Towards a Circular Products Initiative in the EU

Policy brief of the

Leiden-Delft-Erasmus Centre for Sustainability

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Content Policy Brief

About the Leiden-Delft-Erasmus Centre for Sustainability

The Centre for Sustainability focuses on the sustainable production, management and use of resources in an urbanizing society. It develops and provides research based knowledge, innovation and solutions on resource efficiency and circular economy.

Collaboration in the Centre for Sustainability leverages the complementary strengths of the three universities as knowledge centres in the fields of Science, Technology and Business. Through participating in joint projects in interdisciplinary research groups, specialists work together on shared research roadmaps and translate research based knowledge into solutions for resource efficiency. The objective of the Centre for Sustainability is to build a triple helix consortium in partnership with companies, governments and universities.

The Centre for Sustainability is a joint multidisciplinary centre of Leiden University, Delft University of Technology and Erasmus University Rotterdam in The Netherlands. It was founded as one of eight joint centres as part of the Strategic Alliance between the three universities.

1 The circular product challenges

The circular economy provides huge opportunities for reducing the ecological footprint and enhance profit of products and for businesses. Whilst traditionally closing material loops has been considered primarily an environmental duty, the current revival of interest in material and product recycling focuses upon the economic value for individual business and supply chains by reducing dependency on volatile virgin resource markets, by making virgin resource delivery more reliable and by creating post-consumer positive value for products. According to the report "*Growth Within: A circular economy vision for a competitive Europe"* (by the Ellen MacArthur Foundation), Europe can create a net benefit of €1.8 trillion by 2030 by adopting circular economy principles. This is €0.9 trillion more than in the current linear development path.

Yet, our world has never been fully linear, whilst many materials go through a take-make-dispose linear process, many other materials, for example many metals and fibre products, have always been recycled to preserve their economic value. What we thus need is a shift in the present linear-circular balance towards the latter. This also necessitates to not only consider radical new products, but also to look at the transition of existing products and lines of business towards circularity. These existing products are produced, sold and maintained in highly complex, cross-industry, often global, supply chains and circularity also involves the product life after use (such as collection, re-use, refurbishment or recycling). Each of the often many industries involved in a specific product supply and after-use chain, can have its own technological flexibility, sunk investments, power structure and trust relations, leading to very different opportunities for circular products. The circular product challenge is thus to move from innovation at the individual firm to reconfiguration of entire supply chains with the aim to incorporate the post-consumption phase. We further have to accept that as long as there is economic growth and a built-up of economic stocks, full circularity is impossible: in such growth stages inevitably there will be a net transfer of materials from the natural system to the economic system.

In this policy brief we will outline the relevant results of a literature study into EU 'policy mixes' for stimulating the shift from linear to circular product chains. Based on these results, we present recommendations for enhancing and optimizing the current set of instruments for environmental product policy at European level. These recommendations are summarized under the header 'a Circular Products Initiative' (CPI) (§2). We then discuss current EU policy instruments and barriers to circularity (§3). We further provide a background on what we can learn from literature on possible policy strategies (§4) and we present the results of four case studies on specific product groups (§5). The case studies provide a more in-depth analysis of the current circularity of the European economy.

The Communication from the Commission **'Closing the loop - An EU action plan for the Circular Economy' (COM(2015) 614 final)** sets many useful conditions for developing a more circular economy in Europe under the right regulatory framework in the single market, and gives clear signals to economic operators and society at large on the way forward with long term waste targets as well as a concrete, broad and ambitious set of actions, to be carried out before 2020. Of special importance is the passage on product policy in which is stated that the Commission will examine options and actions for a more coherent policy framework for the different strands of work on EU Product Policy in their contribution to the circular economy. This policy brief can be treated as a first view on certain relevant options hopefully leading to a strong and coherent approach in what could be a Circular Products Initiative (CPI).

2 What the EU can do: towards a Circular Products Initiative

Further development of EU policy through a 'Circular Products Initiative' has most success if such an initiative is not a stand-alone activity but integrates and strengthens the myriad of policies already implemented and in development, in line with the identified challenges.

Enhance existing instruments which provides opportunities now

Plenty short-term opportunities already exist, These opportunities could be supported by enhancing various existing EU product policies, as suggested in the table below.

Table of EU policy instruments & short term actions (see full report for further details)

Life cycle stage	Example of current EU instruments	Typical products and materials	Typical sustainability topics	Potential enhancement (short term)
Resources	Critical raw material list	Minerals and metals	Resource scarcity	Introduce quality standards for recycling of critical raw materials.
Manufacturing and design	Environmental / product liability directive Restriction of Hazardous Substances (RoHS) Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) Ecodesign directive	Electrical Equipment, chemicals, buildings, vehicles, manufactured goods	Energy consumption of the product, hazardous chemicals, sustainable innovation	Enhance Extended Producer Responsibility, truly along the full life cycle rather than just the use stage Enhance the Ecodesign directive to a broader set of product groups as the 40+ currently covered, and to other environmental aspects as energy efficiency. Include criteria for circular product design and circular business models Introduce voluntary agreements ('Green Deals') between industry and EU to stimulate sustainability initiatives throughout the sector. Identify and award frontrunners and bottom-up initiatives.
Distribution and retail	Energy labelling Eco-labels Organic labels	Electrical equipment and food	Energy and pesticides	Enhance labeling instruments to a 'product passport' system
Consumer behavior	Green Public Procurement (Energy labelling)*		Not topic specific	Enhance Green public procurement to a broader set of products, and award circular product design and circular business models
Post-consumer ("waste" phase)	Waste directive** WEEE directive** Packaging directive EU End of life vehicles directive Landfill regulation Shipment of waste regulation Extended Producer Responsibility**	General and household waste, electrical equipment, vehicles	Third world waste dumping, recycling, health and safety, pollution, resource scarcity	Move away from recycling targets on mass basis - set specific targets for small mass flows of critical or harmful materials, Set also targets for re-use and remanufacturing. Implement measures to allow for improved identification of illegal waste shipments.

**) Energy, eco- and organic labels are at the intersect of retail and consumer behavior*
***) These instruments have a focus in a certain link in the product chain, but also exhibit more integral characteristics*

The current image of the Circular Economy emphasizes entirely new products, supply chains and business models. While it is necessary to start working on such innovations now for the medium and long term, plenty short-term opportunities already exist, which many actors might not yet recognise. These opportunities could be supported by enhancing various existing EU product policies, as suggested in the table above.

Several EU policy instruments in that table do not directly aim to promote the circular economy (e.g. REACH, RoHS). These instruments are nevertheless included in the table because they can indirectly contribute to circularity and sometimes contain circular principles (such as Extended Producer Responsibility).

Address systemic issues in the current policy mix

Promoting the circular economy however also needs more fundamental adjustments to address systemic problems. We suggest to address the following issues on the medium to long term:

***Reduce policy fragmentation and intervene at the in- and output of linear chains**.*

Reducing fragmentation requires more general and less specific instruments, as it is infeasible to develop coordinated instruments for each type of product. We thus need a shift from a policy mix that primarily differentiates between products (or industries), to differentiation between laggards and frontrunners, and policy mixes that combine different types of instruments. Logical intervention points for more general policies are the beginning and end of the product cycle (primary and secondary resources), where the complexity is less than at the level of thousands of different products. Recommendations for the use of instruments include:

a. Shift tax from labour to resources.

b. Stimulate the use of abundant materials and de-incentivize the use of critical materials, e.g. by tax differentiation.

c. Set limits to incineration and landfill of materials that can be re-used or recycled.

d. Further development of Extended Producer Responsibility beyond the use stage of products towards re-using and remanufacturing of products and product components and re-use and recycling of materials.

***Improve prioritisation**.*

For better prioritising, the identification of critical materials could be expanded upon by an ‘EIPRO study for circularity’ (EIPRO: Environmental Impact of Products) which products have the most potential for enhanced circularity? For which products (as in our report: clothing / textiles) have a high potential but are hardly addressed by policy instruments? Prioritise those products that have large inefficiencies in terms of waste production, low recycling rates, and high input of virgin materials. It is probably feasible to transfer the existing good examples to other, uncovered product groups. Other high potential product groups might be more challenging and require a new type of instrument. For these products, policies aimed at the design stage could be far more effective than measures aimed at improving opportunities for reuse and recycling.
Other recommendations for better integration and prioritisation are:

a. Minimize the use of instruments based on norms, standards and prescriptions, but use instruments based on goals and targets.

b. Organise a more balanced attention of policies and instruments over the full life cycle, instead of mainly addressing the waste stage.

c. Stimulate cross-industry dialogues over the entire supply chain and identify those parties that can take on a leadership role for cross-chain innovation towards circularity.

d. Use instruments that reward product life extension, product and component re-use rather than re-use per se.

e. Use instruments which give more focus on the recycling of scarce/critical materials, rather than setting targets on material recycling by volume.

f. Circular policies should be designed to take priority in policy and practice over energy policies, as the EU waste hierarchy prioritizes material recovery over energy recovery. For instance, recycling of biomass should prioritized over its use as (carbon neutral) energy carrier.

Explore a new generation of policy instruments to further fundamental breakthroughs

Lastly, the EU needs to move beyond the current emphasis on conventional policy instruments, existing instruments must be re-examined. We have to accept major changes to circularity imply a future, in which new business models run by new businesses will arise, and old business models run by existing businesses will die out. Existing firms will not in all cases be able to make this change. Relying on win-win solutions only hence will not result in fundamental breakthroughs.

True radical changes towards circularity are a form of creative destruction, in which also contextual factors and framework conditions must change. Such change usually takes a long period and ‘command and control’ approaches usually will not work. Indicative planning and developing ‘strategic intent’ with a process of learning by doing along the way are likely to be much more successful. Policy needs a broader system approach instead of just looking at value chains of resource extraction, production, consumption and waste management so central in the analysis above.

A delicate balance has to be maintained in engaging front runners and constructive actors in policy making, and more or less neglecting parties that are probably unable to make changes, and who hence may fight any intervention that is not in their interest. Inspiration for novel policy instruments supportive of fundamental breakthroughs can be found in fields like **innovation studies, transition management, strategic niche management, and social innovation**. Suggestions from these fields include:

1. Put pressure on the existing linear production regime. In this, an important role is to be played by the instruments already suggested in previous paragraphs, such as shifting taxation from labour to resources, landfill and incineration bans for re-usable and recyclable materials and product components, and awarding front runners via e.g. labelling and green public procurement.

2. Organise a process of ‘visioning’ and experimentation in specific value chains, particularly when it is not totally clear into which direction the change has to go.

3. Encourage and facilitate market-based actors and industry leaders, who interact in supply chains and within sectors, to create innovative ideas, and share best practices. Support flagship’ (niche) experiments with new practices and systems should provide stepping-stones for potential future new socio-technical constellations. Inspiring examples of resource-efficiency in sectors where resistance to change is high can help to legitimate stronger top-down policies.

4. Organise financial and technology support policies to reduce costs of long-term, high impact resource-efficiency improvements that currently are too expensive to implement.

5. Labelling and other environmental product information should be clear, correct, verifiable and relevant without misleading consumers. For a better understanding of labels by consumers it would be of importance to look into ways for harmonizing the world of labels in Europe. It would be interesting to identify options for making the level of sustainability of products visible or readable in such a way that consumers can understand it in a blink of an eye and without any background information on specific environmental aspects or product related issues.

6. The current Ecodesign Directive requires the setting of benchmarks in each product specific implementing measure. Benchmarks should be used as the new minimum requirements for products after a certain period of time or when revising product-specific regulations. Benchmarks should address all relevant environmental aspects and become the motor of a policy that encourages a ‘race to the top’ of the best performing technologies. The use of long term benchmarks as ‘technology forcing standards’ containing long term requirements will support innovation.

7. Design plays a crucial role when moving towards a circular economy. The traditional design brief is product focused without much realisation to the restorative opportunity of the ecosystem through design itself. Circular design approach requires taking one step back before the actual design brief. The current model is about ‘regulation’ in a traditional sense: the directive aims to improve efficiency through minimising negative environmental impact, whereas the circular design approach is about maximising a positive, regenerative footprint. Circular design requires a move from product level to the systems level and from energy related products to all products and services as well as an effective approach to incentivise businesses to adapt their design strategies accordingly.

8. The polluter-pays-principal is currently reflected in the instrumentation of the Extended Producer Responsibility (EPR) but in such a way that EPR doesn’t offer an environmental protection strategy aiming at a decreased total environmental impact from a product. The EPR should be delivering a strong mechanism for industries to continuously improve their products and processes. Linking it to the broader scope of Corporate Social Responsibility could be an option to strengthen the position of EPR on a strategic business level.

3 Present EU policies: strengths and issues

The Circular Economy, and policies to further it, are not an ideal for the far future; the Circular Economy has arrived and will become stronger over the coming years and decades. EU policy has been (and is) pivotal in establishing this Circular Economy in interaction with enterprises and markets. Even though in EU environmental policy themes such as energy, climate and environmental health dominate, on a wide range of products, materials and industries EU policies have been implemented in member states with varying degrees of success. We already observed that administrative instruments dominate, but these are often complemented by policy mixes of voluntary and compulsory economic, administrative and communicative instruments (shown in Table 1). Notwithstanding these successes, which appear underemphasized in the current perception of the Circular Economy, we identify two significant issues for effective EU policies to make the full transition to a circular economy that remain.

Issue: fragmentation and prioritising

Even if each individual policy instrument may be well motivated and effective, the myriad of instruments that evolved over the decades is fragmented. The EU instruments are also 'children of their time': they reflect historic priorities, which might not always match current priorities for a circular future. This fragmentation and lack of coherent prioritisation has a number of aspects, amongst which:

1. There is a significant difference in level of circularity between member states. Bringing all EU member states to 'best of class level' is a priority.
2. Especially for biobased circularity (e.g. wood) there are potential negative effects on circularity from energy policies that urgently need addressing. Energy recovery is currently stimulated, rather than re-use or material recycling. In other fields, well designed material circularity can also reduce energy use.
3. We see quite some differences with regard to the extent that instruments cover the product life cycle. Even instruments that aim for an integral approach, often concentrate efforts on the waste stage. Particularly the design of products and business models needs an overhaul, if one wants to make a switch to circularity beyond materials recycling (i.e. life time extension, product and component re-use).
4. This fragmentation over the cycle of policies, mirrors the fragmented nature of many supply chains that cut through different industries, markets and geographical scales, greatly challenging integral design for circularity owing to power relations, inability to influence (or even understand) up-chain processes and the role of standards and norms.
5. The EU waste hierarchy prescribes priorities such as reducing and re-use before recycling and the Circular Economy philosophy in addition demands high purity or cascading loops. It seems however that most instruments still effectively stimulate re- and downcycling of materials, rather than explicitly addressing product or component re-use and refurbishing/remanufacturing. Where often it would be theoretically possible to design cascades, we see high-quality components and materials in one step downcycled to the lowest form of recycling possible.
6. There is a significant bias on circularity of the largest volumes of materials that constitute products, rather than on the circularity (or avoidance) of the most scarce or critical materials within these products.
7. Even for product types that have public or private systems in place to provide circularity to products, a large percentage of products never enter these systems and directly move to landfill or incineration; or products take a short-cut to low quality applications, where more added value is possible by first cascading through high quality applications.

Issue: meeting high ambitions and countering averse trends

For the short term, thus ample opportunity exists for enterprises to better exploit the existing opportunities and for the EU (and other policymakers) to increase these opportunities by optimising their policy mixes and so gradually progressing towards circularity. But as the urgency and ambitions for larger, accelerated leaps towards circularity increases more fundamental long term challenges loom, especially as we also concluded that there are averse long term trends in many industries, towards linearity, such as shortening life spans of products. It can be questioned if such 'megatrends' can be reversed by simply strengthening and expanding the current EU conventional policy mix. In the cases we found such instruments to be effective for low hanging fruit, but less effective for fundamental breakthroughs, especially if we take into consideration that policy development and implementation is not a straightforward, analytical activity, but a complex interplay of economic, psychological, political, demand, market and cultural factors. Integral design, moving from recycling to re-use and re-manufacturing, might not be possible without innovations that might be perceived as disruptive by incumbent actors.

Annex 1: How to combine instruments in policy mixes

Current material flows can be circular because economic actors have recognized and exploited an opportunity for economic value without policy intervention (see textiles example on in the main report), but since the 1970s many materials flows have also become circular or in other ways more sustainable because of government policies at all levels, including a significant role for the EU. Designing policy for the circular economy thus does not start from scratch, but by understanding present policies and their interaction and to better align these instruments. In addition, as we discussed before a new type of long term policy instruments might be necessary.

Fortunately, from policy science and practical experience, a rich body of knowledge exist on different types of policy instruments and how they do or do not fruitfully interact. We identified three strategies for successful 'policy mixes' of different instruments.

Choose strengthening and complementing instruments

Some instruments better complement or reinforce each other, than others (interpreted and adapted from Sorrell 2001):

- Information instruments strengthen both economic and administrative instruments.
- Administrative instruments in general combine with other administrative instruments. Technology standards however combine badly with any other instrument and public voluntary schemes' compatibility with other (administrative) instruments is very context dependent.
- Administrative instruments and economic instruments do in general not mix well. Notable exceptions are voluntary schemes and financial instruments, which do mix well with resp. economic and administrative instruments.
- Economic instruments can often be combined with other economic instruments, but it highly depends on the context and specific instruments used.

Differentiate instruments for different actor or product groups

The above assumes a policy mix target all actors and products equally. Earlier research also demonstrated policy mixes can become more effective by differentiating on different aspects:

- Differentiating on the basis of the sustainability of current products on the market, where the least sustainable products are targeted by policy interventions such as minimum standards, the products with a mediocre sustainability by communication and economic instruments to drive the bulk of the market towards sustainability and through innovation policies highly sustainable products can be created at the cutting-edge of the market.
- Differentiating between frontrunners, adopters and laggards, with the first group being facilitated by R&D support, demo subsidies etc., the second group with public procurement and economic (fiscal) incentives and the last group by taxation and regulation (Ryder 2008).
- Differentiating between costly and economical product innovations (e.g. cost abatement curves, see Hood 2010), where typically cost-effective potential is unlocked by communication and/or regulation, the neutral or cheap options by economic incentives and the costly options are supported by R&D policy to reduce these costs

For circularity, we could expect a similar approach to be successful: some circular chains can already outcompete linear chains if a level playing field is established, power structures in the chain do not hamper innovation and producers are aware of this potential for profit. Other linear chains need incentives to transform to circular ones. These incentives can – for example – consist of offsetting costs or incorporating externalities. The full-scale

transformation of a last group of linear chains is presently expected to be prohibitively expensive. Policies focused at innovation are thus required.

Pay attention to intervention points in the cycle and cross-chain effects

Figure 1 depicts how different intervention points can be used to increase circularity in a product chain. The intervention should be done at the point of:

- Maximum effect. For example: for manufactured goods, the costs for changing production to facilitate later recycling (design for recycling) can be much lower (and the benefits from a better quality much higher), than in the recycling phase investing in for example expensive separation equipment.
- Maximum feasibility: for example, it might be much more feasible to tax or subsidize a few producers, or a material flow at the point of entry into the EU, than millions of consumers.

These two criteria do not necessarily coincide. This problem holds especially for 'ecodesign': redesigning manufacturing has often a high potential for both economic and ecological benefits, but it can be very complicated for policymakers to influence the intricacies of the design process of millions of products. The previous underlines the need to design policy instruments for their effect throughout the chain:

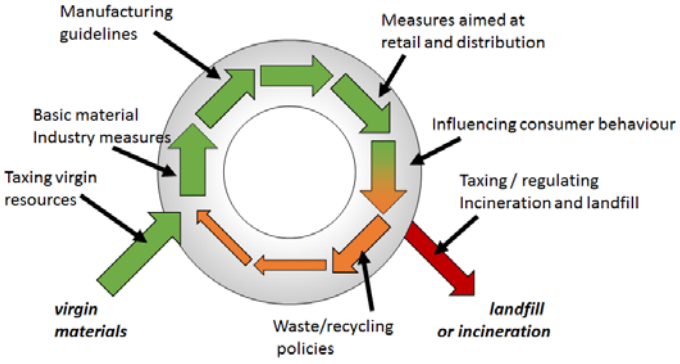

Figure 1: Intervention points in product chain.[1]

- Regulation in one link can set hard limits throughout the chain: for example prohibiting certain additives in materials, will force manufacturers to design products that do not need these prohibited materials.
- Information instruments are often directly aiming to solve information asymmetries through the chain. For example: ecological certification signals sustainability practices of producers to customers.
- Economic incentives travel through the chain in 'ideal' markets. In practice there might be market failures in the chain or demand might be highly inelastic.

The structure of underlying industries also determines the success of a policy strategy. In vertically integrated markets, trade-offs in the chain can be made within a single firm, but sunk investments in any link in the cycle could block innovation throughout the cycle. In highly liquid, competitive markets price signals might travel quickly through the chain, but integrative solutions might be difficult to coordinate. Many policy instruments thus need complementing instruments to propagate their effect through the chain. Especially informative instruments can very well be used to strengthen other instruments by resolving information asymmetries in the chain. Voluntary administrative measures might especially require additional policy instruments, as power asymmetries can exist in the chain. If producers in one link come to voluntary agreement, they might need aid (or the threat of mandatory measures) to avoid parties associated to other links in the chain to push for cost savings at the expense of sustainability.

Annex 2: Case studies

1. Synthetic textiles

[1] For simplicity, re-use and re-manufacture have been left out of this figure (as well as energy flows),

EU policy involvement in synthetics textiles appears to be limited to supporting R&D projects, the general re-use target from the Waste framework directive and indirectly, EU policy targeting for example plastic packaging, does push supply of recyclates for use in textile materials. In absence of a strong policy influence, a market based on economic values has autonomously developed, especially focusing on re-using textiles for export (with recyclable textile as a by-product). In principle, ample possibilities for cascading use of virgin materials (such as PET) exist (from packaging through textiles to insulation for example). The circular economy is thus already happening for textiles. However, not unlike policy intensive cases, significant shortcomings can be noticed: (1) large losses because many textiles never make it into the recycling systems; (2) textiles are becoming more and more a 'disposable' item with shorter lifespans and increasing use of mixed and non-natural materials; (3) there is little to no transformative innovation over the entire product chain: the post-consumer phase and production phase are not coordinated and the supply chain cuts through different industries.

These shortcomings can also be seen as opportunities for policy to strengthen the circularity of synthetic textiles. Even though the supply chain is long and largely situated outside the EU, stimulating the fashion and retail industry through voluntary instruments might be feasible by including an ecological agenda to the current social agenda in these industries. Large players with more influence over the supply chain and interest in the Eco friendliness of their brand may fulfill a frontrunners role. The most important recommendation for this sector is thus to introduce voluntary agreements ('Green Deals') between industry and EU to stimulate sustainability initiatives throughout the sector. This is a typical frontrunner instrument, which can be followed up (if necessary) by a compulsory instrument to broaden the results of voluntary initiatives to all actors and products.

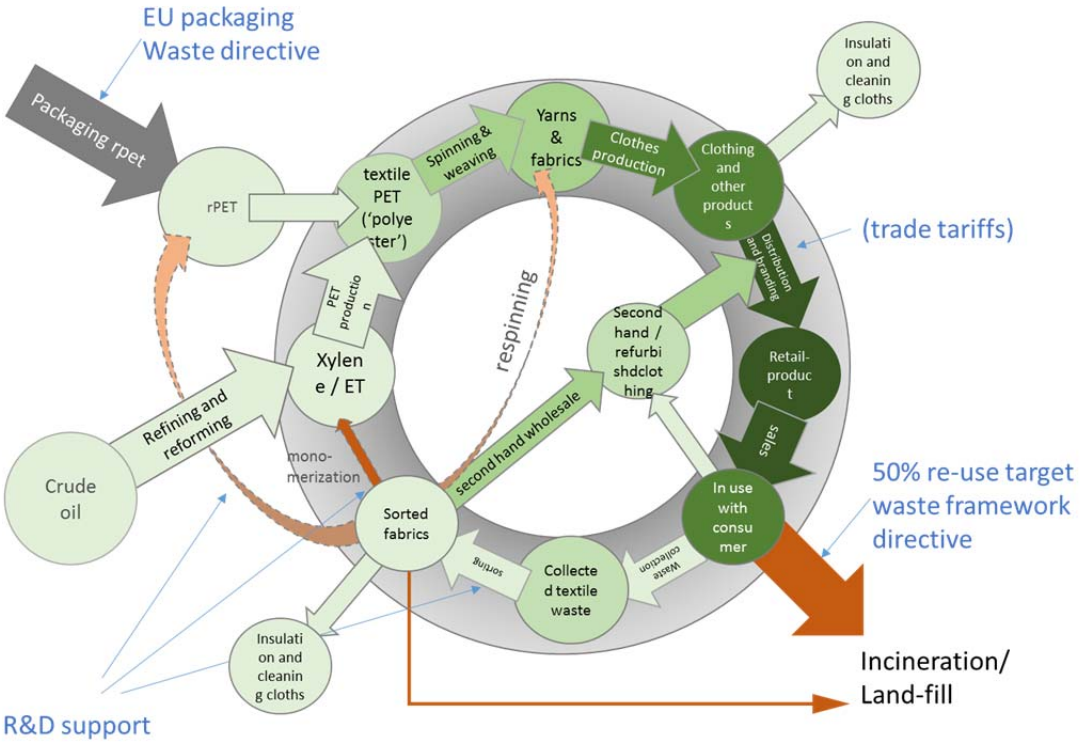

Figure 2: Current EU policy instruments affecting synthetics textiles.

2. Building materials

Construction provides the EU with 20 million direct jobs and 40% of all extracted materials are stored in the built environment, providing an enormous reservoir for re-use and recycling. Recovery and recycling rates vary between MS from 10% in some states to over 90% in for

example the Netherlands (even though recycling of building materials in the Netherlands often involves downcycling - for example - to road foundation). Many critical materials are used such as iron, other components of stainless steel and copper, as well as many energy intensive materials (such as Portland cement), which have a greatly reduced CO_2 footprint if brought into circular chains.
The most voluminous flows (such as sand, gravel and cement) are locally sourced, whilst other flows such as metals and chemicals are sourced on a global or European scale. The construction industry produces unique individual products by largely standardized methods and components. The sector itself is fragmented with many actors playing a role in the different stages of the life cycle of buildings. In informal networks actors comply on a voluntary basis to formal and informal rules. Some material markets, however, are vertically integrated (e.g. a concrete producer also own the quarry). Long term contracts, fixed relations with suppliers and demand for large quantities at a time make, combined with a risk averse culture, progress to sustainability slow. At the same time, networks have also formed, such as green building councils that voluntarily take an integrated approach to sustainable building far beyond the regulatory minimum. On a material level, many economic viable cycles already exist, for example for iron, copper, aluminum and zinc. In addition, industry is progressing towards 'dematerializing' components, which both reduces ecological footprint and has an economical advantage. Despite this strong performance in some aspects on building and material level, large challenges remain, especially for large voluminous streams such as concrete (materials) which are now not recycled or rapidly downcycled (e.g. road foundation). The potential for such circular flows is not exploited because they require high, risky investments in a market that is saturated and in which producers often have interests or long term relations with the extractive industry.

The industry is largely self-regulated because of information asymmetry and even in top-down regulation, industry is heavily consulted for input. Many EU policy instruments have been implemented varying from directives directly aimed at energy performance (Energy Performance of Buildings Directive, Energy Efficiency Directive), creating boundary conditions (Green Public Procurement, EU Lead Market initiative, Eurocodes, Construction Product Regulation). In addition within buildings other products such electrical equipment (see case 2) are used, which are also subject to EU policy. Lastly, many general waste policies and other environmental policies of the EU also directly or indirectly apply to construction.

Policy successes can be contributed to a combination of end user demand, industry initiative and MS and local governments' push-and-pull policies; as well as an important role for the EU in harmonization and certification. Even though not intended as such, a successful two-tier combination of building-level and component/material-level EU policy has been created. The future challenge for EU policy is to create a market demand for energy-intensive materials such as concrete (components). One way of achieving this is limiting or de-incentivizing land-fill whilst also stimulating higher quality applications of concrete recyclate and similar materials. We recommend implementing the following policy instruments:

- Promote building designs that allow for easier demolition and higher material recycling rates through setting industry guidelines & recycling protocols.
- Identify frontrunners and encourage them by R&D support and subsidies.

3. Wood products

The wood sector consists of forest resources and the production, trade and consumption of forest products and services. The EU contains 176 million ha wood-land (42% of all land) and EU forests have continuously expanded for over 60 years. Wood from these forests is popular: it is renewable, it has various reuse and recycle options, it is durable, it can be produced locally, its carbon balance is superior compared to other products, it is a light material with a high strength to weight ratio, and the 'production sites' (forests) have positive by-effects for nature (biodiversity, climate) and recreation. This had led to a true, European and local Circular Economy for softwood products, featuring high recycling rates. Almost all by-streams of wood production and manufacturing, e.g. various by-products of sawmills and woodworking industry, are used within wood-based industrial processes. A country-specific example of the wood value chain is shown in Figure 3.

Current EU policy focuses on safeguard long term sustainability of forests and forest services. The EU Timber Regulation is highly important to reduce the market opportunities for illegally logged wood from other non-EU countries. For example, the paper and pulp industry expect their already high percentages of reuse and recycling of by-products and pulp to go up in the coming years as a result of the regulation. This focus is also a weakness: there are no clear regulatory or other instruments on for example cascading use. As such, cascading use is more and more threatened by direct use for energy (also stimulated by sustainable energy policies). Circular policies that address the whole wood value chain – and not merely forestry – are needed. We therefore have the following recommendations:

- The introduction of extended producer responsibility schemes for wood-based products to promote cascading use.
- Incorporate circular principles in energy policy to assess the sustainability of biomass for energy.

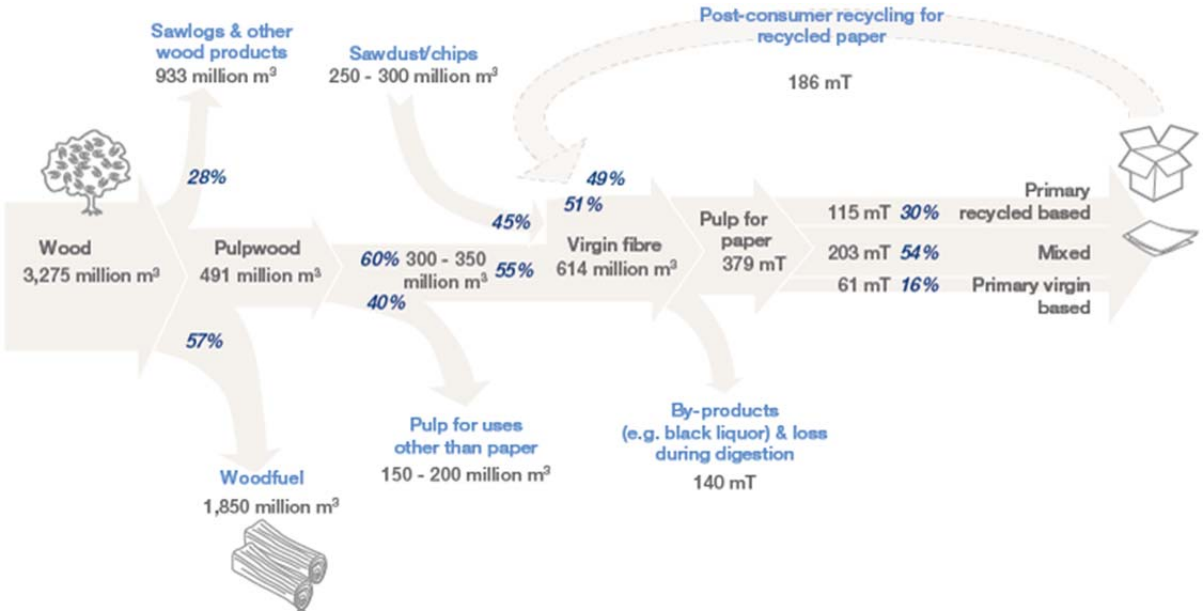

Figure 3: Value chain and added value of the forest-based sector in Austria in 2004.2

[2] Neubauer F-J (2009) Die Wert- schöpfung der österreichischen Forst und Holzwirtschaft inklusive nach gelagerter Branchen. Schriftenreihe des Instituts für Marketing und Innovation, Band 2, Universität für Bodenkultur Wien, ISSN 2074-1022, as published in Lenzinger Berichte 87 (2009).

4. Electronic and Electrical equipment

Production and use of electronic and electrical equipment (EEE) has been expanding over the last decades, ranging from healthcare apparatus to smartphones and from power tools to IT servers. EEE contains various amounts of metals such as iron, copper, gold, and tin, and small, but significant, quantities of rare earths, gallium, germanium, indium, beryllium, platinum and cobalt (all on the EU critical EU materials list). Each year 10 million tonnes of EEE is put on the EU market. Recognizing the importance of curbing E-waste and other environmental burdens of EEE, in various stages of the product cycle, strong EU policy instruments have been developed such as WEEE (addressing amongst others collection and recycling), REACH and RoHS (dealing with chemical safety). Whilst achieving results, we also note critical challenges:

- the most critical materials are often most difficult to recover and EEE products are not or only very limited designed for circularity;
- large streams of E-waste remain outside of the reach of EU policy (e.g. used EEE is exported to Asia and Africa where its hazardous fractions are improperly treated).
- the current increase in especially electronic equipment (with shortening lifespans) is almost impossible to compensate with current policies.

In this respect the supply chain has not become circular, but separate worlds of recycling and production exist. This highlights the need for more encompassing, integrated and long term policy instruments, such as:

- Ecodesign & -labelling regulations for EEE categories for which Ecodesign criteria (repairability, material selection, etc.) have not been defined.
- Instruments that facilitate information exchange between manufacturers and recyclers.
- Measures to allow for improved identification of illegal waste shipments.
- Instruments supporting bottom-up initiatives for new ways of consuming EEE through sharing & leasing.

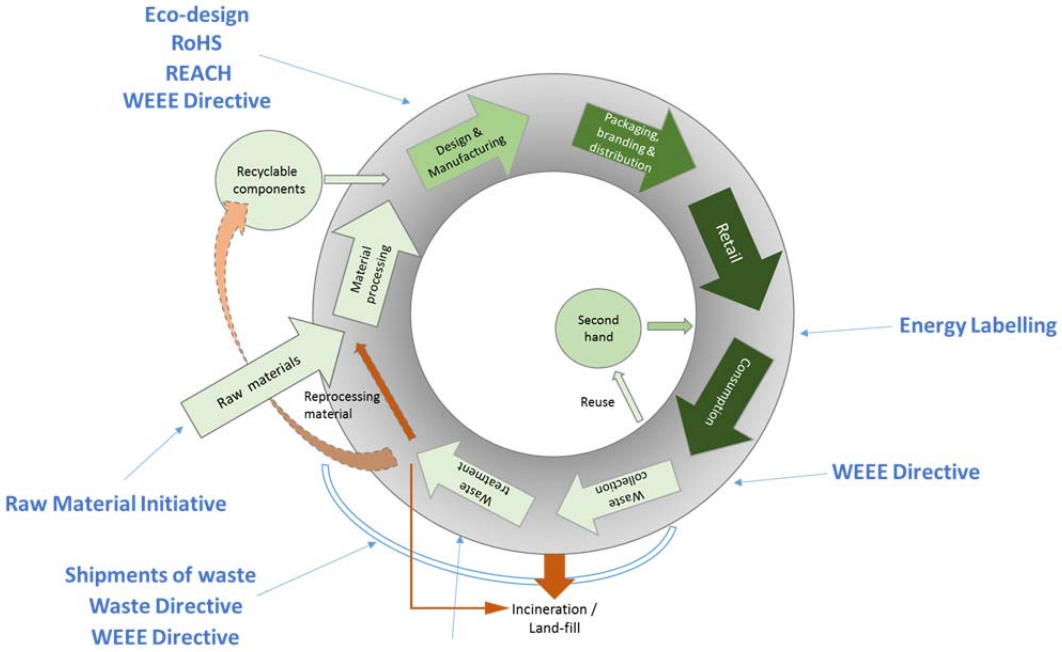

Figure 4: Current EU policy instruments affecting (W)EEE.