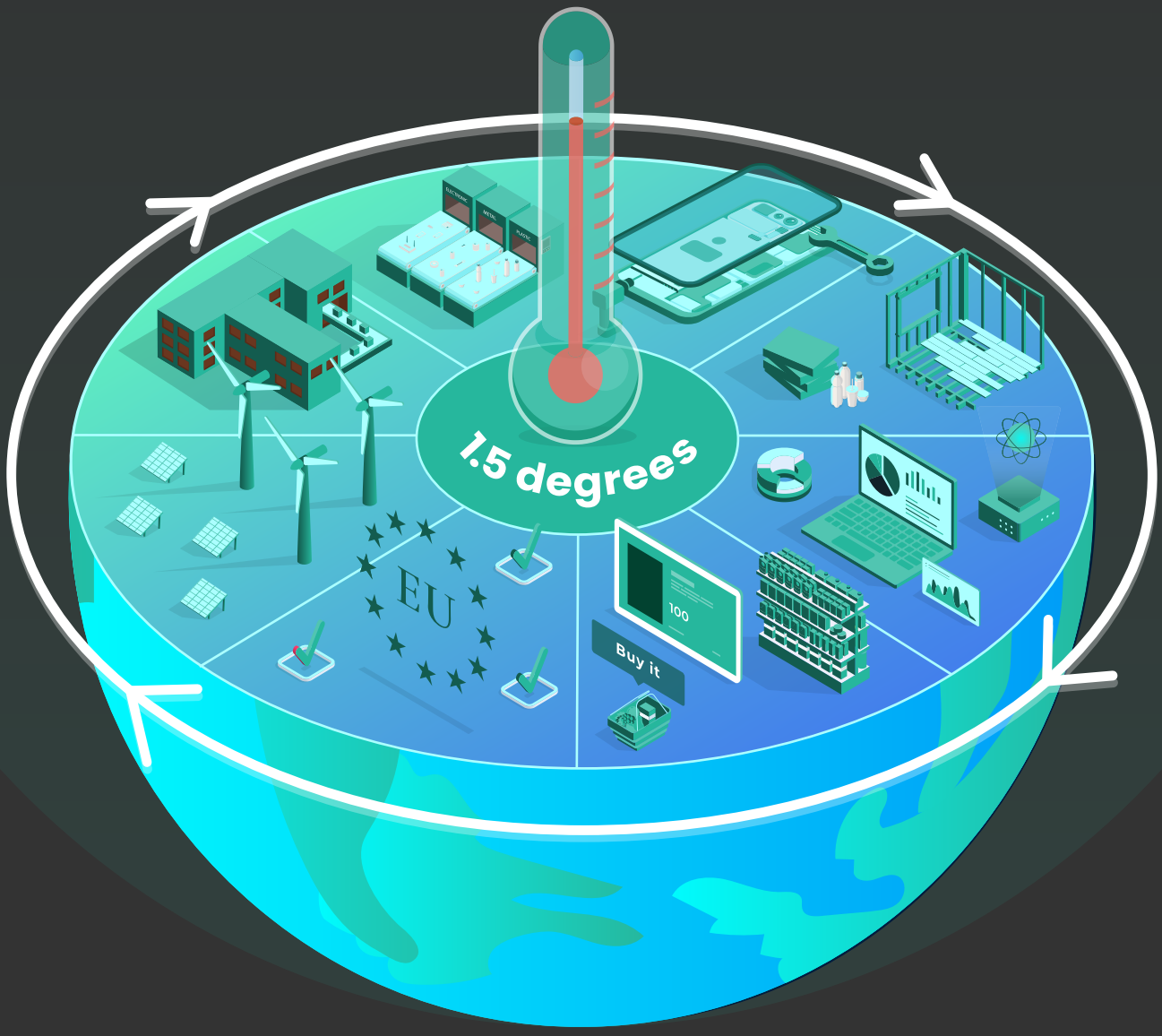

Whitepaper

Reimagining the Waste Framework Directive

An EU Regulatory Framework for a Circular Economy consistent with 1.5 degrees

April 2023

eunomia

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Contents

Executive Summary

The European Union has led the world since the 1970s in thought and action on how to responsibly prevent and manage waste. The EU economy as a whole still wastes a great deal, however – spending money to discard resources as waste and then spending more on extracting and importing new resources to replace what has been thrown away.

While the EU's resource productivity has increased by 35% since 2000, the average citizen still consumes almost 14 tonnes of materials each year, at significant economic and environmental cost, and much of the resources on which we depend come from outside the EU.[1, 2]

This not only leaves the EU exposed to geopolitical uncertainties and price volatility; it also misses a significant economic opportunity.[3] According to a recent Ellen Macarthur Foundation report, a circular economy, enabled by the technology revolution, would allow Europe to grow resource productivity by up to 3 percent annually. This would save EU economies up to €0.6 trillion per year by 2030. It would benefit them by up to €1.8 trillion when savings from lower maintenance costs, longer product lifetimes, and avoided external costs like pollution are included, as well as having positive impacts on employment.[4]

Roughly half of all greenhouse gas emissions derive directly from things we consume. Resource efficiency – in the ways we extract, use, reuse and recycle materials and products – is thus essential for limiting temperature increase to 1.5°C, in line with the EU's Paris Agreement commitment.

Unlocking this potential requires a policy landscape that will create the opportunities, incentives, and confidence necessary for businesses to innovate and invest in the new business models that will break the link between material consumption and prosperity. A circular economy is an enterprise economy, but it needs an effective regulatory environment to develop, grow, and thrive. At the EU level, much has already been achieved, but more could be done to dismantle administrative and practical barriers that hold back progress.

This calls for a step change in ambition. The current revision of the Waste Framework Directive, which has guided EU policy in this area since 1975, offers an opportunity to design a coherent and consistent policy framework for a circular economy.

1 Eurostat (2022) Resource Productivity Statistics, available at https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Resource_productivity_statistics

2 Eurostat (2023) Material Flow Accounts Statistics – Material Footprints, available at https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Material_flow_accounts_statistics_-_material_footprints

3 Ellen Macarthur Foundation (2023) Growth Within: A Circular Economy Vision for a Competitive Europe, available at https://ellenmacarthurfoundation.org/growth-within-a-circular-economy-vision-for-a-competitive-europe

4 Ellen Macarthur Foundation (2023) Growth Within: A Circular Economy Vision for a Competitive Europe, available at https://ellenmacarthurfoundation.org/growth-within-a-circular-economy-vision-for-a-competitive-europe

Responsibly managing waste is just one aspect: a truly circular economy will increasingly focus on maintaining, managing, and enhancing Europe's wealth of materials, products, buildings, and infrastructure. A new policy framework will strike an appropriate balance between the roles of government, business, and the public. It will leverage the power of the EU's internal market, along with data and technology, to transform how we use resources. It will enable a competitive and efficient market to move swiftly towards a circular economy, working in tandem with the energy revolution to help society achieve the goal of staying within 1.5°C.

This white paper presents a vision for 2040, describing the way in which society will use materials and products in an economy that is well on its way to circularity. This sets the stage for the development of a detailed policy blueprint, supported by research and stakeholder engagement, for the steps needed to realise the vision.

Initial thinking on the blueprint has indicated the following possible elements:

In the short term (between now and 2026), a revision of the Waste Framework Directive to provide:

- A lighter-touch regulatory environment for products that can be reused, repaired, and remanufactured;
- Clarity for industry on the environmental performance required of reuse systems;
- Greater consistency in the scope and application of extended producer responsibility(EPR), including modulated fees;
- A more granular recycling hierarchy that characterises 'high quality' recycling, and provides a dynamic framework for the beneficial use of composted biowaste; and
- A supportive environment for managing mixed waste to rapidly reduce greenhouse gas emissions.

In parallel, a strengthening of the emerging product policy framework that will:

- Simplify reporting for producers through introducing consistent data requirements for both Digital Product Passports (DPPs) and EPR schemes;
- Maximise the potential effectiveness of modulated fees under EPR in driving improved product design;
- Stimulate innovation in the eco-design of products through the use of fiscal incentives; and
- Leverage the power of public procurement policies to further encourage the adoption of circular business models.

Subsequently (before 2029), a deeper revision of the Waste Framework Directive to transform it into a Resources Framework Directive that will:

- Guide the continued reduction in raw material consumption across the EU economy in a way that most effectively and efficiently delivers decarbonisation, as well as addresses the full range of other societal needs; and
- Steer the use to which different materials are put to maximise the potential for decarbonisation across the economy as a whole (rather than on a sector-by-sector basis) through introducing a materials application hierarchy.

The EU is well placed to once more demonstrate global leadership – not only in how waste is managed, but also how we can fundamentally reshape our relationship with natural resources to enable humanity to live well, and within our collective planetary means.

Introduction

01

1.0 Introduction

It is time to transform how we use materials – to maximise their utility and value and avoid waste as much as possible.[5]

While the EU's resource productivity – the ratio of GDP to domestic material consumption – has increased by 35% since 2000, the average citizen still consumes almost 14 tonnes of materials each year, much of which comes from outside the EU.[6,7] In discarding used resources as waste, then spending more to extract and import new resources to take their place, Europe is effectively throwing away wealth that could otherwise remain in circulation for longer.

Alongside exposure to price volatility and geopolitical uncertainties this continued 'linear' approach means a significant economic opportunity is missed. According to a recent Ellen Macarthur Foundation report, a circular economy, characterised by far greater resource efficiency, enabled by the technology revolution, would allow Europe to increase resource productivity by up to 3 percent annually, and boost employment. It would lead to savings of €0.6 trillion per year by 2030 from reduced expenditure on resources, or up to €1.8 trillion when accounting for lower maintenance costs, longer product lifetimes, and avoided external costs like pollution.[8]

Our current levels of material use are not only wasteful from an economic perspective, but environmentally unsustainable. Each year sees us extracting and using more virgin resources to feed our consumption habits.[9] The extraction, manufacture, transport, use, and discard of materials together generate about half of greenhouse gas emissions; they are also the key driver of biodiversity loss and water stress.[10] While attention has focused on moving away from fossil fuels to cut carbon emissions, reducing material consumption more broadly is equally essential for limiting global temperature rise to 1.5˚C, the goal set in the 2015 Paris Agreement. Since 2015, the idea of reaching 'net zero' carbon emissions has become mainstream, but as the Intergovernmental Panel on Climate Change (IPCC) makes clear, net zero is not enough on its own, as we also need to limit how much carbon we emit in the interim, to stay within our total carbon 'budget'. [11]

Steady but slow reductions in emissions will spend our carbon budget too soon. Achieving greenhouse gas (GHG) emission reductions at the speed and scale we need will mean significantly reducing our material consumption by moving from an inefficient, material-hungry, linear economy to a circular one that keeps materials in use for as long as possible.

5 In this paper we align with the definitions provided by UNEP's International Resource Panel. Resources – including land, air, water and materials - are seen as parts of the natural world that can be used in economic activities to produce goods and services. Material resources are defined as biomass (like crops for food, energy and bio-based materials, as well as wood for energy and industrial uses), fossil fuels (in particular coal, gas and oil for energy), metals (such as iron, aluminium and copper used in construction and electronics manufacturing) and non-metallic minerals (used for construction, notably sand, gravel and limestone). International Resource Panel (2019) Global Resources Outlook 2019: Natural Resources for the Future We Want, available at https://www.resourcepanel.org/reports/global-resources-outlook

6 Eurostat (2022) Resource Productivity Statistics, available at https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Resource_productivity_statistics

7 Eurostat (2023) Material Flow Accounts Statistics – Material Footprints, available at https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Material_flow_accounts_statistics_-_material_footprints

8 Ellen Macarthur Foundation (2023) Growth Within: A Circular Economy Vision for a Competitive Europe, available at https://ellenmacarthurfoundation.org/growth-within-a-circular-economy-vision-for-a-competitive-europe

9 Circle Economy (2023) The Circularity Gap Report 2023, available at https://www.circularity-gap.world/

10 UNEP International Resource Panel (2020) Resource Efficiency and Climate Change: Material Efficiency Strategies for a Low-Carbon Future, available at https://www.resourcepanel.org/reports/resource-efficiency-and-climate-change

11 The IPCC's 2021 Sixth Assessment Report (AR6) estimates that there is a 67% chance of global warming staying within 1.5°C of pre-industrial levels if total future cumulative global greenhouse gas (GHG) emissions stay below 400 Gt CO_2

Europe has led the world in setting targets and designing effective policies to tackle climate change. Now the triple planetary crisis – climate disruption, biodiversity loss, and growing levels of pollution[12] – demands something even more ambitious: a bold reshaping of our relationship with materials. We need innovative policy that will enable business to unlock the potential of the circular economy and facilitate citizens' participation in it, to ensure we can maintain our quality of life and better protect the environment.

This White Paper sets out a vision for a circular economy that will build upon the real progress achieved so far in Europe, enabled by a reshaped policy framework. This framework will create the conditions for an innovative, thriving economy and equitably transform the EU into a fair and prosperous society that can flourish whilst working to remain within the 1.5˚ carbon budget[13]

We set 2040 as the focus for this vision, as it will take time for Europe's policymakers and innovators to turn ideas into transformative action. Making significant change to how we use materials by this date will pave a path to a net zero European economy by 2050 that is consistent with limiting global warming to 1.5˚C.

12 UNEP (2020) The triple planetary crisis: Forging a new relationship between people and the earth. Statement prepared for delivery to the Sub-Committee, Committee of Permanent Representatives by H E Fernando Coimbra, Chair of the Committee of Permanent Representatives. Available at https://www.unep.org/news-and-stories/speech/triple-planetary-crisis-forging-new-relationship-between-people-and-earth

13 European Commission (2019) Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions: The European Green Deal, 11th December 2019, available at https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2019%3A640%3AFIN

Reimagining how we use materials

In the long span of human history, treating waste as a problem is a relatively recent phenomenon.

For most of that time, material at the end of use has been treated as something valuable to be repaired, reworked, or used to fertilise crops. In the post-war economic boom, the value placed on material declined, a shift exemplified by the advent of the 'throwaway' society and the surge in litter since the 1950s.

Our digitalised world differs enormously from that of pre-industrial and even pre-war societies, but we still rely on natural ecosystems for our survival and have the same core needs for food, shelter, health and wellbeing. We still make and use the things needed to facilitate everyday life – and many things we arguably don't need – but in vastly larger quantities, using processes that discharge GHGs and other damaging wastes and pollutants into the natural environment at rates far greater than the planet can absorb.

Realising our vision for a thriving circular economy will mean changing how we interact with materials, so that we use them for as long as possible, waste as little as possible, and turn items that currently end up as waste into valuable inputs to new products while expending as little energy as possible. By reducing material demand to sustainable levels consistent with the global carbon budget, we will safeguard quality of life for all and mitigate the impacts of climate change on our standards of living.

02

2.1 Carbon emissions as a measure of progress

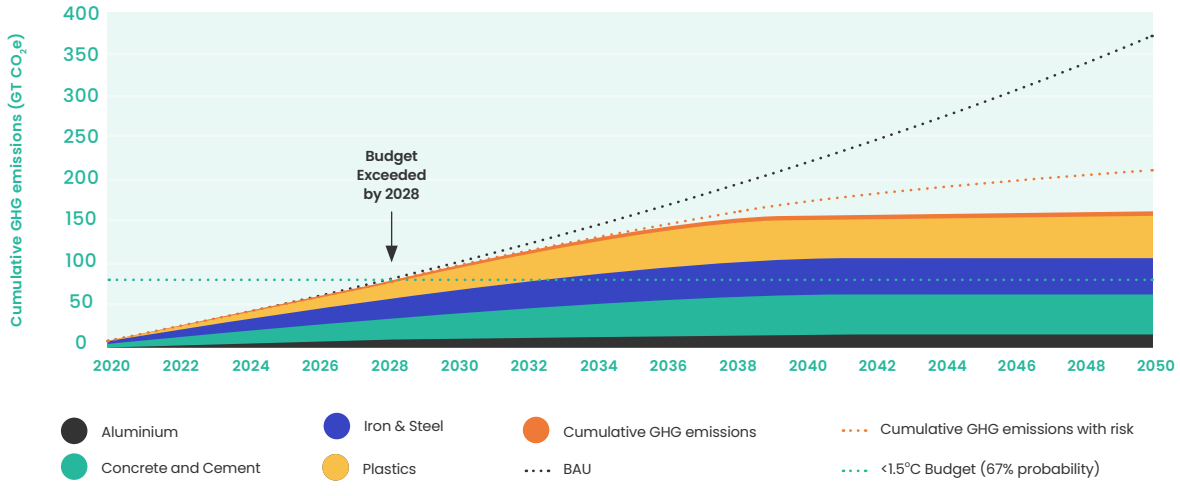
While reducing material consumption at the scale necessary to reach carbon goals will ease burdens on the natural world – for example, through extracting fewer materials and reducing climate stressors on ecosystems – the impacts of our linear material economy are most readily quantifiable in terms of carbon emissions. Measuring emissions thus provides a consistent metric to track progress in reducing material consumption.[14]

The scale and speed of the changes required show up starkly when we consider how much our consumption of four high-emitting materials must drop by 2050, even assuming each sector adopts more aggressive decarbonization strategies than they currently have.

Figure 1 shows the 'Business as Usual' cumulative emissions for the four sectors (aluminium, plastics, iron and steel, and cement and concrete – which are jointly responsible for 78% of GHG emissions from the material production sector), alongside cumulative emissions associated with sectoral strategies for achieving net zero (with a variant of these accounting for certain risks).

It can be seen that even under scenarios consistent with their net zero plans, emission breach their share of the carbon budget (based on their existing share of emissions) for 1.5°C by 2028 and overshoot by almost 100% by 2040.[15]

Figure 1 Cumulative GHG Emissions for Four Materials



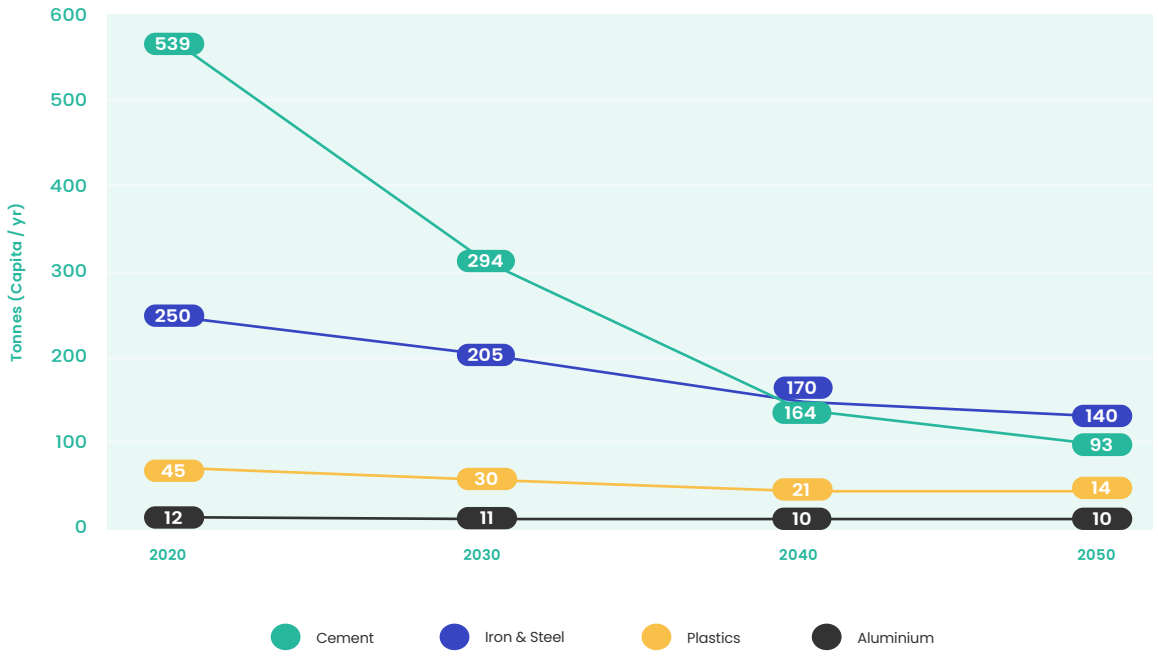
14 In this paper we focus on reducing material consumption to reduce carbon emissions. Given the imperative of dramatically reducing emissions in the next few years this focus is warranted. However, the wider impacts (beyond GHG emissions) associated with raw material extraction, such as impacts on biodiversity and water, justify efforts to ensure human needs are met with the minimum need for extraction of raw materials even if efforts to remain within the carbon budget are successful

15 Eunomia (2022) Is Net Zero Enough for the Material Production Sector?: Analysing the decarbonisation pathways for key material sectors and their ability to stay within global carbon budgets, available at https://www.eunomia.co.uk/reports-tools/is-net-zero-enough-for-the-materials-production-sector/

Figure 2 shows the fall in per capita material consumption needed for each sector to stay within the 1.5˚C carbon budget. The level of reduction in per capita consumption is based on what can currently be foreseen in terms of plans for decarbonising production. If decarbonisation of production proceeds at a slower rate than anticipated, per capita consumption of these materials would need to reduce even further to stay within the carbon budget.

Conversely, if decarbonisation of production is more rapid – perhaps as a result of currently unanticipated technological developments - a smaller reduction in consumption would be required to stay within the carbon budget.[16]

Figure 2 Reducing consumption of high-emitting materials to meet our carbon budget



16 Even within an overall reduction in consumption of a specific material, for example steel, the consumption of 'low GHG' steel may increase in absolute terms at the expense of 'high GHG' steel

These and other materials are currently deployed in different products and services – where we encounter them directly – and significant quantities of GHG emissions can be associated with this 'use' phase. Understanding the complex interplay between material production, use, and discard is critical to designing policy interventions that will reduce environmental impacts, minimise disruption, and ensure we can continue to live well.[17]

While various reports (such as those by the Platform for Accelerating the Circular Economy[18]) and strategies (such as the EU's Circular Economy Action Plan[19]) categorise economic activities and areas for action in different ways, there is strong overall agreement on where efforts must focus to reduce carbon emissions from material consumption and ease other environmental impacts.

Reshaping our relationship with materials will need an integrated policy framework, one that enables governments, businesses, and individuals to make better choices at all stages of material life cycles.

It will mean using data on material flows and stocks, along with smart tools and logistical systems, to track, manage, and maximise the value of materials from extraction, through production, all the way to end of use.

It will necessitate a fundamentally different way of thinking about materials – as finite resources to feed the circular economy at each life-cycle stage. It will also highlight the shift in mindset needed around the impacts of materials and the socio-economic opportunities of changed practice across all policy areas.

Six core sectors stand out as those where the EU must take rapid, ambitious action to reduce material consumption in order to keep within the 1.5°C carbon budget:

1. Construction and buildings
2. Transport
3. Food systems
4. Packaging
5. Textiles
6. Electronics, electrical equipment and ICT

17 For example, most of the GHG emissions associated with plastics are produced by the oil and gas and petrochemical industries in the "upstream" part of the lifecycle. See Minderoo Foundation (2023) Plastic Waste Makers Index 2023, available at https://cdn.minderoo.org/content/uploads/2023/02/04205527/Plastic-Waste-Makers-Index-2023.pdf

18 Wang, K., M. Costanza-van den Belt, G. Heath, J. Walzberg, T. Curtis, J. Barrie, P. Schroder, L. Lazer, and J. C. Altamirano. (2022) Circular economy as a climate strategy: current knowledge and calls-to-action. Working Paper. Washington, DC: World Resources Institute, available at https://pacecircular.org/circular-economy-as-a-climate-strategy

19 European Commission (2020) Circular Economy Action Plan: for a Cleaner and More Competitive Europe, available at https://op.europa.eu/en/publication-detail/-/publication/45cc30f6-cd57-11ea-adf7-01aa75ed71a1/language-en

A vision for 2040

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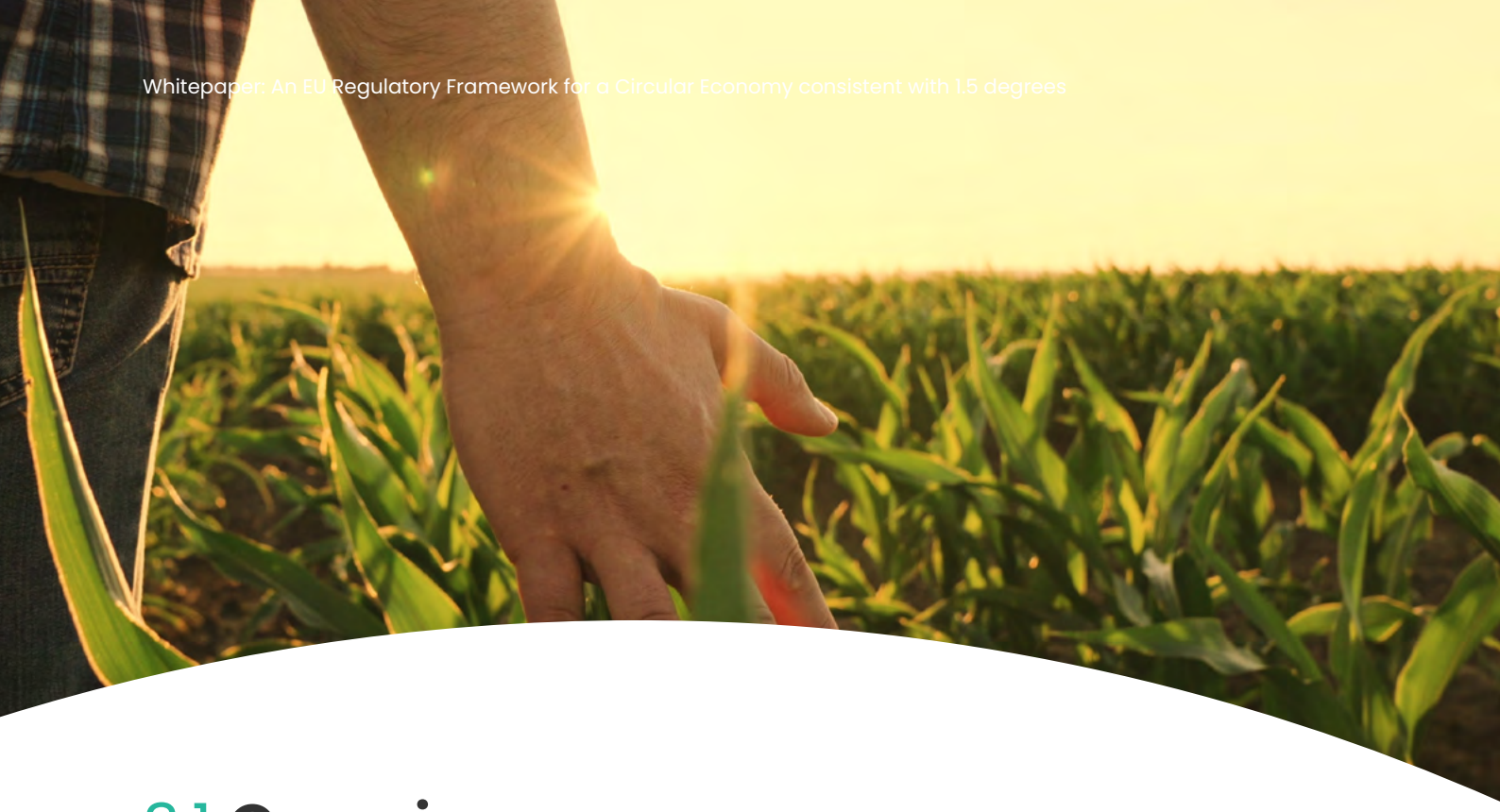


3.1 Overview

By 2040, we will have moved decisively towards a truly circular economy. We will extract far fewer virgin resources, and we will need to use fewer materials to maintain a good quality of life for everyone. Products will be designed to last longer as a result of regulation, innovation, and shifting consumer demand.

Policy interventions may also be needed to ensure this transition maintains or improves fair, affordable access for all. Digital tools, data, and supply chain logistical systems will help us monitor the carbon emissions and other environmental and social impacts of products and materials, and this will enable much more efficient use and reuse, while creating economic opportunities for everything from physical repair to digital data services.

As a result, we will prioritise prolonging not only the valuable lifetimes of products, but also their component parts and their constituent materials, switching from the concept of 'end of life' to 'end of use.' With much less waste to consider, regulation will focus on resources, materials, and products.

With supply chains and infrastructure re-engineered, and supported by increasingly intelligent automation, many of the cogs that drive the circular economy will turn out of sight from the perspective of citizens, rather than requiring changes in how they live and work. In other cases, the transition to a circular economy will deliver easily accessible public and private services that improve living standards for many.

Below we describe the central features of this re-shaped relationship across the material life-cycle, and highlight some illustrative examples.

3.2 Product design and manufacturing for sustainability

Manufacturing will be driven by a concern for resource efficiency; this will extend to the sourcing of materials and components, including land use and the ecological footprint of bio-resources.

Products will be made using materials and processes that have lower carbon and other environmental impacts, and they will be designed to last longer. Wherever possible, they will also be designed to be readily repaired, reused, remanufactured, and ultimately recycled at the end of their useful life – the realisation of this potential clearly depending on the systems being in place to ensure this happens. Technological innovations in product design will mean EU manufacturers and service providers in both the physical and digital economy are well-positioned to sell to the world on the basis that EU standards continue to be taken up globally.[20]

For example:

Domestic appliances like washing machines will be designed to be easily serviced, repaired, and disassembled at the end of use – reducing the number of new appliances and their components manufactured and the metals and plastics needed to make them. Consumers will have the option to hold appliances on fixed-term leases that cover their maintenance, service, and collection at the end of the lease, saving them money.

Clothes will be designed for durability, and producers will convey standardised information about sizing and fit to help consumers choose lasting options. While the way clothing and textiles look will still vary – reflecting their cultural and emotional significance –they will be produced in different ways. Next-generation biomaterials will be standard, significantly reducing microplastics pollution, and secondary raw materials like recycled fibre will be indistinguishable from virgin materials from the consumer perspective. Where virgin plant fibres are needed, they will be produced in ways that minimise ecological impacts. New business models based on demand-driven production will avoid the manufacture of excess stock and the overconsumption of clothes. Affordability of these higher quality textiles and garments will be addressed by new business and financing methods.

Vehicles will be designed and produced with a focus on lightweighting and right-sizing for in-use energy efficiency and lower embodied emissions. This, along with a focus on public transport, sharing models, automation, active travel and reduced demand due to careful urban planning, will mean we need fewer vehicles – freeing up critical raw materials for the metal-intensive global energy transition. Lighter vehicles, slower speeds, and materials innovation will extend the lifetime of tyres and reduce microplastic emissions from tread wear.

20 See "The Brussels Effect: How the European Union Rules the World", by Anu Bradford.

Producers will have many more options for reusable packaging that work for their products and use minimal or no virgin material. A new industry of providing high performing, highly optimised systems supporting reuse will be well-established, built on collaboration as well as innovation. Technological advances in the manufacture and filling of reusable packaging will dramatically change the way that products are packaged and presented. Packaging design decisions will be guided by the overarching goal of decarbonising the economy as a whole (rather than just the packaging sector), as well as protecting human health and minimising wider environmental impacts and producers will have the tools to make these decisions robustly.

For example:

Biomaterials, which can sequester carbon, may be used much more extensively in packaging – but this will be in the context of greater competition for bioresources and the land used to produce them, and the priority that will need to be given to applications that sequester carbon in much longer cycles. Single-use packaging will largely be reserved for a limited set of applications, such as medical. The potential for recycling processes to displace the use of virgin material will influence material choices and packaging design.

3.3 Construction, urban design, and food production for good quality of life

The ways that we meet our needs for shelter and food will be designed to enhance citizens' quality of life while delivering resource efficiency and minimising carbon emissions.

For example:

To dampen demand for construction materials, buildings will be designed or adapted to serve various functions at different times. A building used as a co-working space during daytimes, for example, could be re-used for community clubs or classes in the evenings. This could be coupled with planning policy that supports active travel and local access to services (via the 15-minute city concept, for example, where that aligns with local needs and preferences), to reduce the need for vehicles and transport infrastructure and the materials used to create them.

New buildings will be created and older ones renovated using lightweight, right-sized materials that reduce embodied energy, sequester carbon, increase energy efficiency, enhance local climate and air quality, and mitigate flood impacts. Modelling technology will help architects and planners make informed choices about materials and design for decarbonisation and future-proofing, both during construction and any subsequent rebuild or deconstruction. Design parameters will make domestic buildings easily adaptable to residents' changing needs for space, with minimal impact on material requirements.

Food choices will remain hugely diverse, reflecting local environments and cultures and a mix of old and new production methods. The lens of a circular material economy will help balance competing demands for land, so that multiple, robust and essential food-production sectors can thrive across the continent.

For example:

Food-growing practices will use less space – through vertical growing in cities; more protein grown in the form of nuts, seeds, and legumes; and new products like meat and dairy alternatives from precision fermentation processes. This will free up more land for wildlife recovery, natural carbon sequestration, biomaterial production, and critical ecosystem services like flood and erosion protection. Farming methods will increasingly integrate such services. This will help restore and maintain some of Europe's iconic pastoral landscapes and, along with more efficient practices, reduce reliance on unsustainable material inputs like pesticides and fertilisers. From shorter supply chains to local producers to local composting and food-growing initiatives, we will have many more options to reduce food miles and improve the quality of what we eat.

3.4 Innovative service business models for convenience and resource efficiency

A wholesale restructuring of how we do business will see many more firms making most of their profits from providing services rather than selling goods, while providing better value for their customers.

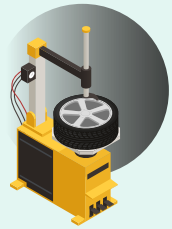
New areas of enterprise will emerge to connect consumers with the products they need via hiring and sharing models. This will create new business opportunities at local, regional, and global scales. It will also mean higher-quality products will be used more efficiently, be more affordable and remain in use for much longer.

For example:

When smartphones are damaged, networks of repair services will be available to fix them. Financial incentives and quality-assured processes for wiping personal data will drive the return of phones into circulation after they are refurbished.

Clothing and electrical goods will be repaired at large scale by commercial operators –both original manufacturers and businesses devoted to this – and at small scale by SMEs and third sector organisations and citizens sharing their skills via a dense network of local repair cafés.

School curricula will teach young people practical repair and refurbishment skills, along with a resource efficiency mindset – with professional and industrial-scale equivalents for those pursuing vocations in these new economic sectors – to help embed circular approaches in education and future generations.



Technological innovations will emerge to meet specific challenges posed by the transition to circularity, such as those around vehicle tyres. As a result, tyres will last longer and shed fewer microplastics. They will also be retreaded up to three times to prolong their use lives, significantly reducing the need for new tyres and the steel and rubber to make them – both identified by the EU as critical raw materials.[21] At the same time, a more efficient transport infrastructure will mean we need fewer tyres overall.

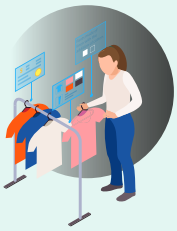
21 European Commission (2020) Critical Raw Materials Resilience: Charting a Path towards greater Security and Sustainability, Brussels, 3rd September 2020. Available at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0474&from=EN

Where products are reusable, they will be actively reused at high intensity within well-functioning systems.

For example:

Policy levers will remove current barriers to the sharing economy – for example, where regulations around the taxation, ownership, and insurance of private vehicles can discourage co-ownership at household level. Companies operating sharing models will give numerous drivers access to the same vehicle over the course of its life. They might employ the car club model for personal use or, for business use, the model already adopted by many taxi drivers, who loan their vehicles to other taxi drivers when their shifts have finished.

Localised sharing apps will put businesses or social enterprises in touch with consumers who want to hire infrequently used equipment such as lawnmowers and power tools, to whom they can deliver on demand and at short notice.



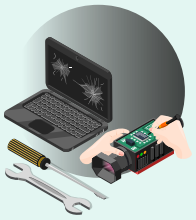
Fashion retailers and brands will prioritise more timeless designs of higher quality alongside versatile accessories, rather than pursuing a short-term trend driven business model. Consumers will be able to access occasion wear and other pieces of clothing for specific purposes via rental and subscription services. Clothing repair and refurbishment services and second-hand retailers will offer more ways for people to put unworn and unwanted items back into circulation – displacing new, short-life clothing and diverting much material from residual waste.

3.5 Effective collection for reuse, repair and high quality recycling

We will see very high rates of collection for products at the end of use, facilitated by sophisticated digital asset tracking.

This will support reuse and repair, which will typically be preferred for both whole items and their components. When it is time to recycle items or materials, they can be collected for recycling to high quality standards; this will mean the material produced can be used in place of virgin materials in high-value applications that will be reused and ultimately recycled into further high-value uses.

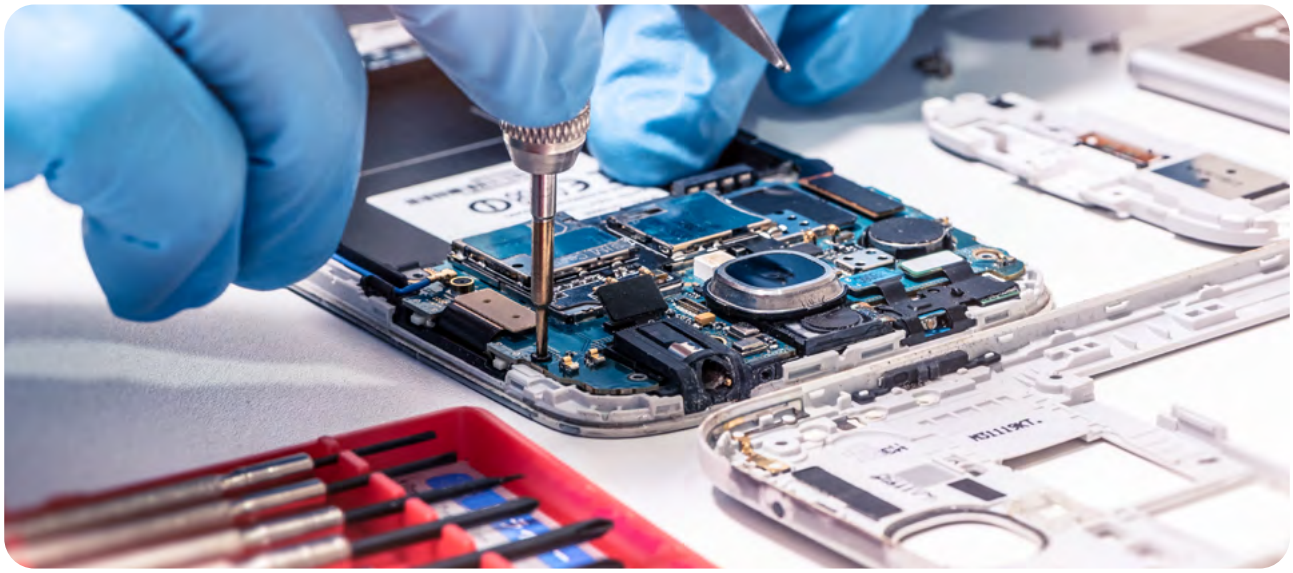
For example:



When a smartphone or laptop is past repair, it will be collected and disassembled, so that some components can be reused for new or refurbished phones or laptops and others reduced to raw materials in highly efficient recycling plants.

When clothes are no longer suitable for reuse, they will be recycled to produce secondary materials for use in new products, offsetting the high environmental impact of producing virgin fibres and textiles.

Vehicles at the end of their useful lives will be carefully dismantled to extract components and critical raw materials, such as permanent magnets and the rare earth elements they comprise, which are so critical to Europe's digital and energy future.[22]



22 In 2022, while large permanent magnets in wind turbines are more readily recovered – rates of 90% recovery are assumed across rare earth elements by the authors of a recent study – the recovery of magnets in electric vehicles is more challenging. Not only are the magnets smaller than in wind turbines, but they are used in both traction motors and in auxiliary motors. It is expected that the magnets in traction motors could be recycled, but the magnets in auxiliary motors risk getting lost in the shredding process. See KU Leuven (2022) Metals for Clean Energy: Pathways to solving Europe's raw materials challenge, Report for Eurometaux. Available at https://eurometaux.eu/media/jmxf2qm0/metals-for-clean-energy.pdf

3.6 Societal shift

The transition to this truly circular economy will depend on considerable cultural change from all of us, in our capacities as citizens, consumers, employers and employees.

For example, if products are to be repaired, refurbished, and otherwise kept in use longer, people will need to be motivated to engage with collection and repair systems and use the digital tools that support these. These systems will be highly accessible and easy to use, with appropriate incentives in place where necessary, with reuse and recycling technologies receiving the levels of investment needed to achieve these outcomes.

Policy instruments will need to encourage, facilitate, and even require engagement with these systems by manufacturers, suppliers, consumers, and reuse and recycling system suppliers. The way that we currently consume materials is built around a certain conception of convenience. In 2040, business will increasingly compete to offer consumers convenience through efficient access to products and the means to repair, refurbish, and recycle them to a high quality standard. Widespread automation and industrialised robotics will support these circular services and make it convenient for consumers to hire products or return purchased items for repair or reuse.

For example:

Consumers will be highly engaged with product life extension services, such as clothing repair and refurbishment companies – who will in turn make that engagement easy by offering to collect items from consumers' homes, repair or refurbish them, and return them.

Businesses will convey information about products' environmental impacts (held on Digital Product Passports) to consumers via retail websites and product reviews. Consumers may access this directly, but are more likely to interact with ratings and review services through their favourite apps. These will increasingly provide easily understandable information on products' carbon footprints and sustainability, help consumers access highly convenient repair, refurbishment, and recycling services, and advise consumers on caring for products to extend use lives.

3.7 Tracking material progress

Going further, faster in reducing demand for raw materials through creating a circular economy will complement the ongoing energy transition and increase the likelihood of staying within 1.5°C.

Achieving significant reductions will be challenging, but it will also create huge opportunities for innovation – not only in materials but also in how we live and do business. A circular economy is a smart economy; understanding material flows at macro and micro scales while ensuring consistency with data protection and privacy legislation (and concerns over privacy) will be crucial to making it work. It will also provide world-leading expertise and knowledge that can be exported as the rest of the world seeks to transform its material use.

The EU Circular Economy Monitoring Framework and Economy-Wide Material Flow Accounts (EW-MFA) already track, at a high-level, the materials we use and how they flow around the economy. In future, these will form the basis for the more sophisticated tracking tools needed to enable circularity. Public datasets will be open source, facilitating smart investment and innovation by the private sector. In 2040, smart data will be the key for both public and private sector actors to ensuring changes in material use co-exist with a high quality of life for citizens. Granular data will be needed on, for example, repair and reuse – particularly for valuable and strategically vital metals, and to identify hazardous substances or those that will disrupt reuse or recycling.

Tools such as Digital Product Passports will ensure aggregate data is easy to collect and analyse and also that customers and actors throughout the supply chain can access operational data. Indicators will monitor all loops in a circular economy, so that we can focus on optimising the use of materials and reducing material consumption overall.

For example:

Digital Product Passports will record all the information that retailers, consumers, and recyclers need to make informed decisions and keep material in circulation. Passports will identify components that could disrupt reuse and recycling processes or substances that might limit the onward use of materials in certain applications.

Blueprint: A new policy framework for a better material future

Below we set out a blueprint for a new policy framework that will enable business and society to realise the vision for 2040.

This represents an initial response to the opportunities and challenges described above, rather than a fully formed proposal. It is designed to provide a starting point for wider discussion with stakeholders to more fully develop the blueprint.

The framework has been constructed on three key principles:

- Building on existing regulatory foundations;
- Minimizing administrative burdens for business, with an emphasis on harmonisation across the single market; and
- Leveraging the potential of the internal market to stimulate innovation.

The policy framework needed to unlock a circular economy comprises three broad elements. The first is a revision of the Waste Framework Directive, to be undertaken by 2026. The second, to run in parallel, is a strengthening of the emerging product policy framework. The third is a deeper revision of the Waste Framework Directive, to be undertaken by 2029, to transform it into a 'Resources Framework Directive'.

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4.1 Revision of the Waste Framework Directive

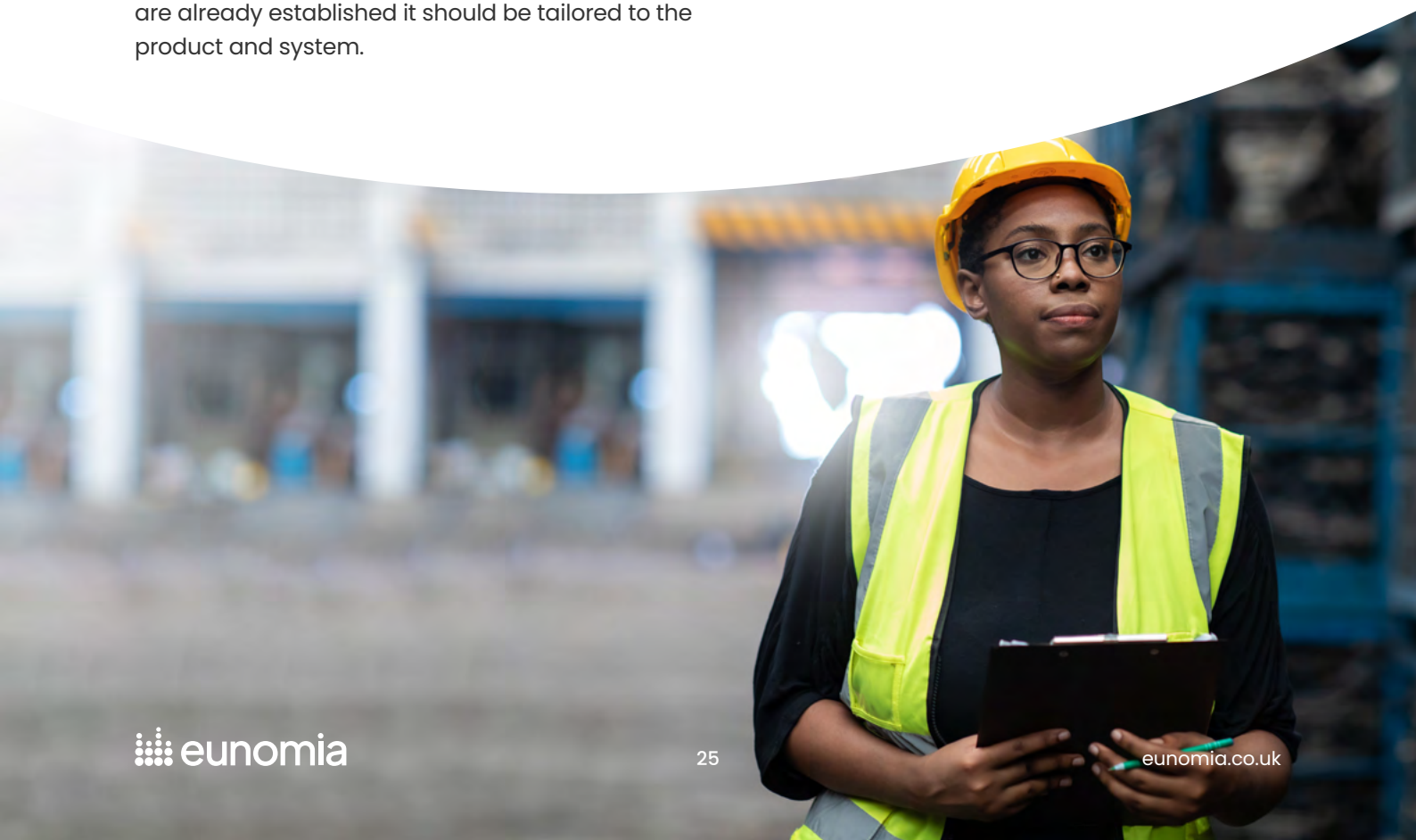
Below we outline changes to the Waste Framework Directive that are needed in the short term (between now and 2026) to set the conditions for success in the wider transition.

Environmental standards for product reuse systems

Introducing clear standards that product reuse systems must achieve in terms of environmental performance (relative to one-way alternatives) will ensure they deliver genuine benefits, and provide certainty for Europe's businesses and innovators. Reuse rate is not always an appropriate metric to demonstrate environmental performance, and its relevance to environmental performance will depend on the product; for example, it may make sense for a reusable packaging system where each use is counted, but not for clothing where reuse may only denote change of ownership rather than reflecting the actual number of uses. Ultimately, this measure should encourage the high intensity use of a particular product, and so where reuse systems are already established it should be tailored to the product and system.

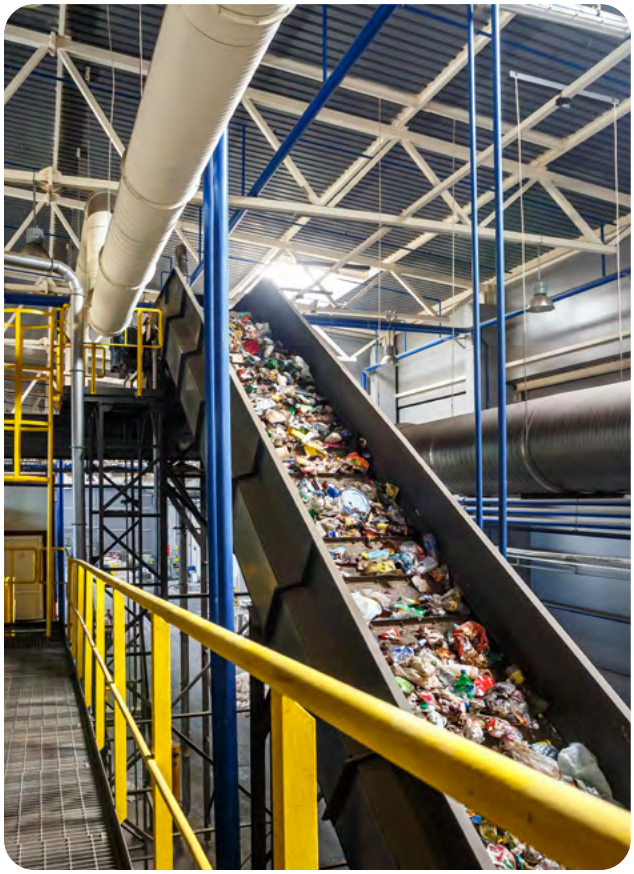
Clear definitions, serialisation, and traceability to encourage longer use

The revised WFD should clearly define the boundary between waste material and those products that can be reused, repaired, and/or remanufactured, but which are currently treated as waste. It should always be easier for businesses and individuals to do the more efficient, sustainable thing. Making sustainability easier to prove and materials easier to reuse will link to the proposed serialisation of products (see Section 4.2), which will mean individual items can be tracked more readily and thus move freely within the EU for reuse, repair, and or remanufacture. The combination of improved definitions, serialisation, and traceability will enable a lighter touch regulatory environment to facilitate reuse, repair, and remanufacture.



EPR expansion and harmonisation

When businesses have to take real responsibility for the end-of-life consequences of their products, they will have a clear incentive to innovate and invest in improvements. The revised WFD should expand mandatory EPR to cover a wider range of products, especially furniture, mattresses, and floor coverings, and ensure greater consistency in the scope and application of existing and future EPR schemes.



EPR fees should cover the full end of life costs in all Member States, to maximise fees' influence on design choices and more fully implement the Polluter Pays Principle. Fees should cover the cost of managing the fraction that is not separately collected as well as illegally dumped and littered items (as relevant to specific products). To provide a consistent incentive for design change, the criteria for modulation of fees should be harmonised across all Member States. Harmonisation should also extend to reporting requirements, and data requirements to inform the calculation and modulation of fees should align with those for Digital Product Passports (see Section 4.2).

Implementing EPR consistently across the single market with respect to the interface between producers and EPR schemes will be hugely beneficial in terms of minimising the administrative burden on firms, maximising the size of market opportunities they can pursue, and sending clear signals to investors and innovators.

Material Preservation Potential in a revised recycling hierarchy

The WFD needs a more granular hierarchy that reflects the differing environmental benefits of various recycling processes. This should be measured against outcomes, rather than specific processes per se, and would favour 'high' or 'higher' quality recycling over 'lower' or 'low' quality recycling.

This will require a dynamic approach that evolves in tandem with technological developments and changes in the net benefits from one process over another.

In most cases, environmental benefits should be measured by the amount of recycled material of a quality that can replace virgin material, while accounting for energy and other inputs. A key criterion for the hierarchy should therefore be the ability of a recycling process to produce a high yield of materials that can be recycled again and again without substantially reducing the benefits of subsequent recycling activity – what might be termed Material Preservation Potential. Businesses and processes that deliver this should be encouraged and rewarded.

A dynamic composting hierarchy

The WFD also needs a dynamic composting hierarchy that reflects the different environmental benefits of composting processes and looks ahead to future challenges. To date, most countries in Europe have focussed on producing a net energy gain and reducing fugitive methane emissions from composting processes. However, the raw material inputs into crop production (NPK) and carbon structural materials have significant environmental impacts (fossil material and associated energy inputs) and recycling these nutrients via composting may have a much bigger part to play in Europe's future.

Indeed, high quality solid outputs from composting may be more environmentally beneficial from the perspective of climate change than biogas generation as energy systems decarbonise. This may require a regulatory framework that promotes, or even mandates, composting of digestate (where anaerobic digestion is adopted for processing organics), to minimise leakages of methane and ammonia and maximise sequestration of carbon after application to soils. We need a policy framework that encourages those businesses and processes producing the greatest environmental net gains.

Managing mixed waste to reduce emissions

While separate collection rates continue to improve, the revised WFD should require that mixed waste be sorted in order to maximise further extraction of recyclable materials and reduce greenhouse gas emissions from residual treatment as much as possible, given the urgency of staying within the 1.5˚C carbon budget. Applying such a requirement at scale across the EU will be important in terms of market efficiency and impact, and a clear signal of intent will provide certainty for businesses and innovators.

4.2 Product Policy

Strengthening the emerging product policy framework – in parallel with revising the WFD – can use the Ecodesign for Sustainable Products Regulation (ESPR) as a starting point.

Through the consistent and interlinked application of EPR, fiscal policy, and public procurement, this will help to drive change in product design and reduce overall levels of material consumption.

If regulation, incentives, and demand align, then businesses – large and small, established and start-up – will respond with the solutions the market demands. The framework should focus especially on reducing administrative requirements for producers and, through harmonisation, aligning the incentives that EPR schemes and fiscal instruments provide. This will create the strongest possible driver for design change for a given level of price signal.

For specific products, a requirement for **serialisation** (where each item has a unique identifier) should be introduced (starting with the most relevant cases); this will mean individual products can be traced at key points through their lifetimes, such as when they are returned for repair or refurbishment. For example, using unique serial identifiers for vehicle tyres would enable a better understanding of their use lifetime, including the number of times tyres are retreaded. Serialising mobile phones will enable greater traceability and facilitate their return for reuse, repair, and remanufacture (see Section 4.1).

The ESPR will enable the setting of performance and information requirements for almost all categories of physical goods placed on the EU market, encompassing:[23]

- **Product durability, reusability, upgradability, and reparability**
- **Presence of substances that inhibit circularity**
- **Energy and resource efficiency**
- **Recycled content**
- **Remanufacturing and recycling**
- **Carbon and environmental footprints**
- **Information requirements, including Digital Product Passports (DPPs)**

23 European Commission (2022) Ecodesign for Sustainable Products, available at https://commission.europa.eu/energy-climate-change-environment/standards-tools-and-labels/products-labelling-rules-and-requirements/sustainable-products/ecodesign-sustainable-products_en

The product policy framework should require that producers provide **consistent information on products for DPPs** – but only once, no matter how many times an item is sold in the single market. EPR schemes can then access the relevant information about each product through its DPP, to calculate fees (and modulate them if appropriate). This will mean producers do not need to report on product characteristics more than necessary, and harmonisation is essential so that producers will not have to report on the same product in different ways in different Member States. This will be an evolving process as DPPs are rolled out.

EPR that covers full end of life costs, with harmonised reporting requirements and modulation criteria across all Member States for specific product categories, will have maximum potential to drive change. However, EPR is subject to the constraint of cost-coverage; the overall fees charged must be no more than necessary to meet the scheme requirements for end-of-life costs).

This limits the extent to which it can drive changes in design or consumption habits, especially where the product's price is far greater than end-of-life costs. For this reason, **a harmonised approach to product taxation** would be useful, to drive changes that cannot be achieved through EPR alone. While a politically challenging step for the EU, it would unlock significant potential for a more circular approach to product policy.[24]

A critical feature of the transition to a circular economy is that price signals must reflect the changes needed, so that businesses and consumers can respond intelligently.

Basing harmonised product taxes as far as possible on the information held on DPPs would minimise administrative burdens, while aligning taxation with relevant modulation criteria would strengthen the incentives that modulation offers. An example of the potential merits of a harmonised approach is on vehicle taxation (both on purchase and annual ownership), which currently varies considerably across Member States.

If taxation were based uniformly on vehicle weight, for example, this would send a strong signal to both manufacturers and consumers to promote smaller, lighter vehicles, in turn encouraging encourage resource efficiency in vehicle design and reducing the energy demand throughout a vehicle's lifetime.

However, there are limits to what taxation can achieve. By setting minimum requirements across a range of products, the ESPR has potential to go further and rule certain products off the market. Fee modulation and taxation can be used in concert to drive change in a certain direction; the ESPR can then be used to tackle the areas these other instruments cannot reach. Co-ordination in the operation of EPR, fiscal incentives, and the ESPR will help to maximise their efficiency and impact.

Public procurement can provide further impetus for change, especially where new systems need to be established, and help facilitate a smooth transition to new business models. For example, if public authorities are required to use retreaded tyres on their vehicle fleets, this will generate greater supply-side capability in the form of a network of retreading providers, which can then itself scale up as demand for retreading increases in response to broader incentives.

24 European Commission (2019) Communication from the Commission to the European Parliament, the European Council and the Council: Towards a more efficient and democratic decision making in EU tax policy, 15th January 2019, available at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52019DC0008&from=EN -change-environment/standards-tools-and-labels/products-labelling-rules-and-requirements/sustainable-products/ecodesign-sustainable-products_en

4.3 Resources Framework Directive

Subsequently (before 2029), the Waste Framework Directive should undergo a deeper revision and be recast as a Resources Framework Directive. This will guide the continued reduction in material consumption across the EU economy in a way that most effectively and efficiently delivers decarbonisation, as well as addressing the full range of other societal needs.

A Resources Framework Directive will also – in the context of an overall drop in material demand – steer the use to which different materials are put through a new materials application hierarchy. This hierarchy will maximise the potential for decarbonisation across the economy as a whole (not on a sector-by-sector basis). It will take particular account of a material's expected lifetime in a specific application. This will be particularly relevant for biogenic materials, where carbon sequestration in long-lived applications such as buildings may be preferable to short-lived applications such as packaging.

The materials application hierarchy will express a clear preference for the use of some materials over others in certain applications, guide the use of particular materials into specific applications and away from others. Economic instruments can incentivise this, potentially supported by ruling out the use of some materials for particular applications.

We envisage that the Resources Framework Directive will also introduce raw material reduction targets and EU-level resource taxation.

A Resources Framework Directive will – in the context of an overall drop in material demand – steer the use to which different materials are put through a new materials application hierarchy.

Next steps

We will be engaging with stakeholders over the next few months to further develop ideas presented in this White Paper as we work up in more detail the proposed policy framework.

In our next paper we'll describe in detail our analysis of the combination of possible measures that could be applied to create an EU Regulatory Framework for a Circular Economy consistent with 1.5 degrees.

Click here to provide your organisation's feedback on the White Paper, register your interest to participate in stakeholder engagement, and be notified when our next paper is published.

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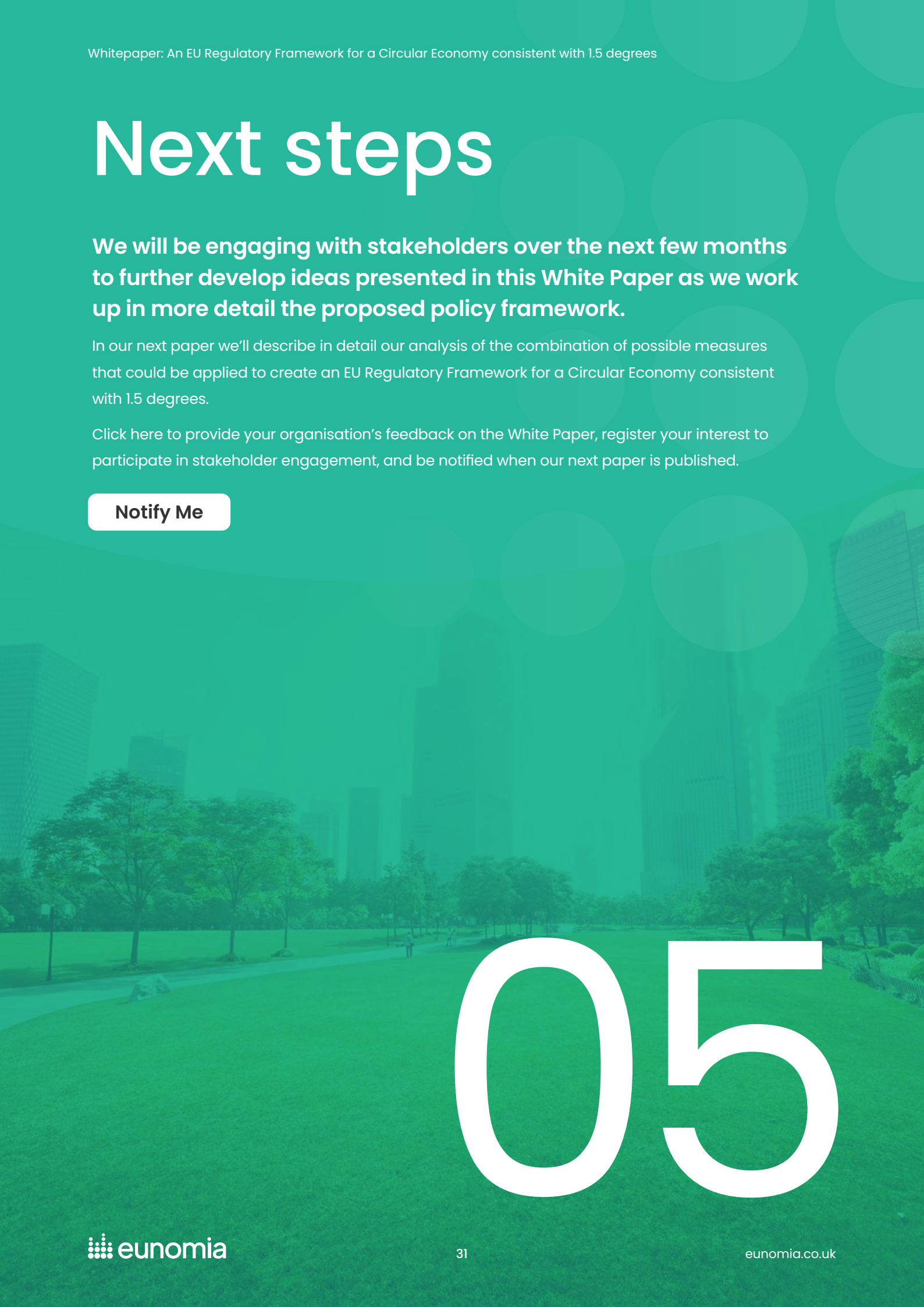

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