavioural, cultural and organisational.

[243] Material Economics, 2019; REF consultant's supporting study to SPI IA, Task 5

[244] Based on Diaz Lopez, F., Bastein, T., Tukker, A. (2019) Business Model Innovation for Resource-efficiency, Circularity and Cleaner Production: What 143 Cases Tell Us, Ecological Economics, 155, 20-35

Using these categories, some examples are identified below.

Table 23 Barriers and drivers for Circular Economy Business models

Barrier	Scope	Example
Institutional	Policy framework not adapted, e.g.: regulations, fiscal measures, conditions for investment	The lack of clear end-of-waste criteria excludes many remanufacturing actions as a product that has become waste cannot be put back on the market. Waste shipment rules prevent adequate feedstocks Lack of minimum standards for design make repair, remanufacturing and recycling uneconomic Labour is generally taxed more than materials as a factor input.
Market	Market conditions, information gaps and asymmetries, split incentives, monopolies, subsidies, relative costs of inputs	Benefits of design for durability or easy dismantling and recycling do not accrue to the manufacturer. Costs of repair of a DVD player outweigh costs of replacement. OEMs refuse to allow their products to be remanufactured by independents for reputational or IP reasons. Cheaper to landfill than to recycle. Lack of critical mass of consumer demand Reverse material flows are restricted
Behavioural/ cultural	Risk aversion, social norms and habits, hassle avoidance	CBMs are often excluded from public procurement by restrictive interpretation of "most economically advantageous offer"; for example not incorporating life-cycle costing, and excluding possibilities for supplying reconditioned/remanufactured products or products-as-a-service. Consumer ownership is often for "prestige" motivations, reinforced by branding and marketing.
Technological	Lack of equipment and tools, underdeveloped or expensive technology	Robotic disassembly and use of AI are not rolled out yet. Technologies for chemical recycling of plastic are not cost effective yet.
Organisational	Company structures and routines, Management, accounting and reporting systems	Accounting processes, performance measurement and bonuses are based on sales revenues, with less importance to benefits of asset retention in servitisation models. Lack of knowledge and expertise in circular approaches.

These barriers can be split into those that are more internal to companies or to the practices of individuals, over which companies have some control, and external barriers, over which they have little control, and where policy intervention would be required to unlock circular potential. In reality the distinction is often overlapping, in that for example accounting, reporting and management practices will be influenced by accounting and tax rules.

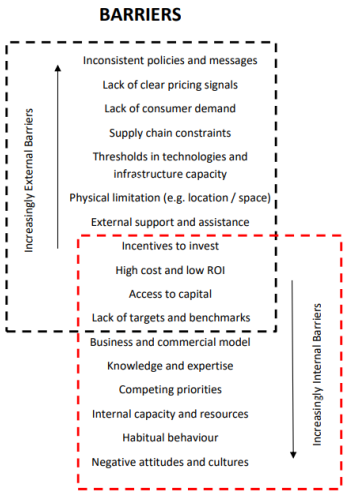

Figure 6.1: Barriers to business becoming more resource-efficient. Source: Adapted from AMEC and BioIS (2013), Figure B9, p.83

Figure 19 Barriers to business becoming more resource efficient

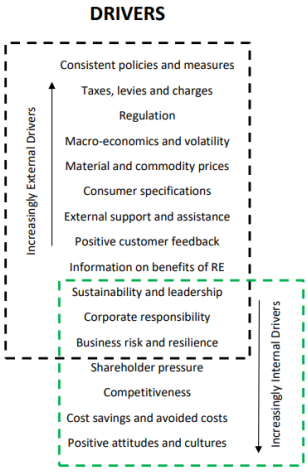

Figure 6.2: Drivers to stimulate businesses to become more resource-efficient. Source: Adapted from AMEC and BioIS (2013), Figure B9, p.83

Figure 20 Drivers to stimulate businesses to become more resource-efficient

Amongst the potential external drivers for CBMs, several respond directly to the barriers set out in the previous figure. For example, consistent policies and measures, and the use of taxes, levies and charges, and of regulation, to address a lack of clear pricing signals. Policy makers can also assist with providing information on the benefits of resource efficiency and the circular economy. Customer specifications and positive customer feedback in support of circular economy practices and products are clearly external to businesses, but would themselves be dependent on other broader social trends, within which governments could play a role.

An important general observation arising from considering these internal and external barriers and drivers, is that barriers and drivers are frequently not isolated, but operate in a context, and in combination with other drivers and barriers, both internal and external. This is why Kemp et al

(2014)[245] develop the concept of the 'web of constraints' – and a corresponding 'web of drivers' – rather than considering individual barriers and drivers operating independently.

A study by SITRA[246] points out four categories of barriers to further application of CBM: cultural, technological, market and regulatory. The interrelatedness of these four categories of barriers can result in a chain reaction towards circular economy failure, with the economy then remaining in its current business-as-usual.

Figure 2. Categories of Circular Economy Barriers

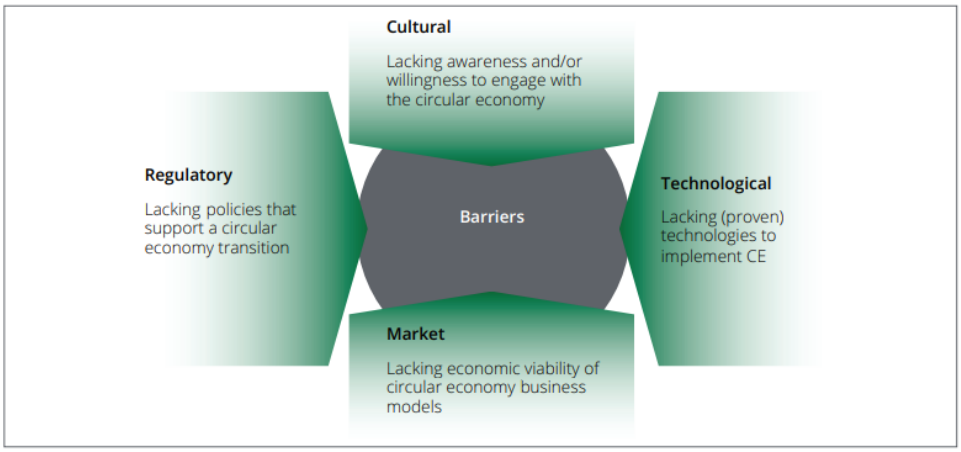

Figure 21 Categories of circular economy barriers

These four types of barriers are interrelated. For instance, a business with a company culture hesitant towards circular economy will not develop circular designs. **Hence, consumers will lack awareness and interest regarding circular designs since none of these are offered in the market**. This means that cultural barriers can induce technological barriers which induce further cultural barriers. Another example regarding interrelatedness are regulatory and **market barriers**. For instance, limited circular procurement can result in **limited funding for circular business models** since circular firms may not be able to demonstrate convincingly that there is a market for their products in the absence of such procurement. This, in turn, may further undermine the development of a global consensus among policy-makers regarding transitioning towards circular economy since convincing use cases are missing. Hence, regulatory barriers can induce market barriers which induce further regulatory barriers. This analysis is underpinned by a study of the Circular Economy Initiative Deutschland[247], which analysed the barriers to development of circular business models in the area of maintenance and upgrading, repair, reuse, remanufacturing, and recycling. On the **demand side**, amongst other barriers the study highlighted the inhibiting role currently played by **price** (as, in some cases, carrying out a value-retaining operation such as repair costs a similar price/is more expensive than purchasing a new product), as well as by **geographical or structural distance** between providers and users (which leads to increased 'hassle costs'). On the **supply side**, amongst other barriers the study identified **lack of access to spare parts**, **information asymmetries**[248], **low profitability margins**,

[245] Kemp, R., Dijk, M., Domenech, T., Wieser, H., Bahn-Walkowiak, B. Weaver, P. (2014), Synthesis Report and Conclusions about Drivers and Barriers, POLFREE Deliverable 1.7. Available at: https://www.ucl.ac.uk/polfree/publications/publications-2014/1.7.pdf

[246] SITRA, 2020 Rethinking ownership (sitra.fi)

[247] acatech/Circular Economy Initiative Deutschland/SYSTEMIQ (Eds.), 2020, Circular Business Models: Overcoming Barriers, Unleashing Potentials, https://static1.squarespace.com/static/5b52037e4611a0606973bc79/t/608a9b723926032d9f74aea2/1619696523596/GM_Gesamtbericht+EN

[248] e.g. for repair and maintenance businesses: lack of access to products' repair and maintenance information; for recyclers: insufficient information about material composition, recyclability and toxicological characteristics of materials

difficulties in accessing relevant funding (due to perceived lack of solid business cases), and **competition** (e.g., in the case of recyclers, from well-established virgin materials industry and value chains).

Results from the survey as part of the impact assessment also uncovered some barriers relating to the development of CBMs. When asked to list the main barriers to the successful deployment of more circular business models, a clear regulatory framework, the profitability of business models, and consumer awareness and responsiveness were considered to be the most important barriers. A lack of technical skills and the support provided by banks and investors willing to provide funding was considered much less important.

In the particular case of the CBM relating to the sustainable manufacturing of products, barriers highlighted by respondents referred mostly to the difficulty in obtaining trustworthy information on the social conditions of work along the supply chain, as well as the environmental conditions of processing along the supply chains. The ability of obtaining certificates of good environmental or social credentials were considered a much less hampering factor.

Table 24 Link to identified Policy Options

Driver	**Related Policy Option (SPI)**	**Other related EU policies**
Consistent policies and measures	Single market basis of Ecodesign,	Value-chain approach of CEAP
Taxes, levies and charges	promotion of eco-modulation of EPR, and potentially enabled via DPP	EU competence limited,
Regulation	Ecodesign, non-destruction of unused goods obligation, take-back obligation	Waste regulation, chemicals regulation, Consumer regulation (right to repair, green claims),
Material & commodity prices		CRM Action Plan Raw Materials Initiative Innovation Partnership, Strategic Partnership
Consumer specifications	Ecodesign and DPP	
External support and assistance	Guidelines on supporting CBMs, EIC funding and accelerator, Hub	EEN advisory services (SME Strategy)
Positive consumer feedback	DPP	
Information on benefits	Guidelines, Hub, DPP	Stakeholder platform

Imperfect Information: economic actors lack reliable information on product sustainability

There is often imperfect communication in the supply chain about a product's energy, environmental and social sustainability information, both from downstream actors (end-users and recyclers) up to product designers, and from product manufacturers downstream to end-users and recyclers. This leads to observed market failure in terms of sound economic purchasing decision because of:

- Lack of information for end-users on the efficiency of products;
- Lack of incentives to base purchase decision on factors other than direct performance ("suboptimal economic behaviour" of the users);
- Myopia of cost calculation, i.e., not assessing the Total Cost of Ownership (TCO) and instead solely relying on purchase price, especially in the case of SMEs or lower income households;
- Split incentives within companies due to the separate budgets for purchasing and running costs;
- Lack of communication between the designers and the actors in the supply chain involved in repair, refurbishment and end-of-life treatment.
- User preferences for selecting specific brands of equipment and ancillary materials (e.g. tradition).

Overall, that are multiple reasons why economic actors do not rationally choose the products which are the most cost-effective over the product's lifetime. In several cases companies and households are less likely to undertake energy or resource saving measures, even if they would have the same economic viability as other investments. Moreover, as seen in the section dedicated to the sub-problem 2, the lack of information on the sustainability of products along the supply chain leads to missed opportunities for value-retaining operations and affects the demand and market competition for more sustainable products and material.

These market failures could to some extent be tackled by reliable information on product sustainability: for example on whether one product is more resource efficient during its use phase than another. Such information is often not obvious for consumers who often lack information on products' sustainability including information on the environmental characteristics of products, expected or guaranteed lifespan of products, the availability of repair services, spare parts and repair manuals; and the software update/upgrade policy concerning the product. These parameters are considered[249] as the most relevant to help consumers assess a product's environmental sustainability.

An increasing number of consumers are interested in sustainability, with the majority of EU consumers being "occasional" consumers of environmentally-friendly products (56%) and more than a quarter paying attention to the environmental impact of all or most goods and services (23%). 67% EU citizens buy products that are better for the environment even if they cost more[250]. 43% of EU consumers declared that they would be willing to pay for environmental information[251], and 56% of consumers would use the information to buy "more environmentally friendly products[252]. Consumers say they look actively for information about the environmental characteristics of products[253], such as their environmental impacts or performance. However a large number of them find that the existing information is simply insufficient[254, 255].

[249] Based on European Commission, *Behavioural Study on Consumers' engagement in the circular economy,* October 2018 as well as the Impact Assessment for the green Claims Initiative [add reference when published].

[250] *Consumer conditions survey*, European Commission, 2021.

[251] Data extrapolated from the consumer survey in the framework of the impact assessment on Consumer Empowerment initiative [*add reference when published*].

[252] Impact assessment on Consumer Empowerment initiative [*add reference when published*].

[253] Half of the respondents look for environmental information on the packaging when purchasing a product.
European Commission, *Consumer Market Study on Environmental claims for non-food products*, 2014, p. 75.

[254] 60% of consumers found it difficult to determine the environmental impact of products, mostly because the information was not available or not clear or that consumers were unaware that such information existed.
European Commission, *Flash Eurobarometer 367*, 2013, p. 73.

Currently, evidence suggests that 26% to 40% of consumers[256], i.e., 74-150 million consumers, would use information to buy "more environmentally friendly products". Consumers would be on average willing to pay between 2.25% and 4.25% (depending on the product-type) more for an identical product, presented as environmentally sustainable[257].

Currently, these issues hamper effective support for buyers' decision-making based on environmental performance. For example, information could favour certain product characteristics, despite increasing impacts on other environmental indicators (e.g. optimising for climate change but worsening water use) and would omit information on what environmental issues are truly relevant for the product or company.

Even for consumers les interested in sustainability, there are good economic reasons for favouring products with higher sustainability because of savings over the use period (such as energy savings) or longer durability.

In response to this market demand by consumers, businesses, investors, and public administrations for environmental information, green products and services, environmental performance has become a competitive and differentiating factor. This has driven a proliferation of methods and initiatives and boosts the number of claims. However, claims, labels and initiatives can be based on different, inconsistent methods, with a varied level of reliability and coverage. Coverage may be different on environmental impacts (e.g. climate change only) or elements in the supply chain covered (e.g. whole supply chain, use phase or end of life phase only).

In response, there is an increasing effort to ensure that information on the sustainability performance is reliable, credible, and clear. This can be seen in the use of labels such as Energy Labels, EU Ecolabel and the initiatives to improve the clarity of green claims (the accompanying proposals on consumer empowerment and the use of PEF/OEF to substantiate green claims). These initiatives will contribute to tackling the problem, but will not remove it[258].

Lack of incentives to produce more sustainable products and retain value

All of these market failures lead to a lack of incentive for producers to produce more sustainable products. Why do so if the market will not properly reward sustainability, and you do not need to pay for pollution.

This also feeds through into a lack of incentives to ensure an optimal "expected lifespan" of goods (i.e. years of life, hours of use, number of cycles etc.) Information about the "guaranteed lifespan" is only available when a commercial guarantee of durability is offered by the trader (corresponding to the number of years covered by the commercial guarantee). Research shows that while consumer products are regularly offered with a commercial guarantee,[259] the information on such commercial

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[255] 85% of respondents to the OPC & targeted consultations carried out in the context of this study reported being unsatisfied or only partially satisfied with the environmental information available to them, due (among other factors) to the fact that such information is generally not sufficient to support consumer decision-making.
European Commission, *Sustainable Products in a Circular Economy - Towards an EU Product Policy Framework contributing to the Circular Economy*, 2019, p. 66.

[256] Varies depending on the sources and consequently on the methodology used. For instance, see:
Plank, A., & Teichmann, K., *A facts panel on corporate social and environmental behavior: Decreasing information asymmetries between producers and consumers through product labeling*. Journal of Cleaner Production, 177, 2018, p. 868-877.
Binninger, A.S., Robert, I., Ourahmoune, N., *Etiquettes environnementales et consommation durable: des relations ambiguës en construction*. Revue de l'organisation responsable 9, 2014, p. 5-24.

[257] European Commission, *IA supporting study*, forthcoming.

[258] Please see Annex 14 for more details.

[259] In 66% of the mystery shops at least one commercial guarantee was offered (38% of which were included in the price of the product). The most common duration of a commercial guarantee was 36 months (30%).
European Commission, *IA supporting study*, forthcoming.

guarantees, and the way how consumers are being charged, is often unclear, imprecise or incomplete[260].

Producers also face weak incentives to manage this lifespan, through repair services, spare parts and repair manuals of goods as well as on the software update/upgrade policy. This links to a lack of information for consumers[261].

Indeed, there can be a perverse incentive to design in early obsolescence, meaning that a product cannot be used for the expected purpose and breaks earlier than expected[262]. Several types of 'early obsolescence' practices can be identified, such as planned obsolescence or built-in obsolescence, premature obsolescence, indirect obsolescence, incompatibility obsolescence, etc.[263]. A few of these are intentional, whilst others are allowed to happen.

Moreover, in the absence of adequate requirements and incentives, low virgin material prices continue to be a dissuasive barrier to increased sustainability for many companies, as do fears that engaging in circular practices will increase product prices, resulting in loss of customers[264].

Regulatory and administrative failures

Insufficient EU regulatory framework for sustainable production and consumption

Bringing more sustainable products to the market is currently hampered by the lack of a harmonised regulatory framework in the EU.

As outlined in the introductory section, there is currently no overarching, integrated EU policy instrument capable of covering the sustainable production and consumption of all products and/or the availability and reliability of sustainability information on these products. Rather, a 'patchwork' regulatory situation exists, which allows only certain aspects related to product sustainability and circularity to be addressed, and leaves certain highly relevant sectors (such as textiles and furniture) almost wholly unaddressed in this respect. This situation leaves room to national initiatives: EU Member States have begun to press ahead with national-level rules to foster the sustainability of the products placed on their markets. This is illustrated in the **TRIS database graph** as well as the

[260] 50% of consumers do not possess enough information to distinguish between legal and commercial guarantees.
European Commission, *Consumer market study on the functioning of legal and commercial guarantees for consumers in the EU*, 2015, p. 77.

[261] Information on reparability aspects of goods is not provided for more than 80% of all goods in the market. This information when available is not complete nor available in a consistent way to allow consumers to compare products based on it. Information on the availability of software updates is not provided for more than 5% of the products with digital content. European Commission, *IA supporting study*, forthcoming.

[262] COM(2020)696 final, 13 November 2020, p. 5.
Planned obsolescence, or built-in obsolescence in industrial design, is a commercial policy involving deliberately planning or designing a product with a limited useful life so that it will become obsolete or non-functional after a certain period of time.
SWD(2016) 163 final, p. 75.
Premature obsolescence implies that the product lasts less than its normal "lifespan". The normal "lifespan" needs to be defined by taking into account consumers' expectations.
Indirect obsolescence generally occurs because the components required to repair the product are unobtainable or because it cannot be repaired or substituted (e.g. batteries welded into an electronic device).
Incompatibility obsolescence occurs when a device no longer works properly once an operating system is updated, or when the software update has resulted in poor functioning of the device.
SWD(2019) 91 final.

[264] Deloitte, Utrecht University, 2017: Breaking the Barriers to the Circular Economy, https://circulareconomy.europa.eu/platform/sites/default/files/171106_white_paper_breaking_the_barriers_to_the_circular_economy_white_paper_vweb-14021.pdf

'**Table on national level initiatives**', both set out in this section. Taking this into account, as well as the growing political and legislative momentum to foster a more sustainable economy in order to address, amongst other aspects, the climate emergency, **the continued absence of overarching or harmonised rules at EU level is likely to lead to increased fragmentation of the EU internal market**.

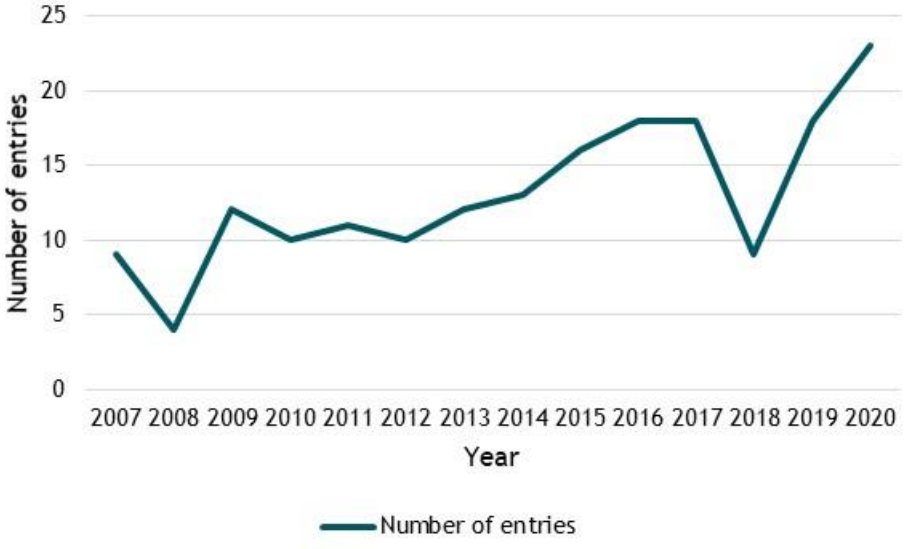

Figure 22 Number of entries per year in the Technical Regulation Information System for the product category of 'environment'. Source: elaboration from TRIS database[265]

The Technical Regulation Information System (TRIS) database reports the legislative initiatives by Member States susceptible to have an impact on the Internal Market. **Error! Reference source not found.** above shows that there is a growing trend in the number of national environmental legislation entries that potentially have an impact on the Internal Market

Some of the initiatives recently adopted by Member States are particularly ambitious and broad in scope. For example:

- In February 2020, France adopted a "law against waste and for a Circular Economy" n°2020-105[266]. It includes requirements on washing machines (filters against the release of micro-plastics), a national index of reparability of products and of their longevity, information requirements on the duration of software compatibility, and 5-years plans for the ecodesign of selected value chains.

- More recently, France notified[267] the Commission of its intention to require information on the environmental qualities and characteristics of waste-generating products to be made available to the consumer at the time of the purchase, in a dematerialised format, accessible and free of charge. The environmental qualities and characteristics in question include: reparability and durability, compostability, incorporation of recycled material, use of renewable resources, re-use opportunities, recyclability, presence of precious metals, presence of rare earths, presence of hazardous substances, traceability, presence of plastic microfibres.

[265] https://ec.europa.eu/growth/tools-databases/tris/en/
[266] https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000041553759/
[267] https://ec.europa.eu/growth/tools-databases/tris/index.cfm/en/search/?trisaction=search.detail&year=2021&num=644&mLang=EN

– Germany is planning to introduce a new label, which would include greenhouse gas emissions and raw-material consumption over the full lifecycle of products[268].

– In the Netherlands, the government-wide circular economy programme'[269], published in 2016, set out national-level plans to utilise raw materials, products, and services in more efficient and smarter ways. The stated objective – as endorsed by companies, trade unions, governmental and other social organisations in the 2017 'National Agreement on the Circular Economy'[270] – is for the Dutch economy to use 50% less primary raw materials by 2030 than it does today, and to be fully circular by 2050. The three strategic paths singled out in this agreement focus on efficient use of raw materials, replacement of non-sustainable raw materials with sustainably produced ones and **designing new production methods and products for a circular economy**. The government has clarified that its objective is to ensure that as many manufacturing companies as possible have taken steps towards circular design of their products by 2022[271]. This plan includes the development of a Dutch biobased content label or certification[272].

– Finland published in 2019 an updated version of its Strategic programme to promote a circular economy[273] with a coherent set of actions by all stakeholders in society.

– Regarding the destruction of unsold goods, several member states are developing or have developed legislation to restrict this practice. The French "law against waste and for a Circular Economy" includes a provision that producers, importers and distributors of new non-food products intended for sale are required to reuse in particular by donating or recycling their unsold products. The Spanish preliminary draft law on contaminated soil and waste includes a ban on the destruction of unsold surpluses of non-perishable products such as textiles, toys and electrical devices, unless another regulation requires their destruction[274]. The German the Recycling Management Act introduces a general 'duty of care' to ensure, when distributing products, also in connection with their return, that their fitness for use is maintained and that they do not become waste. More specific ordinances will follow determining the functioning of the duty of care for specific products. The German act also includes the possibility to introduce a transparency obligation requiring manufacturer to clearly document how unsold goods are handled[275]. These measures by Member States differ in terms approach (e.g. a general ban as opposed to a duty of care principle) and stringency (e.g. whether recycling of unsold goods is allowed instead of sale or donation) which leads to fragmentation from diverging national approaches.

While such initiatives are indicative of the growing momentum at national-level to engage with circular economy practices to foster sustainable products, they risk leading to growing uncertainty for businesses, increased administrative burden and potential barriers to the development of their

[268] As reported in an expert workshop organised by the European Environmental Agency on 22 September 2021 on the promotion of circular behaviours by consumers.
[269] https://www.government.nl/documents/leaflets/2016/09/22/a-circular-economy-in-the-netherlands-by-2050
[270] fhttps://www.government.nl/documents/discussion-documents/2017/01/24/national-agreement-on-the-circular-economy
[271] https://www.government.nl/topics/circular-economy/accelerating-the-transition-to-a-circular-economy
[272] https://kidv.nl/media/wet-en-regelgeving/uitvoeringsprogramma-circulaire-economie.pdf
[273] https://ym.fi/en/strategic-programme-to-promote-a-circular-economy
[274] Search the database - European Commission (europa.eu)
[275] The 'duty of care' obligations has been introduced under its 'Waste Management and Product Recycling Act' (Kreislaufwirtschaftsgesetz – KrWG), which has recently entered into force https://www.bmu.de/themen/wasser-abfall-boden/abfallwirtschaft/abfallpolitik/kreislaufwirtschaft/die-obhutspflicht-im-kreislaufwirtschaftsgesetz/

economic activities – **something businesses themselves have drawn attention to and called for action on**[276].

Table 25 National level initiatives

The table below presents national legislative initiatives, either already adopted or in the pipeline, and which aim at addressing some of the issues identified in this Impact Assessment. This substantiates the fact that increasingly divergent approaches are being adopted across the EU, leading to further internal market fragmentation. Economic operators active across the EU internal market will have to comply with different rules and requirements varying from one Member State to another when they want to place a product on the market. This will inevitably create distortions of competition that need to be addressed by EU measures to preserve the correct functioning of the internal market (*see section 2.1 on Consequences*).

[276] See for example ORGALIM position paper on the Sustainable Products Initiative, https://orgalim.eu/position-papers/environment-orgalim-position-sustainable-products-initiative-0, as well as a number of other examples set out in the *Consequences* section.

	Durability	Reparability	Obsolescence	Environmental information	Prohibition of destruction of unsold goods
Enacted legislation and existing initiatives at national level	**France**	**France, Slovenia and Finland**	**France and Greece**	*** See 'Legislative proposals' section**	**Germany and France**
	Durability index	**Reparability index**	**Ban**		**Ban**
	France – Durability Index: introduced by the Circular Economy Law 2020, it will integrate/replace the Reparability Index from 2024. It obliges producers, importers, distributors or any other person placing electrical and electronic products on the market to inform consumers on reliability and robustness of a list of products to be established.	**France – Reparability Index:** The Circular Economy Law obliges producers, importers, distributors or any other person placing electrical and electronic products on the market to provide the reparability index of their product to sellers of their products or any other person requesting it. The aim is to inform consumers about the ability to repair five groups of products (televisions, smartphones, laptops, lawnmowers and washing machine)	**France – Criminalisation of planned obsolescence:** Consumer Code and Law on energy transition for green growth defines and forbids the practice of planned obsolescence. In case of breach of this provision, the person responsible for placing the product on the market can be sentenced to two years' imprisonment and a fine of EUR 27 product0,000.		**Germany – 2020 amendment to the Recycling Management Act:** This amendment established a new 'duty of care' for producers and provided a legal basis to prohibit companies from destroying unsold goods (unless they are proven to be unusable). As part of this initiative, the government announced that it plans to develop a transparency ordinance requiring manufacturers (as well as retailers) to clearly document how unsold goods are handled
		Information on spare parts and/or repair manuals and/or software updates	**France – Criminalisation of intentional irreparability and deliberate obstruction of access to repair information:** Circular Economy Law criminalise any technique used by the person responsible for placing the product on the market, which makes it impossible to repair or recondition outside its approved/licensed repairers.		**France – Law n° 2020-105 of 10 February 2020 on the fight against waste and the circular economy**: This law strengthened existing French legislation aimed at was reduction and included new objectives, tools and obligations, notably a prohibition on the destruction of unsold non-food goods, such as clothing, shoes, beauty products, books, or consumer electronics. According to the law, manufacturers, distributors, and stores with unsold goods are be
		France – Obligation to inform consumers on the availability of spare parts: The Circular Economy Law establishes that manufacturers and importers have the obligation to inform retailers on the availability or non-availability of essential spare parts and of the time period during which they will be available. It also establishes that the retailer has the	**Provision of spare parts and repair service** **France – Obligation to provide spare parts for a certain time period:** The Circular Economy Law requires producers of		

		obligation to inform consumers on the updates necessary to maintain the conformity of the product, how to install these updates and the consequences of refusing to install them. **Slovenia – Consumer Protection Act:** It obliges the producer and/or seller, in case of obligatory conformity guarantee for certain types of technical goods[277] to provide information on the duration of services for maintenance of goods, spare parts, and supplementary devices (at least 3 years after the elapse of the guarantee). It also obliges the producer and/or seller, in case of obligatory conformity guarantee for certain types of technical goods[278], to provide an assembly manual and a list of authorised services centres (at least 3 years after the elapse of the guarantee). This guarantee is provided on top of EU harmonised 2-year guarantee. **Finland – Legislative ban on untrue or misleading information:** the Finnish Consumer Protection legislation introduces a ban to provide untrue or	household appliances, small IT and telecommunications equipment, screens and monitors to make spare parts available for a minimum duration of five years. **Greece – Provision of technical service for repair and maintenance and supply of spare parts:** Consumer Protection Law establishes that the supplier (including both the manufacturer and the retailer) of new durable goods must ensure that consumers are consistently provided with technical services for maintenance and repair of these goods, as well as supply of spare parts, for at least 2 years from delivery.		required to donate or recycle them instead of incinerating or dumping them in landfills.

[277] Household appliances, vehicles and similar products, machines for agricultural and small-area cultivation, information technology products, sport equipment, products in the field of radio communications, audio and video technology and devices connected thereto, electro-medical devices intended for personal use, fire protection devices and wastewater treatment plants.

[278] Household appliances, vehicles and similar products, machines for agricultural and small-area cultivation, information technology products, sport equipment, products in the field of radio communications, audio and video technology and devices connected thereto, electro-medical devices intended for personal use, fire protection devices and wastewater treatment plants.

		misleading information in marketing or during the course of the customer relationship including information especially relating to 'the availability and need for maintenance, repairs and spare parts'.			
Legislative proposals at national level	**Belgium and Italy** **Belgium – Proposals for a Bill aiming at combating planned and premature obsolescence and increasing the possibilities of repair (**9 November 2019**):** it prohibits producers from engaging in planned and premature obsolescence practices; it proposes to include in pre-contractual information the reparability and non-reparability of products, as well as the length of time of spare parts are available; it suggests that all products have on the surface, on the packaging, and on advertisement, an indication of the lifetime of the product and the possibility for repair in a legible, apparent and unequivocal manner. Lifespan is expressed in hours, month or years or, where relevant, in number of operating cycles. The obligation to provide information on lifespan to consumers and to ensure that the	**Belgium, Italy, Spain and Portugal** **Belgium – Proposals for a Bill aiming at combating planned and premature obsolescence and increasing the possibilities of repair (**9 November 2019**):** it prohibits producers from engaging in planned and premature obsolescence practices; it proposes to include in pre-contractual information the reparability and non-reparability of products, as well as the length of time of spare parts are available; it suggests that all products have on the surface, on the packaging, and on advertisement, an indication of the lifetime of the product and the possibility for repair in a legible, apparent and unequivocal manner. Lifespan is expressed in hours, month or years or, where relevant, in number of operating cycles. The obligation to provide information on lifespan to consumers and to ensure that the product does not fail	**Belgium, Italy and Portugal** **Belgium – Proposal for a bill to address planned obsolescence and support repair economy** (19 July 2019): This proposal introduces a definition of planned obsolescence and bans it. In case of breach of this provision, it provides a sanction for the producer. It also suggests the creation of a product passport, an extension of the legal guarantee to 5 years. It also provides that it can be decided to require manufacturers and importers to provide professional sellers and repairers with essential spare parts. **Belgium – Proposal for a Bill to address organised obsolescence and support the circular economy** (7 January 2020): It introduces a definition of organised obsolescence and prohibits it. If the product is considered affected by organised obsolescence, it is the producer who is deemed responsible unless the producer is established abroad, in which case the trader	**France** **France – Proposal for a Decree on consumer information on the environmental qualities and characteristics of waste-generating products** (draft notified to the Commission on 04/10/2021): This proposal concerns public information on the environmental qualities and characteristics of waste-generating products, as well as the premiums and penalties paid for environmental performance. The draft proposal provides that information on the environmental qualities and characteristics applicable to the products concerned shall be made available to the consumer in a dematerialised format, accessible free of charge at the time of the purchase and reusable in such a way as to allow aggregation, at least on a dedicated web page and including an application programming interface. Where	

	product does not fail earlier than the indicated lifespan is on the producer. **Italy – information obligation on the durability of the product (9 July 2018):** This legislative proposal would introduce an obligation to inform consumers on the "guaranteed lifespan and the presumable lifespan"[279] of products on the packaging. It is the producer who is in charge of providing the information and guaranteeing the correct durability of the product.	earlier than the indicated lifespan is on the producer. **Italy – Consumer rights on lifespan and possibility of reparations at accessible prices (9 July 2018):** This legislative proposal would recognise the consumer's right to be informed by producers on the possibility of reparation at accessible prices. **Spain – Reparability index (15 March 2021):** This legislative proposal would consists of a classification of electrical and electronic equipment on a scale of zero to ten points awarded based on five objective criteria. Awareness-raising actions will accompany the Reparability Index. It will create an opportunity for the industry to have a new incentive for innovation in eco-design and repairable, upgradeable, sustainable technology without obsolescence. **Portugal – reparability (4 November 2019):** Legislative proposal requiring that producers and importers must ensure the availability of user's manuals	is considered responsible. It proposes to include in the pre-contractual information the lifetime of the products, the period during which spare parts that are essential for the use of the product are available in a visible and equivocal way on the packaging and advertisement of the product. It obliges producers to guarantee the availability of a product's spare parts - which are essential for its use - at a reasonable price. **Italy – Definition and prohibition of planned obsolescence (9 July 2020):** This legislative proposal would define and ban the practice of planned obsolescence and introduce criminal sanctions for the producer or distributor of goods who mislead the consumers on a number of issues including planned obsolescence. **Portugal – Promoting product durability and combating planned obsolescence** (4 November 2019): Legislative proposals to prohibit planned obsolescence by producers.	appropriate, they may also be communicated in accordance with procedures which may be defined by order, by posting, labelling or any other legible and comprehensible device, at the time of the purchase. These arrangements will also apply for the provision of information on premiums and penalties paid for environmental performance. Finally, the present draft decree specifies the prohibition of the words 'environmentally friendly' and "biodegradable", as provided for by the AGEC law.	

[279] No methodology is proposed to assess this, yet.

Implementation and enforcement deficiencies leading to sub-optimal application of the Ecodesign Directive

Evaluations[280] of the Ecodesign Directive have concluded on its relevance and effectiveness. As such, public intervention in the framework of the Directive appears to be well designed and cost-effective[281]. This is confirmed by stakeholders from national authorities, industry and civil society, who generally praise the framework for its successes. In itself, the regulatory framework does not expose any significant structural failures, even if it could benefit from adjustments based on experience and evolutions of the wider legislative framework, from the Lisbon Treaty to reviewed Market Surveillance rules, and a progressive change of consumption patterns in the recent years, with a rising role for online retail.

Nonetheless, evaluations and stakeholders unanimously point to shortcomings of the implementation and enforcement, leading to the sub-optimal application of the Directive, as presented under section *0 Sub-problem 3: Sub-optimal application of the current Ecodesign legislation* above.

Upstream, the limitations presented above (incomplete coverage of scope, progressive enlargement of requirements to non-energy aspects, delays) have been evaluated as being driven mostly from **resource allocation constraints at EU level**, compared to an increased legislative complexity. Ecodesign is a complex process which requires extensive consultations with stakeholders from the Industry, NGOs, National authorities and EU citizens. As the number and complexity of products regulated increases, as well as the number of environmental aspects that are looked at, the overall time required to properly assess potential regulations also increases. With constant financial and human resources, even with a high degree of prioritisation on the products with the highest energy savings potential, only a limited number of products and aspects can be addressed.

In that context, the 2020 Court of Auditors report on Ecodesign pointed that some delays were to be attributed to the package approach of 2019: "In 2016, the Commission decided to adopt several implementing measures as a single package, meaning that it would adopt regulations on several product groups at once. According to the Commission, this approach helps to communicate on the overall impact of multiple product groups and better demonstrate that the policy delivers significant results. However, we found that it led to delays for those product groups that are ready earlier, until the full package is ready to be adopted, leading to further delays in an already lengthy process".

One of the most important aspects raised by stakeholders is the lack of Commission staff and other resources dedicated to Ecodesign, as the scope and product coverage of the Ecodesign Directive has increased. The 2012 and 2014 evaluations point out that for the size of its economy, the EU commits substantially less resources to support its programme than other economies. For instance, the US expenditure is roughly 10 times that of the EU despite both having similar sized economies and similar magnitudes of benefits to achieve from optimising their equipment energy efficiency programmes. The 2017 European Parliamentary Research Service's European Implementation Assessment on the Ecodesign Directive notes that "[m]any stakeholders agreed that there is a shortage of staff at the European Commission working on this topic and the question of staff expertise is accentuated when staff are shifted from one topic to another relatively quickly. The expertise they have acquired on highly technical subjects is all too often lost".

The European Commission's limited access to relevant data with regard to environmental performance and market shares of products has also been identified as a constraining factor. Data is key in the framework of an evidence-based approach to regulate products and the time it takes to access data and the reliance on stakeholder's cooperation can be seen as a delaying factor.

[280] Ref to CSES, Ecofys, ECA
[281] See e.g. Ecofys

The lack of appropriate standards and methodologies to implement the circularity aspects of the Ecodesign Directive has been analysed as a limiting factor of a full implementation of the Directive's potential. The 2020 Court of Auditors report on Ecodesign noted that the "depth and scope of existing preparatory and review studies exploring circular economy concepts (durability, reparability, reusability, recyclability and recycled content) varied between product groups", explaining that this was due to studies not following a standardised methodology on the non-energy aspects. Beyond specific circularity requirements, stakeholders have also pointed to a lack of methodology and clear enforcement strategy as one of the underlying reasons for not using the provisions of Annex I of the Directive with regard to ecological profiles, which would allow to look at inputs and outputs associated with a product throughout its lifecycle.

Finally, in practice, the formulation of the exclusion from the scope of the Ecodesign Directive of "means of transport for persons or goods" has led to the exclusion of potentially important products from an environmental point of view, such as personal electric transportation means, as well as to discussions as to whether products included in means of transport were also excluded from the scope.

Downstream, limited enforcement capacities can lead to incomplete implementation. As discussed above, it has been estimated that up to 10% of potential energy savings are lost due to non-compliant products. There is a general agreement[282] that the level of market surveillance is too low and should be increased as it is economically beneficial for society (current investments in enforcement are estimated to be 0.05% of the value of lost energy savings[283]). Apart from the level of resources allocated to market surveillance by Member States, timely access to product documentation and EU Market Surveillance Authorities cooperation have been found to be key aspects that need to be addressed to enhance enforcement of ecodesign rules.

Behavioural biases

Behavioural biases – including cognitive biases – are also relevant to set the context of this initiative and need to be taken into account in possible solutions. This includes the fact that some consumers take consumption decisions based on short-term costs and disregard the long-term costs of their choices (myopic behaviour). In addition, for consumers, a transition to more environmentally sustainable choices often requires a behaviour change, which is knowingly difficult because of resistance to change and the status quo bias. When choosing between different products, consumers already have to process a lot of information relating to various product attributes, which may lead consumers to focus on less complex information and leave aside sustainability aspects.

Four types of behavioural biases have been identified as important drivers for the problems analysed above:

- Social norms: perceived obsolescence; fashion trends; fast technological changes

Previous sections of this impact assessment have demonstrated how decreasing product life spans is generating social and environmental impacts. This is partly related to brand actions to make their former models seem obsolete and influence consumers to discard their still functional technological products to get new models[284]. This is perceived obsolescence: the part of planned obsolescence that

[282] See e.g. European Implementation Assessment - The Ecodesign Directive (2009/125/EC), European Parliamentary Research Service, November 2017; ECOS, https://ecostandard.org/wp-content/uploads/ECODESIGN-AS-PART-OF-CIRCULAR-ECONOMY-IMPLICATIONS-FOR-MARKET-SURVEILLANCE.pdf

[283] Ecofys final technical report p.159 referring to P. Waide et al., Enforcement of energy efficiency regulations for energy consuming equipment: findings from a new European study, Proceedings of the 6th International Conference EEDAL'11 Energy Efficiency in Domestic Appliances and Lighting

[284] Dominique Kreziak & Isabelle Prim-Allaz & Elisabeth Robinot & Fabien Durif, 2016. "Perceived obsolescence, replacement decision and destiny of cell phones [Obsolescence perçue, décision de renouveler et destinée des produits : le cas du téléphone portable],

refers to “desirability”. Despite being functional, a product is no longer perceived to be stylish or appropriate, so it is rendered obsolete by perception, rather than by function[285]. Fashion trends as well as fast technological changes are a good examples of perceived obsolescence:

a) The average number of collections released by European apparel companies per year has gone from two in 2000 to five in 2011, with some offering up to 24 new clothing collections each year. This has led to consumers to throw away their cheap clothing items after wearing them only seven or eight times.[286]

b) Under the influence of “Moore’s law”, performance of microprocessors has doubled every 1.5 years since 1965, leading to low durability of electronic goods and a strong drive to replace them early to benefit from significantly increased performance at constant price. Consequently, the typical duration of use of a smartphone is 3 years only[287]. “Moore’s law” seems to have come to an end around 2020, so that it is likely that the usage duration of electronic products will increase.[288]

This driver is contributing to problem 2: Too difficult for economic operators and consumers to make sustainable choices in relation to products.

- Bounded rationality

Bounded rationality is the idea that rationality is limited when individuals make decisions, for instance when buying a product. Limitations include the difficulty to make a decision among alternatives, the cognitive capability of the mind, and the time available to make the decision. Consumers tend to act as “satisfiers”, seeking a satisfactory solution, rather than an optimal solution. Therefore, they do not undertake a full cost-benefit analysis to determine the optimal purchasing decision, but rather, choose an option that fulfils their adequacy criteria[289].

Bounded rationality can explain why even well-informed consumers do not act rationally when making purchasing decisions.

This driver is contributing to problem 2: Too difficult for economic operators and consumers to make sustainable choices in relation to products

- Myopic behaviours

A behaviour can be defined as myopic when it is based on the pursuance of short-term results, leading to actions focussed on what one wants now, without taking into account future consequences. Consumers act myopically when they to overvalue the reward received immediately and undervalue the price to be paid in the future. When consumers compare present costs with future benefits, there is sometimes a tendency to select the option that appears most advantageous (e.g. financially) in the present moment. An example of this can be “consumer discount rates”, where the discount offered may lead consumers to make purchases on the spot that do not in fact make sense (e.g. financially) over the longer term. By extension, considering their frequent preference for the present, consumers

[285] Annie Leonard, “The Story of Stuff”

[286] EPRS | European Parliamentary Research Service – January 2019 “Environmental impact of the textile and clothing industry. What consumers need to know”. https://www.europarl.europa.eu/thinktank/en/document.html?reference=EPRS_BRI%282019%29633143

[287] EEB (2019) Cool products don’t cost the earth - full report. www.eeb.org/coolproducts-report

[288] David Rotman “We’re not prepared for the end of Moore’s Law”. MIT Technology Review, February 24, 2020 https://www.technologyreview.com/2020/02/24/905789/were-not-prepared-for-the-end-of-moores-law/

[289] Campitelli, Guillermo; Gobet, Fernand (2010). "Herbert Simon's Decision-Making Approach: Investigation of Cognitive Processes in Experts". Review of General Psychology.

may also be less likely to purchase more sustainable products, such as energy-efficient appliances[290], unless their advantages are readily comprehensible, in a manner that also facilitates comparison. Even when consumers have sufficient information, they can be discouraged by high upfront costs when buying a more performing product, while the benefits accrue over a longer period of time (i.e. during its use-phase). Consumers may not take into account the use cost of a product but focus on the purchase price only. On top, consumers can often not tell whether a product is more resource efficient during its use phase than another.

This driver is contributing to problem 2: Too difficult for economic operators and consumers to make sustainable choices in relation to products

- Linear production and consumption patterns are the default options

The transition to more sustainable production and consumption patterns and levels requires changes in mainstream business models. These are typically based on linear production processes and the throwaway mentality, generating the problems highlighted in the main problem definition section above. Alternative business models are often based on ideas of circular flows of products and materials, in both production and consumption phases (see *section 0Markets for Circular Business Models are not fully developed*, above). Consumers are crucial in the success of these models, but they are still locked-in linear production and consumption patterns, which are in the vast majority of cases the default options[291].

Convenience is a major driver of purchasing decisions. According to a recent study, 93% of consumers in the United States have refrained from a purchase due to convenience issues[292]. In the United Kingdom, 76% of consumers state that convenience is their key priority in selecting a retailer[293]. Circular Economy purchasing options rate badly when assessed on a convenience scale: maintenance, repair, returning a rented product to its owner after having reviewed it for defects, purchasing second-hand products, sorting one's waste are time-consuming actions. Linear economy options, along the purchase – use – dispose model, are comparatively much easier and less time-consuming to implement, and represent often the default option for the hurried consumer under strong time constraints.

This driver is contributing to problem 2: Too difficult for economic operators and consumers to make sustainable choices in relation to products as well as to the part of the main problem linked to EU economy being too linear.

HOW WILL THE PROBLEM EVOLVE?

This section shows how the problems identified in the previous chapter will evolve in the absence of any EU policy intervention on environmental product policy, as foreseen in the Sustainable Product Initiative.

As illustrated above in *Figure 4: Environmental impacts of EU consumption footprint along time, compared to population, GDP, DMC and resource productivity*, all categories of environmental consumption footprint have grown faster than population over the years 2010-2017, meaning that the consumption footprint per capita has increased. The average "single score" has risen by 9% over these 7 years, i.e. at ca. 1%/year, whereas "ozone depletion" rose more than any other impact category by

[290] Richard G. Newell and Juha V. Siikamaki (2015) "Individual Time Preferences and Energy Efficiency" NBER Working Paper No. 20969, February 2015, JEL No. D9,H43,Q41,Q48, https://www.nber.org/system/files/working_papers/w20969/w20969.pdf

[291] Edbring, Lehner, Mont, Exploring consumer attitudes to alternative models of consumption: motivations and barriers, Journal of Cleaner Production, Volume 123, 2016,

[292] National Retailer Federation. Winter 2020 Consumer View. https://nrf.com/research/consumer-view-winter-2020

[293] Linnworks "The effortless economy. A new age of retail" (2021): https://www.linnworks.com/the-effortless-economy

more than 20% and "mineral resources depletion" less than any other impact category but still by 2.5% and above population (by 1.5%). This worrying trend has even been accelerating over the years 2016 and 2017. Whereas it is likely that the COVID-19 crisis may have temporarily interrupted this rise, so that the figures for 2020 (yet to be published) may appear better, these figures show that, under normal economic circumstances, and in the absence of any further EU policy, **the consumption footprint per capita of EU citizens will continue increasing**.

As was seen in the section dedicated to the main problem, the EU consumption footprint per capita of non-food Baskets of Products (Appliances, Housing, Household goods, Mobility) exceeds the planetary boundaries several times: 7.3 times for climate change, 4.9 times for particulate matter, 3.8 times for resource use – fossils. Considering the uninterrupted rise in the environmental consumer footprint in the EU, this **transgression of planetary boundaries by the EU consumption footprint will remain and even aggravate without more targeted EU policies addressing the life cycle impacts of consumption**. The transgression of these planetary boundaries will, according to the available scientific evidence lead to "*deleterious or even catastrophic due to the risk of crossing thresholds that will trigger non-linear, abrupt environmental change within continental-scale to planetary-scale systems*"[294].

In the specific case of climate change, the rationale for EU action is set out in the European Green Deal Communication of 2019[295] as well as in analysis supporting the 2018 *Clean Planet for All* communication[296] and 2030 Climate Target Plan[297]. Political agreement has already been reached on enhanced greenhouse gas reduction targets for 2030[298], and on a European Climate Law[299] which sets the objective of climate neutrality by 2050 and the direction of travel towards it. Further proposals to meet these objectives are contained in the Fit for 55 Package[300]. Options in the context of the Sustainable Product Initiative can help contribute to meeting these objectives (and potentially reducing the cost of doing so) by identifying additional ways to reduce emissions along the different value chains.

Linear vs. Circular model

As stated in the chapter above describing the problem, "at present the EU economy is still far from being circular and progress towards this goal remains slow".

The circular material use rate has been constantly growing over the last years, but remains very low (11.8% in 2019)[301]. At the rate of improvement observed over the years 2004 to 2019 (a 3.6% increase in 15 years), and in the absence of any more ambitious EU policy, more than 150 years would be needed to reach a circular material use rate of 50%, admittedly still far from a fully circular target of 100%.

Similarly, the recycling rate of all waste excluding major mineral waste reached only 56% in 2016[302], with an average gain of only 2 percentage points in 6 years. If this trend were continued in the absence of any more ambitious policy, 132 years would be needed to reach a recycling rate of 100%.

[294] https://www.stockholmresilience.org/research/planetary-boundaries.html
[295] Communication, *The European Green Deal*. COM(2019) 640 final
[296] A Clean Planet for all: A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy. COM(2018) 773 final
[297] The 2030 Climate Target Plan: Stepping up Europe's 2030 climate ambition Investing in a climate-neutral future for the benefit of our people. COM(2020) 562 final.
[298] European Council Conclusions, 10-11 December 2020
[299] Available at https://www.consilium.europa.eu/en/press/press-releases/2021/06/28/council-adopts-european-climate-law/
[300] COM(2021) 550 final
[301] https://ec.europa.eu/eurostat/databrowser/view/cei_srm030/default/line?lang=en
[302] Last available data. Eurostat: Recycling rate of all waste excluding major mineral waste [CEI_WM010] https://ec.europa.eu/eurostat/databrowser/view/cei_wm010

Social impact of production

The 2021 report[303] of the ILO and Unicef on **child labour** indicates that the number of children in child labour has **increased** by 8.4 million children (i.e. 5%) compared to 2016, and reaches 160 million worldwide in 2020 (including 63 million girls and 97 million boys). This evolution, which contrasts with decades of previous improvement, illustrates how fragile the progress towards improved living and educational conditions for children can be.

Similarly, the evolution of the situation regarding two major Fundamental Conventions of the ILO, namely the **freedom of association**, the **right to organise** and the **right to collectively bargain** is negative. The yearly Global Rights Index by the International Trade Union Confederation[304] on labour and human rights showed that in 2020, the number of countries:

- violating the right to collectively bargain **increased** from 115 (or 62.5% of total number of countries investigated) to 144 countries (80% of total);
- excluding workers from the right to establish or join a trade union, and hence violating the freedom of association and the right to organise, **increased** from 109 in 2014 (58% of total) to 144 (or 74% of total);
- impeding the registration of trade unions, **increased** from 86 in 2019 to 89 countries in 2020.

In the absence of EU policy, **it is likely that these negative evolutions will continue, further deteriorating the social impacts** of the production supplying the EU Internal Market for non-food products.

As stated above, since the late 1980s, the lifespan of consumer products has generally decreased[305], and in recent years the lifespan of many types of products has become progressively shorter[306]. This reduction in the lifespan of consumer products is related to general trends in the design of products, which generally aim at a reduction in manufacturing costs: integration of functions into fewer, more complex parts, under the concept of "Design for Assembly"[307] or the increased usage of composite, blended or alloyed materials that combine the quality of their components[308]. Integrated, complex parts are more difficult and costly, and often impossible, to maintain or repair. Similarly, because of the intricate mix of materials that compose them, they are difficult, costly or even impossible to recycle. This latter observation is also valid for composite, blended or alloyed materials. In the absence of EU policies regulating the design of products, these design trends will continue developing, under constant pressure to reduce costs of manufacturing.

As stated in the Impact Assessment report on Green Claims, "*the 2020 inventory of green claims **on products** found that 80% of webshops, webpages and advertisements surveyed contained green claims. 45% of the total were implicit claims (imagery and colours suggesting environmental benefit) and 35% were explicit claims (logos, labels and textual claims)[309]. In the EU, 232 environmental*

[303] International Labour Office and United Nations Children's Fund, Child Labour: Global estimates 2020, trends and the road forward, ILO and UNICEF, New York, 2021. https://data.unicef.org/wp-content/uploads/2021/06/Child-Labour-Report.pdf

[304] International Trade Union Confederation, "2020 Global Rights Index", 2020. https://www.ituc-csi.org/IMG/pdf/ituc_globalrightsindex_2020_en.pdf

[305] There are many drivers leading to a decreasing lifespan of products: the technological progress; economic factors (e.g. when the cost of repair or upgrading is higher than replacement; and psychological reasons, shaped by style, fashion or a perceived change in need). See Circular by design. Products in the circular economy (EEA, 2017).

[306] Öko-Institut in Germany, Prakash S. e.a., 2016. Also, EEB (2019) Coolproducts don't cost the earth -full report. www.eeb.org/coolproducts-repor

[307] K.G. Swift, J.D. Booker "Manufacturing Process Selection Handbook", Elsevier, 2013, https://www.sciencedirect.com/science/article/pii/B978008099360700001X

[308] Ellen McArthur Foundation "A new textiles economy: redesigning fashions' future", 2017, https://www.ellenmacarthurfoundation.org/publications/a-new-textiles-economy-redesigning-fashions-future

[309] *Environmental claims in the EU – inventory and reliability assessment*, European Commission 2020

labels are active[310] *within global landscape of more than 450 environmental labels. The claims and initiatives have different, inconsistent methods at their basis*".

The fragmentation of the labelling landscape may start declining over the next years, but it is likely that this consolidation towards a limited number of dominant labels will remain slow. It is thus likely that, in the decade to 2030, the number of competing labels on the EU Internal Market will remain very high, and beyond the capacity of the consumer to cope with this complexity.

The study on Digital Product Passport supporting this Impact Assessment has identified 14 existing private initiatives that explicitly aim at supporting functions that would be part of a Digital Product Passport. This is in addition to existing EU-managed databases on products, such as EPREL and SCIP, and to a range of existing proprietary frameworks for the transmission of data along supply chains (aka. Industrial Internet of Things)[311]. These are the signs of an emerging, immature and fragmented market for solutions for Digital Product Passports.

In the absence of additional EU policy intervention, the three following scenarios are likely to evolve from this current situation:

- Either a fragmentation of the landscape into mutually incompatible solutions, each dedicated to the value chain of a large company or sector, or to horizontal segments of the value chain. The lack of inter-operability between these solutions leads to a loss of information at the interface between them, or to tedious, costly and error-prone transcription[312]; or
- The dominance by a single, hegemonic solution, in a "winner-takes-all" situation, because of the self-reinforcing effects of networks built on technical compatibility standards[313]. Considering the many precedents in the digital sector (e.g. in office productivity software, in social media, on-line platforms), it is very likely that this winner would be a digital hegemon based outside of the EU; or
- A continuation of the current lack of consistent and useful information, with its associated impact of some purchasing decisions being taken where better information would have led to more sustainable purchases and of inefficient maintenance, repair and recycling processes.

The current lack of reliable information on the environmental and social conditions under which operations are performed in the global value chains, as described in the chapter describing the problem, has been observed since the inception of the social and environmental audit model in the 1990s, with no improvement in sight. It is likely to persist if no additional EU action is taken.

Similarly, the currently existing price gap between sustainable products and their conventional, less sustainable competitors is based on a range of technical and economic features of sustainable products (longer-lasting materials, reversible assembly processes, parts and materials sourced from environmentally and socially responsible suppliers)[314]. In the absence of any additional EU policy, the

[310] www.ecolabelindex.com, retrieved on 15/9/2020

[311] E.g. by large corporate vendors, many of which from the US such as Amazon, PTC, General Electric, Rockwell Automation, Mitsubishi, Siemens, ABB, Schneider Electric.

[312] As it is currently the case in the world of Computer-Aided Design – CAD software, in which at least 49 incompatible solutions exist. See an overview here: https://www.trustradius.com/computer-aided-design-cad#products

[313] Arthur, W., & Arrow, K. (1994). Self-Reinforcing Mechanisms in Economics. In Increasing Returns and Path Dependence in the Economy (pp. 111-132). Ann Arbor: University of Michigan Press. Retrieved March 9, 2021, from http://www.jstor.org/stable/10.3998/mpub.10029.12

[314] As confirmed by 86% of academics and 71% of NGOs consulted in the targeted consultation, which either "Agreed" or "Strongly agreed" with the statement: "As product-related externalities are not fully internalised, the less a product is sustainable, the less it is demanding and costly to design, manufacture, use and manage at end of life. It can hence be placed on the market at a lower price than a more sustainable alternative". This question was not asked to manufactures, importers or retailers.

higher cost of these features is unlikely to diminish, so that the price gap with less sustainable products will remain, resulting in a persistent disadvantage of sustainable products on the market.

In the absence of any ambitious legal initiative by the EU on the sustainability of products such as the SPI, the current fragmented situation is likely to remain:

- Requirements on the material efficiency aspects (longevity, reparability, recyclability, resource use in the use phase) of energy-related products only are likely to be progressively added to new product groups, with harmonised standards being developed to support the assessment of these criteria. However, this legal basis will not allow the introduction of additional requirements or incentives to improve the sustainability of energy-related products, such as those envisaged in the SPI (e.g. reduce the carbon or environmental footprint, incentivise circular business models, ban the destruction of unsold products), nor to extend the scope of these requirements beyond energy-related products;
- High-impact product groups, in addition to batteries for which a legislative proposal has been published by the European Commission in December 2020, are likely be regulated regarding their carbon footprint, their recycled content, their recyclability, their reparability, the product information available in digital format, or regarding additional categories of requirements among those currently considered in the SPI. Considering that the legislative initiative for each product group will be developed and adopted independently, it is unlikely that coherence between product groups will be upheld along the legislative process, so that each legislation will have its specificities, making compliance and enforcement more difficult;
- Some aspects of the ambition of the SPI will not be met, such as the ban on the destruction of unsold consumer products, the support (through incentives) to products with a high sustainability level or to circular business models (except for those product groups which will be the subject of product-specific legislation covering such aspects).

In addition, in the absence of an EU-wide initiative on the sustainability of products, it is likely that the fragmentation of the EU Internal Market will rise, as individual Member States are already and increasingly engaging in initiatives regulating the sustainability of products, as illustrated by the evidence and examples below.

As described in the chapter on "Legal Basis", there is a growing trend in the number of national environmental legislation entries that potentially have an impact on the Internal Market. Considering the public pressure for more environmental and social sustainability of products, it is likely, that, in the absence of additional EU policy, Member States will continue adopting legislation on the sustainability of products and thus continue the upward trend identified so far. The adoption of this legislation would of course have the merit of increasing the sustainability level of products in these Member States. However, the criteria to assess product sustainability and the requirements placed on these criteria would be adopted independently, and would result in inconsistencies between legislation applicable to products in different Member States, and hence to increased fragmentation of the Internal Market.

Considering that funding for performing inspections and laboratory testing on products is felt as being a low priority in Member States' budgets[315], and that the consistency of Member States' efforts on the enforcement of product legislation still appears as having room for improvement[316], it is unlikely that

[315] As stated by 67% of the Member States participants having answered the question in the targeted survey.

[316] The targeted survey questions for Member States representatives showed that 81% of the participants having answered the question state "there are gaps and inconsistencies in the data and information reported in the Communication System on Market Surveillance (ICSMS)

the gaps currently observed in the compliance rate of products with EU legislation will improve in the absence of additional EU intervention.

by Member States", 39% that "Cooperation of the market surveillance and customs authorities of EU Member State is limited" and that "Enforcement efforts by Market Surveillance authorities are inequal among Member States", while 59% that "Enforcement efforts by customs authorities are inequal among Member States".

Annex 8: Why should the EU act?

LEGAL BASIS

In the previous sections of this impact assessment, certain problem issues linked to the current situation and **related to the internal market** were set out, including the fact that product-related externalities are not fully internalized (leading to an unlevelled playing field for companies attempting to implement more sustainable approaches); that the transmission of key product information is currently imperfect (meaning that supply chain actors are lacking or find it difficult to acquire a comprehensive understanding of the product's key or final characteristics, which hampers certain more sustainable activities, such as high-quality recycling); that current EU rules only partially cover sustainability aspects of products (meaning that there is no comprehensive set of requirements to ensure that all products placed on the EU market become increasingly sustainable); that (as a result of this partial coverage) various approaches at national level have begun to be adopted (leading to internal market fragmentation); and that insufficient and uneven enforcement of current Ecodesign rules has taken place.

The absence of adequate and comprehensive internal market rules, leave room for solutions to those problems, currently being developed by Member States or by industries and which contribute to the dysfunctionality of the internal market by generating potential barriers, fragmentation and incoherent approaches. In addition, in the absence of a comprehensive set of requirements defining the sustainability of products, the same product considered sustainable in one Member State might not qualify as such in another Member State. What's more, recently adopted national legislations are likely to oblige manufacturers (and retailers) operating across borders to comply with different national obligations. From information requirements on technical operations performed on refurbished electronic devices or on the duration of software compatibility in France, to reporting obligations on handling of unsold durable goods in Germany, all is there to indicate that the trend to intervene by imposing sustainability-related requirements on goods is well established. As a consequence, without EU action, an increased number of national obligations and increased fragmentation seems inevitable (please see section on *Drivers* and *Consequences* in this annex for further details).

The problems outlined above call therefore for measures based on Article 114 TFEU that aim to build an internal market for sustainable products and ensure that national initiatives do not hamper its functioning.

In addition, as set out in the CEAP, the core of this initiative is to make the Ecodesign framework applicable to the broadest possible range of products placed on the EU market and to make it deliver on circularity. The choice of Article 114 as the legal basis reflects a continuation of the approach used under the current Ecodesign Directive 2009/125/EC, which is based on Article 95 TEC (now Article 114 TFEU).[317]

The objective of this initiative is to build an internal market for sustainable products and economic actors operating in it. The aim is to achieve harmonisation of requirements for products placed on the EU market to ensure that they become increasingly sustainable and that there is a common understanding of what sustainability requirements should be met for each product in scope. The

[317] In line with case law of the ECJ, the legal basis is to be determined based on the nature and content of the proposed legal instrument, regardless of the legal basis of the instrument it possible replaces. This sentence reflects a continuation of the approach used under the current Ecodesign Directive' therefore aims to communicate merely that the future instrument will be similar in nature and content (although wider in scope and richer in aspects addressed) to the current Ecodesign Directive. This means, among other things, that it is intended to be built around a free movement clause and provide for the setting of harmonised product requirements. It does not intend to say that the legal basis of that Directive is of direct influence on that of the future proposal.

initiative will create a level playing field for businesses whose (more sustainable) products will become easier for economic operators and consumers to choose from.

In addition to pursuing internal market objectives, the proposal will also pursue a high level of environmental protection, by unlocking opportunities for the circular, clean and green economy. However, internal market objectives are predominant and environmental benefits are complementary.

Moving from the objectives to the nature of the initiative, the main content of the future legal provisions is a mechanism for the setting of requirements for products to be placed on the internal market. The future legal instrument is therefore product-centred, built on a free movement clause and will contribute to the establishment and functioning of the internal market for sustainable products.

As a consequence, Article 114 is the appropriate and correct legal basis, even if other considerations (environmental and social) are decisive for the choices made within that measure.

SUBSIDIARITY: NECESSITY OF EU ACTION

The relevance of the initiative for the Union is very high because the problems it addresses are widespread across the Union territory and have the same underlying causes. What's more, moving to a more sustainable economy is a common indispensable challenge for addressing both the climate emergency and the need to boost the economic recovery of the Union by creating new markets and new jobs.

The transition to a green, circular, sustainable economy, including fostering innovative business models, products and materials requires setting binding provisions. Only EU action, by putting in place a set of common measures, can ensure the necessary level playing field for economic operators, manufacturers, importers, retailers, repairers, consumers, in terms of requirements to be met when placing products on the internal market. Without an EU-level initiative and its effective application, the problems assessed in this impact assessment would not be fully and consistently addressed across the internal market. National initiatives, while bringing certain benefits at national level, would inevitably further intensify an already pointing fragmentation of the internal market.

Member States alone would not have the possibility to enact appropriate measures without creating divergences in the requirements for economic operators, and obstacles to the free movement of products, regulatory burden and excessive costs for businesses.[318] Fragmentation of requirements, moreover, with consequent unnecessary multiplication of specific models, would inevitably increase design, manufacturing and distribution costs, and often be passed on to customers.

Member States have indeed already started to address the issue as shown *inter alia* by the steep increase of notifications for national products measures linked to environmental considerations, and by the various already adopted national legislation) setting product requirements.[319]

This circumstance apart from substantiating the main condition, considered by the ECJ for the legitimate use of Article 114[320] , justifies the necessity of the EU action: not only to prevent the likely emergence of such obstacles but also to address a fragmentation that is already visible and to eliminate the distortions of competition deriving from it.

[318] See Annex 7, under Market fragmentation in the Problem Drivers section, the Table with excerpts from the businesses replies to the consultation on the Inception Impact Assessment that relate to the relevance of the issue.

[319] See Annex 7, under the problem drivers related to regulatory and administrative failures, the extracts from the TRIS Database and the Table on national level initiatives.

[320] The likely emergence of obstacles to trade, together with the need to eliminate the related distortions of competition (Case C-376/98 *Tobacco Advertising*, paras 84-88

Only EU action can provide the tools enabling sustainable production and consumption across the Union, and allow consumers to dispose of pertinent and reliable information about sustainable characteristics and circular features of products in whatever Member State they are purchased.

Member States alone would inevitably develop tools that would diverge and render consumer's choices more complicated. This would impede to build on the emerging sustainability concerns and patterns to boost a new circular and responsible consumption mode.

If Member States would act individually there would also be a high risk to end up with different competing systems, based on different methods and approaches, especially for cross border traded products on the internal market, likely leading to uneven awareness and information levels on the environmental performance of products across the EU and additional costs for companies trading cross border because they would need to use different methods or comply with different labelling schemes.

Also, several Member States have started to introduce national legislation on the destruction of unsold consumer products that could have different impacts on economic actors, for example storage platforms and logistics, therefore introducing market distortions. Even if the economic impacts of such a ban could not be assessed at EU level until now, the risk is real: France has already introduced a ban on the destruction of unsold goods and Germany established a new 'duty of care' for producers. More specific ordinances will follow determining the functioning of the duty of care for specific products. As part of this, the German government announced that it plans to develop a transparency ordinance requiring manufacturers (as well as retailers) to clearly document how unsold goods are handled.[321]. The Spanish preliminary draft law on contaminated soil and waste includes a ban on the destruction of unsold surpluses of non-perishable products such as textiles, toys and electrical devices, unless another regulation requires their destruction[322]. These measures by Member States differ in terms of approach (e.g. a general ban as opposed to a duty of care principle) and stringency (e.g. whether recycling of unsold goods is allowed instead of sale or donation) which leads to fragmentation due to diverging national approaches. This calls for EU action to establish harmonised measures on the internal market.[323]

Finally, in order to be effective, the market surveillance effort must be well coordinated across the EU to support the internal market and ensure a good coverage of product verification, thereby incentivising businesses to invest resources in designing, making and selling sustainable products.

For all these reasons, the EU is better placed than individual Member States to act.

SUBSIDIARITY: ADDED VALUE OF EU ACTION

There is clear benefit in setting common requirements at EU level that cover the full lifecycle of products because economies of scale are needed to attract the investment to be made.

EU action can address effectively the current problems analysed in this impact assessment (including future risks of fragmentation and barriers to the internal market), and ensure it is future proof for scientific and technological progress, industry responsiveness and consumers' growing demand for environmentally sustainable products.

[321] The 'duty of care' obligations has been introduced by a a 2020 amendment to the 'Waste Management and Product Recycling Act' (Kreislaufwirtschaftsgesetz – KrWG), which has recently entered into force (https://www.bmu.de/themen/wasser-abfall-boden/abfallwirtschaft/abfallpolitik/kreislaufwirtschaft/die-obhutspflicht-im-kreislaufwirtschaftsgesetz/)

[322] Search the database - European Commission (europa.eu)

[323] According to the Case law, such '*action intended to approximate national rules concerning production conditions in a given industrial sector with the aim of eliminating distortions of competition in that sector is conducive to the attainment of the internal market and thus falls within the scope of Article 114*' (see Case C-300/89 *Titanium Dioxide*, para 23).

With sustainability and information requirements for products set at EU level, sustainable products and circular practices and business models will be promoted in all Member States, creating a larger market and hence greater incentives for the industry to develop them.

The internal market size provides a critical mass enabling the EU to promote international standards in product sustainability and to influence product design and value chain management worldwide. Supporting measures to actively promote the uptake of these standards globally should also be envisaged.

With such rules, the EU as one of the largest economies in the world can act as a catalyser and encourage sustainable production and consumption in other jurisdictions with great benefit for people and the planet.

The proposed measures do no go beyond what is necessary to provide the regulatory certainty required to stimulate large-scale investments in the circular economy while ensuring a high level of protection of health and the environment.

The initiative will remain fully within the mandate spelled out in the Circular Economy Action Plan, and will cover only the aspects that Member States cannot achieve on their own and only where the administrative burden and costs are commensurate with the specific and general objectives to be achieved.

Given the scale and effects of the initiative, EU action is therefore justified and necessary.