



INDUSTRIAL TRANSFORMATION FOR A MORE RESILIENT FUTURE

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Executive Summary

This report has been developed to contribute to the EU's efforts to transform European industry for a more resilient future. It includes 82 policy recommendations set out in five chapters covering the overarching areas: governance, financing and investment, energy sources, circular economy and the value chain, and industrial transformation.

As Europe debates how to respond to the corona crisis, one thing is certain: a return to 'business as usual' is no longer an option. In an increasingly uncertain world, we need closer cooperation to meet the challenges we face, across borders, and between business and citizens. This must be done under the motto '**Changing together, deciding together**' (p.6). To ensure transparency and monitor progress, we call for the **establishment of an independent observatory** to advise on priority infrastructure and targets, to monitor progress and ensure policy coherence. We also call for **a role for civil society organisations and independent experts** to be able to fully participate in the development of strategies to deliver the industrial transformation.

To meet Paris Agreement targets, emissions must reduce to near zero by 2040, so we need **finance, policy and investments to drive change** (p.8). We call for the EU to ensure that **all public and private financing be compatible with the IPCC's scenario of 1.5 degrees and a zero-pollution economy**; and aligned with a more inclusive Just Transition mechanism. We also demand the **full exclusion of fossil fuels from public investments** and call for **changes to the EU's carbon market**, strengthening and improving it with a variety of tools.

In moving **towards a 100% renewable energy system** (p.13) industrial transformation must seek comprehensive actions towards zero emissions that avoid burden shifting and acknowledge all environmental impacts. We call on policymakers **to prepare grid operators through effective EU energy infrastructure planning**. In terms of gas, **only renewable hydrogen, produced via electrolysis using renewable energy is compatible with the energy transition**. So we ask for the future available volumes of hydrogen and sustainable biomethane to be assessed, before investments in infrastructure are made.

To **drive sustainability along the value chain** (p.16) we call for **improved resource efficiency** throughout, with an increase in the circular material use rate of at least 100% in the next ten years. Policymakers must make sure **the waste hierarchy is rigorously respected** and **support a sustainable market for reuse of products and materials**, especially for high-impact sectors and resources. Minimum performance and sustainability requirements for products and processes will be key to achieving this aim.

Finally, to deliver the **industrial transformation** (p. 18), we ask that a **resource efficiency first principle** – for both energy and materials – is made a precondition for all innovation and refurbishment projects in industry and call for stringent environmental and social criteria in the procurement of the materials and products that support digitalisation.

We hope that these, and the other recommendations contained in this paper, will guide EU policy makers and national governments and inspire industry and wider civil society over the next five years.

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Introduction

The coronavirus outbreak has had a profound and terrible impact on people all over the world. Governments have had to step up to protect lives and livelihoods. In Europe, leaders have taken bold steps to avert economic collapse and deal with the impossibility of returning to 'business as usual'.

EU leaders, including the majority of national governments, support putting the European Green Deal at the heart of a European plan to rebuild the economy. Business leaders have also shown support, with many joining a European Alliance for a Green Recovery.¹ They recognise that the climate and biodiversity crises, and the threat to our health posed by toxic pollution. They also understand that we will need to transform the way we produce and consume, move, live and work in order to create safe, new jobs and make our societies healthier and more resilient.

European industry, from Small and Medium Enterprises (SMEs) to multinational corporations, will have a key role to play as we progress towards climate neutrality and a zero-pollution world. A significant increase in efforts, new targets and real transformations are required in the coming years to achieve meaningful reductions in resource use and greenhouse gas emissions by 2030 and 2040.

To achieve necessarily ambitious goals, European leaders and industry will need to rethink technologies and production processes, transform consumption patterns and enable sustainable living. Europe will need to embrace shorter, more diversified supply chains and more local manufacturing to enhancing resilience. Boosting the circular economy will help industry achieve this objective and could create millions of new jobs.

European leaders can provide support by focusing economic stimulus on fast-growing sectors like renewable energies, energy efficiency, nature restoration, and ecodesign, all of which can offer solutions to multiple challenges. The renewable energy sector alone today employs around 1.2 million people in the EU and number that is expected to increase rapidly, including in coal regions, as the share of renewables is set to more than double by 2030².

The EU Industrial Strategy and its related policy making process are a one-of-a-kind chance to transform European industry by setting climate neutrality, resource efficiency and zero-pollution objectives as drivers for innovation and competitiveness as we rebuild the economy. Only through improved environmental performance can European industry lead global markets and innovation.

¹ <https://www.politico.eu/wp-content/uploads/2020/04/Press-Release-European-Alliance-for-a-Green-Recovery-Pascal-Canfin.pdf>

² Clean energy technologies in coal regions: Opportunities for jobs and growth, JRC, 2020

Changing Together, deciding together.

Shared governance for the transition

Returning to 'business as usual' is no longer an option. Societies and economies must be rebuilt so that we are better able to withstand converging crises – whether they are long-standing and well-known, such as on climate, biodiversity and habitats, or unpredictable and sudden such as Covid-19.

The governance of societal and industrial transformations remains a shared effort. We need an immediate and common response to multiple global challenges in an increasingly uncertain world. In the next five years, the European Commission has a unique opportunity to identify, strengthen and create crucial solutions to secure a better future.

Civil society has an important role to play in contributing to finding the solutions and in deciding how they could be funded. Industrial transformation will require clear aims, targets and implementation structures to ensure maintaining momentum. This must be supported by aligned investment and funding tools and coherent infrastructure.

An independent, participatory body is required to ensure all this. It would provide a shared evidence base for taking policy decisions and highlight knowledge gaps and uncertainties. It would engage with Member States, industry and civil society on a regular basis to guarantee policy continuity in achieving targets. The observatory would also suggest corrective measures in an evidence-based, inclusive and transparent manner if real emissions deviate from the trajectory.

Policy recommendations:

- **Establish an independent observatory** to provide advice on priority infrastructure and targets, to monitor progress and ensure policy coherence. Should its terms of reference be adequate, this could be the “industrial forum” mentioned in the Industrial Strategy.
- **Connect Energy Union governance to industrial transition goals.** Mandate Member States to develop plans for decarbonising both heavy industry and SMEs as part of the National Energy and Climate Plans (NECP) planning and reporting framework. These plans should give a comprehensive overview of the state of play of the industry transition and next steps, including targets for industry, and the policies, measures and financing to deliver them.
- **Improve decision-making processes by empowering regional stakeholder forums and steering bodies** through a comprehensive and effective Climate Pact.
- **Ensure full participation of CSOs and independent experts in the development of the laws and strategies that deliver the industrial transformation** aiming to address multiple social and ecological challenges and balance public, societal and private interests in representation in the Industrial Forum.
- **Ensure the effectiveness of proposed ‘alliance structures’** (private-public partnerships in key sectors like steel and hydrogen) by establishing minimum criteria and elements for their target setting, regular monitoring and evaluation.

Monitor and Benchmark processes

A 'Zero Pollution' Europe must be built on reliable and transparent data flows among institutions, businesses, NGOs and other civil society actors. Yet at present there is a considerable reporting and monitoring deficit for large scale industrial installations.

Improving access to information, including on carbon footprint, would greatly improve the monitoring process and transparency, and would also enable industry players to identify opportunities, frontrunners in the field and mutually support to replicate good practice examples.

Policy recommendations:

- **Guarantee real time access to important data** like flow rates, continuous emissions (climate, air, water) monitoring results, for all major sources of emissions.
- **An annual report for the European Parliament** on progress made in the transition to a net-zero carbon, competitive industry as part of the State of the Energy Union.

Finance, policy and investments to drive change

Ensure a socially just transition

The transition to a climate-neutral industry must be socially just. It requires a strong and clear public investment plan, complementing, supporting, and guiding market- and technology-driven changes with implications for the future of employment, economic disparities and environment.

Efforts in social and regional development must go hand-in-hand with improving climate and environmental policy. A recent CLG report³ highlighted the the potential impact of failing to align investments with decarbonising the economy: job losses could be expected in the region of 10% by 2030 to 30% by 2050. Taking climate action, on the other hand, offers significant opportunities; but taking advantage of them will require new, targeted training and skills development for workers, the creation of alternative sources of employment by diversifying opportunities through climate-neutral, resource-efficient and zero-pollution ambitions, and investments in job creation in the agroecological sector and an active nature restoration agenda.

To fully achieve these objectives, innovation and transformation must be pursued in a way that leaves no one behind and allows regions to leap forward. Coal regions in particular face significant challenges to achieve deep industrial transformation and should be prioritised. The transition presents an opportunity for these regions to seize a once-in-a-lifetime technological revolution, enabling them to leapfrog to the highest levels of competitiveness and quality. However, false solutions, delay and incremental change will not deliver the scale needed in time and will instead lock regions into fossil fuels and a perpetual cycle of catching up. Therefore, a holistic and long-term approach is essential.

While the Just Transition Mechanism is to be welcomed, it is pivotal that the entire EU budget, other EU funds, the European Investment Bank, ETS auctioning revenues, national and private investment funds all align to enable a just transition to carbon neutrality.⁴

Furthermore, the Just Transition Mechanism should also be complemented by broader policy measures and signals which provide a clear framework and direction for the transition, across all sectors and regions.

Comprehensive, locally-developed **transition plans** should be drafted, including clear timelines and milestones for transition steps, providing clarity to investors. These should be evidenced-based and supported with adequate, long-term finance. They should enable and focus on economic diversification. Support for the transition should be contingent on the existence of such plans and should support their development. In the interest of these areas and of the climate, no investments in fossil fuels should be supported in any way by European funds, nor should investments in any way harm the objectives under the EU Sustainable Finance Taxonomy.

³ <https://www.corporateleadersgroup.com/reports-evidence-and-insights/publications/publications-pdfs/working-towards-a-climate-neutral-europe/executive-summary-working-towards-a-climate.pdf>

⁴ See also: <https://eeb.org/library/a-budget-to-address-the-climate-crisis/>

Policy recommendations:

- **Design the Just Transition Mechanism (JTM) to ensure a systemic approach to the transition** and contributes to enhance an inclusive, carbon-neutral, resource-efficient and resilient society.
- **Make the JTM more inclusive**, necessitating and facilitating the meaningful participation of all local stakeholders, including civil society and community representatives in the design of the Just transition plans.
- **Align funding to enable the just transition** – including the entire EU budget, other EU funds, the EIB, ETS auctioning revenues, national and private investment funds.
- **End investments in fossil fuels** (including natural gas and all fossil-derived gases) should be supported in any way through the JTM and should be excluded from all other public funding.

Finance for green industrial transformation

The EU's Multiannual Financial Framework 2021-2027 (MFF) and its operational programmes will play a crucial role. It should ensure direct investments and EU financial flows are consistent with a pathway compatible with the IPCC's scenario of 1.5 degrees and a zero-pollution economy that respects nature. Finance must be stepped up to meet the challenge and better targeted to provide for the investments needed. The MFF's contribution to these funds must also leverage consistent private funding with associated strict and coherent conditionalities. This requires an MFF largely aligned with climate-related spending, nature restoration and nature-based solutions, combined with a stringent monitoring system to ensure these investments actually deliver.

As investment cycles in industry are long (15-20 years), decisions will have to be taken in the next 5-10 years to fully achieve the climate neutrality target. It is essential that we grasp the last chance to enhance climate performance of financial flows and make the entire EU budget Paris-compatible.

Any investments that will lock our economy into fossil fuels must be avoided and our money should be put into the most promising options in terms of environmental and climate results, starting with energy and material efficiency. Investments in fossil-fuel based industrial activities must be phased out, especially in those activities still heavily dependent on coal and gas, as these investments would soon become a liability and yet another burden for the development of such areas.

Governments are already injecting serious resources to rebuild the economy following the outbreak of the Covid-19 pandemic. With unprecedented levels of state aid being authorised, it is essential that money is invested in protecting and creating sustainable, resilient jobs. Receiving public money must be conditional on a real commitment to effective, genuine and timely climate and environmental action by recipients.

Regardless of the speed and the amount of public funding made available for these investments, it is clear that neither all industrial sectors nor all European regions will be able to benefit from these investments from the beginning and it will only be in the mid-term that the full combined effect of technologies and leveraged private equity will deliver the needed results. For this reason, it is of utmost

importance that investment from the various streams of the EU budget be geared towards priority sectors and measures that allow for massive reductions in greenhouse gas emissions, resource use, and de-pollution. This process must be governed by an independent observatory which ensures the transparent monitoring and verification of results.

The negative externalities of carbon emissions need to be fully reflected in the price of pollution. The practice of insufficiently targeted and over generous handouts of free allowances to carbon-intensive industry sectors must end.

Policy recommendations:

- **Support the full exclusion of fossil fuels from public investments** for climate-neutral industry.⁵
- **Ensure financial support for SMEs** reflecting the important role they will play in transforming major industries.
- **Provide adequate and dedicated funding for increased power demand** driven by the electrification of industrial processes and hydrogen production via the different financial tools available.
- **Exclude funding of projects that involve the use of gaseous fuels where electrification is an option.**
- **Ensure that Carbon Capture and Storage (CCS) funding is dedicated exclusively to the decarbonisation of unabatable industrial process emissions** for certain sectors such as chemicals and cement, avoiding “greening” fossil fuels in the energy supply chain including fossil gas.
- **Prioritise innovation in low-temperature processes** in pilot and R&D funds.
- **Require circular economy, energy efficiency and fuel switching in tenders** for projects and funding.
- **Require investments to be fully compatible with the EU green taxonomy** and relevant certification schemes such as guarantee of origin

Get carbon pricing right

The EU ETS, the EU’s main carbon pricing market mechanism, is meant to drive reductions in greenhouse gas emissions for industries regulated within the system. Following the 2007/8 financial crisis and a massive inflow of cheap international carbon offsets, the cost of carbon emissions was significantly weakened shortly after its inception. This resulted in a loss of financial incentive for industry to transition from a fossil-based energy supply and carbon-intensive industrial processes to more sustainable ones. Oversupply of free allowances to industry has further weakened the tool.

In the last decade, emissions from EU ETS industries such as steel, cement and chemicals, have been stagnating and were not foreseen to decrease for a further decade. To meet Paris Agreement targets, emissions must reduce to near zero by 2040.

⁵ This is to be aligned with the latest EIB decision (from November 2019) to stop financing fossil fuels energy projects from the end of 2021. H2 produced from fossil fuel should, therefore, be excluded from future public investments.

There is still significant untapped potential to reform the EU ETS so it provides a stronger market signal for further decarbonisation of industrial processes in Europe. While recent regulatory changes helped to raise the price of carbon within the EU ETS, it is clear that a serious revision of the EU ETS legislation is urgently needed to stay within the Paris Agreement 1.5°C temperature rise limit.

The economic consequences of the current global Covid-19 crisis will impact the effectiveness of the EU ETS as a market-driven instrument if an oversupply of allowances re-emerges on the market and no regulatory reforms are proposed and agreed soon. The effects of the crisis need to be factored in and policies will need to be adapted to a new economic scenario if our climate neutrality target is to be met.

Benchmark values which set carbon efficiency levels to define the amount of free emission allowances now require a rethink. Current benchmarks set on a restricted range of high-emitting products and associated processes result in the free allocation of allowances for the worst-polluting installations. ETS benchmarks need to evolve into carbon performance requirements, to be set on a broader performance basis focused on end-use, making the EU ETS carbon market more future-proof as a result.

Driving clean industrial transformation needs a combination of market and non-market policy instruments. The EU's Industrial Emissions Directive (IED) should be used to reinforce the market-based approach of the EU ETS by ensuring full coherence on addressing all relevant environmental impacts, including climate protection. Greenhouse gas mitigation should be specifically included in the IED, as well as strengthening compliance monitoring with Environmental legal requirements.⁶

A **Carbon Border Adjustment mechanism** has been announced and, if implemented, must work to replace the current free allowances system. It should be designed and implemented to facilitate the EU's and international climate ambition and strengthen the business case for zero-carbon industrial transitions. The negative externalities of carbon emissions must be fully reflected in the price of pollution. The practice of insufficiently targeted and over-generous handouts of free allowances to carbon-intensive industry sectors must end.

State Aid for compensating ETS indirect costs undermines the polluter pays principle and removes market incentives for energy intensive industries to take steps towards energy efficiency, decarbonisation, and investments in cleaner production. Should compensation of indirect costs be maintained, then it needs to be limited in scope and time and help deliver greenhouse gas emission reductions as effectively as possible. It should also be compatible with the wider objectives of the European Green Deal.

⁶ See more information on how to strengthen the IED here: <https://eeb.org/library/an-eu-industrial-strategy-for-achieving-the-zero-pollution-ambition-set-in-the-european-green-deal/>

Policy recommendations:

At the EU level

EU Carbon Market

- **Increase the Emission Trading System Linear Reduction Factor** to align with the Paris Agreement's goal of limiting the global temperature increase to 1.5 degrees.
- **Increase the Market Stability Reserve (MSR) intake rate** to 36% from 2024, and set an automatic cancellation for allowances held in the MSR for more than five years, to avoid re-emerging oversupply of allowances on the market.
- **Phase out free allowances** to transition to their full auctioning and mandate revenue recycling to further climate action (including for industrial decarbonisation).
- **Set regulatory emission performance requirements** through a thorough review of the ETS benchmarks in order to make them more harmonised, functional and transparent, as well as product orientated and more ambitious.

Carbon Border Adjustment Mechanisms (CBAM)

- **Consider alternative policy options**, including the implementation of carbon emission performance standards for energy-intensive materials and creating markets for zero-carbon solutions through public procurement.
- **Fully phase out free allowances to industry if the CBAM is introduced** and make diplomatic efforts to steer targeted countries towards better implementation of the Paris Agreement, also to prevent negative impacts on most vulnerable nations.

Other legislation complementary to the ETS

- **Introduce non-market driven climate tools** to better connect the IED with the EU-ETS.
- **Introduce the regulation of greenhouse gases within the scope of the Industrial Emissions Directive** to support the EU carbon market in driving down emissions from industry.
- **Introduce stricter environmental conditionality on granting state aid** for compensating ETS indirect costs to further incentivise decarbonisation of electricity consumption by energy-intensive sectors and fossil fuel phase out.

At the national level

- **Align cancelling allowances with the closure of power plants** (ETS Article 12.4).
- **Implement national or regional carbon floor prices** in the absence of an EU system, and provide the necessary incentives to phase out fossil fuels.
- **Fund large scale energy saving, renewable energy and clean industrial breakthrough technology projects** with ETS auctioning revenues.
- **Introduce air pollution taxation** building on the example of the Norwegian NOx fee.

Towards a 100% renewable energy system

Industrial transformation must address the multiple challenges facing humanity, seeking actions that avoid burden shifting. Addressing energy supplies must go beyond carbon content in energy carriers, as this risks ignoring other important environmental impacts, including raw material extraction, nuclear waste and air pollution. In an interim period, changing to renewable energy sources is an obvious contributor to industrial decarbonisation. Further market penetration of renewables, in particular non-combustion types, will also play a key role in economy-wide greenhouse gas and wider air pollutants emissions reduction. However, this will entail a steep increase in demand for raw materials that must be met by circular economy provisions.⁷

Set the path to a 100% renewable energy system

Many 'transitional technologies' are promoted as temporary solutions to decarbonisation, but these are actually a double liability: they are bound to become stranded assets as soon as their non-compatibility with climate neutrality becomes evident and, in the critical years of the energy transition they take precious resources from the most needed investment streams such as circular economy measures and renewable energy production to sustain electrification of industrial processes.

The switch towards "green gas" should not be a justification to support further spending on "upgrading" the gas infrastructure, *instead of calling* for a rapid phase out of all fossil fuels. Furthermore, it is highly unlikely that "green gas" will be able to compete with imports of gas from Russia and the Middle East or even with LNG from all over the planet, or fracked gas from the USA, hence leaving room for the cheaper gas to be kept in use. Therefore, for a truly Paris Agreement-compatible grid and wider energy system, priority should be given to efficiency, electrification and shifting away from gas. A major opportunity to dedicate the limited quantities of renewable gas to energy-intensive industrial processes lies in converting domestic and commercial heating away from gas towards renewable energy and heat pumps, via the eco-design directive, and via district heating.

Policy recommendations:

- **Prepare grid operators to adapt their infrastructure** to enable a swift transition to a 100% renewables supply through effective EU energy infrastructure planning.
- **Mandate ENTSO-G and ENTSO-E to formally adopt a Paris Agreement-compatible scenario** in their 10 Years Network Development Plan (TYNDP).
- **Require an update of the NECPs with a specific focus on industry** to factor in the energy efficiency first principle and the shift of power demand to carbon neutrality.
- **CCS should not be used to decarbonise fossil fuels** (both gases and electricity), given its technical economic and environmental challenges.
- **Call for a phase out of coal-fired electricity generation by 2030** at the latest.

⁷ Circular economy for climate neutrality, CEPS, 2019; see also Critical raw materials and the circular economy. JRC, 2017

Target the use of hydrogen and biomethane

Today, over 95% of the globally traded hydrogen is produced from dirty fossil fuels, mostly fossil gas, with or without CCS being applied, at very high cost.⁸ Only renewable hydrogen, produced via electrolysis using renewable energy is compatible with the energy transition. The production of hydrogen should be optimised to enhance renewable generation deployment and should not compete with renewable electricity that could be used in direct electrification of heating and transport.

Hydrogen will not be unlimited and scaling up production will take time. Hydrogen use will need to be targeted at industrial processes that are not easily directly electrified, such as low carbon iron production via Hydrogen Direct Reduction of Iron.

Hydrogen use in industries will require a European hydrogen transport network. Dedicated hydrogen transport networks serving industrial clusters will allow for industries to transition to dedicated hydrogen zero-carbon processes. Blending of hydrogen with fossil gas in the fossil gas grid will not result in the required emission reductions, will preclude dedicated hydrogen processes and retain the transmission and use of fossil gas.

Sometime referred to collectively or interchangeably as “renewables gases” biomethane and synthetic-methane are chemically identical replacements for fossil gas. Realistically, they can only replace a small fraction of the fossil gas volume used today and thus should not be accepted as a rationale for continued deployment of fossil gas infrastructure and fossil gas-dependent processes. In reality, fossil gas will require a radically decreased user base making most of the current and planned fossil gas grid obsolete.

Numerous studies funded by the gas industry have exaggerated estimates of the future availability, promoted ineffective accounting of the GHG impact and downplayed the high costs of these replacement gasses. The vested interests of the fossil gas industry have exaggerated the narrative of biomethane and synthetic-methane to retain investments in fossil gas. The reality will be to continue the lock-in of our economy into fossil fuels and fossil fuel infrastructure.

There is, still, a limited role for sustainably-sourced biomethane (from waste/sewage/manure) as a substitute of fossil fuels to provide heat and feedstock in some critical carbon-intensive processes when electrification cannot be applied.

Policy recommendations:

- **Develop definitions of hydrogen** that are clear, transparent and based on a scientific evidence and a robust life cycle emission assessment.
- **Introduce sustainability criteria for the production of renewable hydrogen** from renewable energy sources.
- **Require a cradle-to-grave life cycle analysis of greenhouse gas emissions for any gas that claims emissions reductions** (biomethane, synthetic-methane) and the application of strict sustainability criteria in biomethane projects for compliance with climate goals.

⁸ Hydrogen: the economics of production from fossil fuels with CCS, Bloomberg NEF, 2020

- **Exclude support for renewable hydrogen projects in industry infrastructure where direct renewable electrification is possible.**
- **Assess the (future) available volumes of renewable hydrogen and sustainable biomethane** and their infrastructure needs before planning and building hydrogen-dedicated infrastructure, to avoid supporting fossil gas and fossil-based hydrogen.

Minimise the use of biomass

While biomass can provide energy and feedstocks for a variety of industrial streams, it can also prove unsustainable when it leads to direct or indirect changes in land use and land cover that hamper natural carbon sequestration. Biomass production for energy and materials can lead to competition with food, biodiversity loss, soil depletion and a sharp increase in local emissions that take a serious toll on public health.

While sustainably sourced biomass might have a limited role to power carbon-intensive industrial process (chemicals, cement) this has to be carefully evaluated as the land consumption associated with it can be 40 to 240 times higher than other decarbonisation pathways.⁹

Policy recommendations:

- **Set limits and criteria for biomass use in industrial production** through a horizontal approach (finance, energy, biodiversity, agriculture and pollution policies).
- **Revise the Renewable Energy Directive II** to provide a clear framework for industrial biomass use.
- **Mandate cascading use of biomass** when this is included in any brownfield or greenfield project.

⁹ <https://scienmag.com/how-the-chemical-industry-can-meet-the-climate-goals/>

Drive sustainability along the value chain

To fully achieve the European Green Deal goals of climate neutrality and zero-pollution, and to fully recover from the economic crisis, industrial transformation must go beyond largely technical measures focused on industrial processes.

Transformative actions must be extended to issues from engaging and keeping skilled workforces, new business models based on quality, rethinking products as services, ecodesign and transparency, as well as collaboration along value chains.

Industrial transformation can create opportunities to deploy synergistic changes along with additional savings to companies, strengthening communities and creating new jobs. The full decarbonisation of energy-intensive industry by 2040 is already technically achievable in some sectors, while in others much can be done even before 2030.¹⁰

Prioritise circular economy and reduced material consumption

Carbon neutral, resource efficient and zero-pollution heavy industry will bring benefits to society and the economy at large. We will see reduced raw material extraction, a lower energy intensity of logistics, longer lifespans of products and less waste.

New, innovative business models are being tested and implemented to increase economic resilience. Among others are industrial symbiosis (e.g. valorisation of waste heat and materials waste streams), product management service, cradle to cradle, green supply chain management, circular supplies business model, product life extension, lean manufacturing, closed loop production, and take back management.¹¹

More specifically, increased material and greater resource efficiency can be obtained through the optimisation of industrial processes and by maximising recycling of secondary materials such as scrap metals and concrete. Extending the lifetime of products such as cars, houses, industrial motors and infrastructure such as roads and bridges via improved design and by increasing shared ownership schemes is also crucial. This would reduce the need for carbon-intensive materials (primarily steel, cement and chemicals) and lead to quicker and cheaper carbon neutralisation, by relieving pressure on natural resources, in part by diminishing the need for resource extraction such as mining and the threat of harmful deep sea mining all together.

Policy recommendations:

- **Improve closed loop production systems** by improving separate collection of the waste streams and setting quality targets for secondary raw materials.
- **Make sure the waste hierarchy is rigorously respected** and support the creation of a sustainable market for the reuse of products and materials, especially for high-impact sectors and resources.

¹⁰ Meeting the UN Global Goals. Cross-linkages and example from the Swedish steel industry, Jernkontoret, 2017

¹¹ Industrial Value Chain: a bridge towards a carbon neutral Europe, VUB+IES, 2018

- **Improve resource efficiency in industrial production** by systematically setting Best Available Techniques associated Environmental Performance Levels for resource consumption and waste prevention, set per production outputs.¹²
- **Increase the circular material use rate**¹³ by at least 100% by 2030, in line with the objectives of the European Commission's new Circular Economy Action Plan, based on transparent sector benchmarking performance.
- **Introduce a minimal share of sustainably sourced renewable feedstock for production** consistent with the EU climate goals.

Build strong links between decarbonisation, circularity and zero-pollution

The implementation of the Industrial Strategy must be aligned with the EU goal of zero-pollution and address the problems caused by hazardous chemicals across sectors. Aligning with the risk management hierarchy of actions that prioritises exposure prevention, elimination and substitution over control measures is also needed to fully realise the potential socio-ecological impacts of zero-pollution. For instance, as the Industrial Emission Directive is set for revision in 2021, further climate neutrality objectives should be fully integrated in BREFs (best available techniques reference documents) alongside circular economy principles, while at the same time full integration of the BAT for environmental protection should be made a prerequisite for financing industrial climate innovations.

Policy recommendations:

- **Implement improvements towards multiple environmental objectives via sustainability criteria** plus carbon and environmental footprints in the framework created by the new Circular Economy Action Plan and the Industrial Strategy.
- **Support low-carbon products with demand-side measures** such as Green Public procurement
- **Set carbon footprint information and performance requirements for materials placed on the EU market**, including recycled content.
- **Redefine the approach on defining Best Available Techniques**¹⁴ so it is based on achieving the best ratio of environmental impact against a public good or service provided, within a value chain approach

¹² The EU BREF documents do not systematically set environmental performance benchmarks for resource consumption, be it energy, water or chemicals. BAT-AE(P)L for energy are often set as "indicative" due to limitations brought by the EU-ETS Directive, or confidentiality concerns of operators. See examples in FDM BREF (BAT18, 21, 27, 28) or TXT BREF Draft (BAT 29, BAT 35-38). See more information here <https://eeb.org/library/an-eu-industrial-strategy-for-achieving-the-zero-pollution-ambition-set-in-the-european-green-deal/>

¹³ <https://ec.europa.eu/eurostat/web/circular-economy/indicators/monitoring-framework>

¹⁴ See <https://eeb.org/library/an-eu-industrial-strategy-for-achieving-the-zero-pollution-ambition-set-in-the-european-green-deal/>

Industrial Transformation

Rebuilding the European economy after Covid-19 lockdowns will create an unprecedented demand on public funding. It is essential that these resources are used to radically transform the industrial sector, which is one investment-cycle away from 2050's climate-neutrality target. A compulsory phase-out of the worst performing products and processes should be a priority. This could be done according to a defined timeline and based on progressive ambition on environmental performances, as is the case for ecodesign measures.

Policy recommendations:

- **Enshrine sectorial carbon neutrality for industry in the implementation of the Industrial Strategy and Climate Law.**
- **Prioritise prevention measures over post-pollution measures.**

Electrify processes and reduce energy demand

In the coming decades, production innovation driving towards better-engineered logistics, process integration,¹⁵ by-products reuse and low to zero-carbon feedstock should become the norm whether in existing or new plants. For energy intensive industries it is imperative to lower energy demand, in order to allow for electrification and 100% renewable energy supply.

The horizontal improvement of waste heat recovery and the electrification of steam crackers, cement kilns, iron ore sintering, steel reheating furnaces, and high-temperature steam production will be required. The heat demand in these production processes is massive and shall be met by several electrified technologies, some of which are being studied and tested (induction, plasma), while others are already available (electric arc furnaces).

Overall, though local production and decreasing installation costs can bring lower energy costs in future, an effort to limit the increase in electricity demand to a maximum of +45% should be made¹⁶ in view of parallel increased electrification of other sectors (i.e. domestic heating) that is likely to increase competition for such energy in the coming years..

Policy recommendations:

- **Prioritise refurbishment processes** that aim to lower energy demand and increase electrification by supply of renewable energy.
- **Secure the development of increased capacity of renewable electricity** production and distribution to industrial compounds.

¹⁵ A bridge towards a Carbon Neutral Europe, VUB-IES, 2018

¹⁶ Industrial Transformation 2050, Material Economics, 2019

Increase material safety and efficiency

Circular Economy measures can more than halve the emissions from the steel, plastics, aluminium and cement sectors by 2050.¹⁷ While other measures are needed to achieve carbon neutrality, circular economy must be a core industrial priority.

The environmental footprint of construction and buildings is derived from material (embodied) and energy-related (operational) emissions: mandatory provisions for reductions in both embodied and operational emissions must be a key outcome of the Commission's future Sustainable Built Environmental Strategy as announced in the Circular Economy Action plan.

Policy Recommendations:

- **Set a reduction target on overall virgin resource use by 2030** (based on Material Footprint) for metals, minerals and plastics
- **Set waste prevention targets on commercial and industrial waste** requiring reduction of residual fractions (similar to halving residual municipal waste reduction target by 2030 as stated in the new CEAP) as well as overall binding waste prevention target for commercial and industrial waste set up at EU level for Member states
- **Support setting stringent Paris-compliant high environmental performances for all energy intensive materials** irrespective of intended use in the future Raw Materials Alliance and Strategy
- **Impose requirements on plastic and other carbon-intensive materials**, so they are made long-lasting, reusable and, when discarded or they reach their end-of-life, are collected through material loops systems decontaminating and recycling them with equivalent functionalities as virgin
- **Ensure that new buildings are net-zero** when constructed and over subsequent stages of the life-cycle. All building codes for new constructions should have provisions for resource efficient design that help minimise the material-use to functionality ration, supported by a minimum requirement for recycled content in new builds of 15% or more,¹⁸ moreover such content should be detoxified 2025 at latest;
- **Urgently promote a moratorium on deep seabed mining** to be in place as of 2021 to prevent harmful raw material extraction in our oceans as secondary materials offer a far more viable supply source.

Promote production improvements

Raw material processing is the core of value chains of carbon-intensive production. Many production sites were built over 40 or 50 years ago. Considering that improving material and energy efficiency along the value chain alone will not be enough to achieve climate-neutrality, a major effort must be made to improve core industrial processes: examples vary from alternative binders from cement to reprocessing of by-products in chemical plants.

¹⁷ Circular Economy, a power force for climate mitigation, Material Economics, 2018

¹⁸ Delivering higher recycled content in construction projects, WRAP, 2009, (Full report available [here](#)).

Policy recommendations:

- **Make resource (energy and material) efficiency first principle a precondition for all innovation and refurbishment projects** in industry.
- **Give priority to R&D on innovative processes to substitute greenhouse gas emitting materials**, especially those unlocking new decarbonisation pathways, through innovative financing scheme such as Carbon Contracts for Difference.
- **Require waste heat recovery in industrial processes** and/or district heating in refurbishment projects.
- **Introduce minimal binding energy efficiency requirements** based on best in class solutions within a given industrial activity (e.g. electricity, heat generation).
- **Introduce minimum greenhouse gas performance requirements**, through stringent and binding minimal requirements (emission limit values) to achieve a complete coal phase-out for electricity generation in Europe by 2030, and set drivers for industrial decarbonisation (such as fuel switching) to achieve decarbonisation pathways in line with IPCC requests and by 2050 at the latest.

Develop clean digitalisation solutions to facilitate the transition

Digitalisation has a role to play in achieving a decarbonised and circular economy. Manufacturing sectors have been slower in their digital transformation and the digitalisation of manufacturing products (steel, construction, chemicals) is still lagging behind. Innovative digital technologies are also key to ensure resource efficiency (feedstocks, materials, water consumption) and therefore help circularity in industrial processes. However, digitalisation necessarily demands increased use of electrical and electronic equipment, products with considerable environmental footprints along their full lifecycle. They contain various plastics, heavy metals, and hazardous substances, and are mainly sent outside the EU for questionable recycling. A holistic approach to the digitalisation transition is needed, one which addresses the environmental and human health impacts of the equipment while addressing the social and ethical aspects of data gathering and ownership.

Policy recommendations:

- **Tackle the growing energy use of data centres** at building, server, and software level, applying strict energy and resource efficiency, renewable energy sourcing and waste heat recovery criteria.
- **Better utilise and harmonise existing industrial data and information sources** based on common approaches using existing technology as a basis for climate target setting for energy intensive industries.
- **Impose stringent environmental and social in procurement of materials and products** supporting digitalisation.
- **Set up an enabling framework (assessment, regulation, finance) for strengthening the role of digitalisation** in the decarbonisation of industrial processes, both in terms of energy consumption and resource efficiency.
- **Identify frontrunners in the digitalisation of manufacturing sectors** and set minimum requirements for key products (steel, non-ferrous metals, cement, chemicals, paper, etc) which digital tools can help to measure, monitor and surveille the market.
- **Make sure that the decarbonisation of the energy system is fully integrated with a strategy for the digitalisation of the manufacturing industry**, with focus on the implementation of the RED II and the Energy Efficiency Directive.

Limit and target the use of Carbon Capture and Storage (CCS)

The EU should prioritise technologies that focus on production process transformation rather than mitigation measures such as CCS: throughout several years, a number of CCS projects have been cancelled¹⁹ and current leakage rates still make both CCS and CCU (Carbon Capture and Utilisation) projects problematic in light of EU climate targets. Inclusion of CCS/U in emission targets therefore needs to take into account high uncertainties and potentially unsatisfactory outcomes once the technology is applied on a larger scale.

- **Review the current regulatory framework of CCS** to better define how the transmission infrastructure for industrial sites will be financed and regulated, especially with regards to access, benefits and cost-sharing arrangements from a cross-border perspective, when CCS is deemed necessary.
- **Ensure that CCS funding is dedicated exclusively to the decarbonisation of non-abatable industrial process emissions** for industrial sectors such as chemicals and cement.
- **Avoid supporting CCS as a solution to “greening” fuels** in the energy supply chain (for instance, natural gas).
- **Define a ‘white list’ of technologies and set priorities for decarbonisation where CCS is not favoured** in the implementation of the Industrial Strategy.
- **Ensure that the EU Strategy on Clean Steel does not rely on CCS as a main source of decarbonisation** of processes.
- **Promote breakthrough technologies and wider innovation** to eliminate currently non-abatable-process emissions sectors to finally replace CCS
- **Monitor and ensure that any form of deployed CCS adheres to strict environmental and social safeguards** in order to minimise negative consequences.

¹⁹ https://www.foodandwaterwatch.org/sites/default/files/ib_2003_carboncapture-web.pdf

Conclusion

The corona crisis has demonstrated the ability, willingness, and popularity of government intervention to protect both people and businesses when science offers clear warnings.

As Europe faces both the short and long-term consequences of the coronavirus, it is essential to plan for a green recovery, where unprecedented public and private investments recognise the urgency of tackling climate breakdown, biodiversity loss and harmful pollution in our air, water and soil.

The European Green Deal has won the support of key figures from industry, politics and civil society as EU leaders have sketched out a bold vision to transform our economy. If adopted, the measures described in the 82 policy recommendations above could help deliver this vision, transforming European industry forever, and helping to create a new, clean and safe industrial sector, with millions of future-proof jobs.

The first few months of the new decade have taught us that a return to “business as usual” is not only no longer possible, but also no longer desirable. Among the loss and suffering we have experienced, stories have emerged of cleaner air and water, a fleeting glimpse of nature and a yearning for more a more resilient economy that can weather future storms.

It is time for European and national decision makers to turn the promise of clean and responsible industry into reality. Now is the moment to build back better.

