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Sitra / Mari Pantsar 16.12.2019 Julkinen

European industrial strategy to operationalise the Green Deal

This document collects the views of the Finnish Innovation Fund Sitra on how the European industrial strategy could be utilised to operationalise the European Green Deal. We describe three required solutions: 1) circular economy, 2) new processes and feedstocks, and 3) carbon capture and storage. We identify five crucial enablers to implement the solutions: 1) clear and shared outlook, 2) access to affordable necessary inputs and infrastructure, 3) incentives for material recirculation, efficiency and new business models, 4) incentives for early investment, and 5) accelerated technology development.

We conclude with eight policy recommendations that aim to accelerate the transition towards a climate neutral EU:

1. Develop a joint industry-energy transition strategy
2. Reform EU ETS
3. Push for the circular economy of materials
4. Create competitive lead markets for low-CO_2 solutions
5. Finance to scale up investments and avoiding high-carbon lock-in
6. Innovation framework to ensure accelerated technology market readiness by 2030
7. Encourage all member states to adopt environmental tax reforms
8. Promote development in capabilities and collaboration

1 Introduction: Industrial strategy must be aligned with climate and circular economy objectives

Europe and the world are at a crossroads. The climate crisis and rapid loss of biodiversity pose a great threat to humanity, and scarce resources are overused. It is evident that the economic system needs to be reformed to operate within the planetary boundaries.

The task of the European Green Deal is to deliver climate neutrality by 2050 while protecting biodiversity, stopping the overuse of natural resources, increasing the wellbeing of Europeans and enhancing the competitiveness of Europe.

European industries will play a key role in delivering the objectives of the Green Deal. Industry emissions under the EU ETS amount to approximately 13%[1] of EU emissions and the sector is a major user of raw materials and energy. To date, emissions from these sectors have been considered especially 'hard to abate'. Existing industrial low-carbon roadmaps left up to 40% of emissions in place in 2050. This would make industrial emissions one of the main roadblocks to overall net-zero emissions. It is vital that the EU industrial strategy, as part of the Green Deal, will be aligned with the ambitious climate and circular economy objectives, and a just transition. To ensure European industries' competitiveness also in the future, the transition needs to be well managed.

2 Recipe for success: the required solution set

2.1 Circular economy

Circular economy is a key solution to address the challenges of climate change, biodiversity loss and overuse of natural resources. It also offers growing business opportunities and an advantage in terms of addressing inefficiencies and untapped value potential.

[1] EEA (2019): The EU Emissions Trading System in 2019: Trends and Projections.

In circular economy, the value creation from a resource is maximised, which means offering products that remain in circulation and retain their value for as long as possible or even increase in value while in circulation. Product manufacturing from virgin raw materials is replaced by maintenance, reuse and recycling, and the aim is to turn waste and side streams into products with a higher value, keeping loss and waste to a minimum.

Circular business models can be applied across the entire value chain – however, the biggest value potential lies typically in the product use phase, requiring increased forward integration of industrial companies. A significant change in industrial culture and mindset is needed: shifting the focus from production to customer and maximizing the value of existing products, while decoupling value creation from resource consumption.

Sitra has identified five business models that enable the shift to circular value creation, and are already applied by forward-thinking companies that are focusing on customer outcomes[2]:

- Circular supply chain models introduce fully renewable, recyclable or biodegradable materials that can be used in consecutive lifecycles.

- Sharing platforms create business opportunities for consumers, companies and micro-entrepreneurs who rent, share, swap or lend their idle goods, leading to higher use rates of products.

- The product life extension model seeks to recapture the value in discarded products through repairs, upgrades, remanufacturing or remarketing, keeping the products economically useful for a longer time.

- Companies using recovery and recycling models recover end-of-life products and/or by-products to recapture and reuse valuable material, energy and components.

- In product as a service model, customers pay for a product per use, while the ownership and lifecycle costs of a product stay with the producer setting incentives for resource efficiency along the complete lifecycle.

A study by Material Economics (2019) supported by Sitra and others[3] found that a more circular economy is a large part of the answer to achieving climate neutral industry. Circular economy reduces emissions through 1) materials efficiency throughout value chains and 2) materials recirculation and substitution. The study found that the emissions from steel, cement, plastics and ammonia could be reduced by up to 65% by 2050 through increased materials efficiency and recirculation.

2.2 New processes and feedstocks to eliminate fossil CO_2 emissions

While the opportunity to improve materials use and reuse is large, the EU will also need clean new materials production. As many current industrial processes are tightly linked to

[2] Sitra in association with The Foundation of Finnish Technology Industries and Accenture created a Circular Economy Playbook http://www.kasvuakiertotaloudesta.fi/, a tool for companies to clarify and define a solid business case with circular business models within the different value ecosystems and networks. The idea of the playbook approach is to recognize and define clear business benefits on circular business models and deploy these benefits as global advantages for sustainable growth.

[3] https://materialeconomics.com/publications/industrial-transformation-2050

carbon for either energy or feedstock, deep cuts often require novel processes and inputs, as showcased by Sitra & McKinsey (2018)[4] and Material Economics (2019).

Both low and high-temperature processes, as well as the production of key inputs, including hydrogen, need to be electrified. For chemicals, new processes are needed to enable the use of non-fossil feedstocks, such as hydrogen, biomass and recirculated plastics.

2.3 Carbon capture and storage

Various studies point to at least some carbon capture and storage (CCS) to be required in order to reach a carbon neutral industry, at minimum to capture the process emissions from cement making.

CCS is also the main alternative to mobilising new processes and can decrease reliance on processes and feedstocks not yet deployed at scale and allow the continued use of more of current industrial capacity. However, CCS is also far from a simple solution: to enable high capture rates, reconfiguration of production processes is often needed, and for geographically dispersed production the provision of suitable transport and storage infrastructure may pose significant challenges.

It must be noted that carbon capture and use (CCU) is viable in a wider net-zero economy only in very particular circumstances, where emissions to the atmosphere are permanently avoided.

3 Economic implications

Costs of the transition would be manageable to the overall economy, suggest Material Economics (2019). Consumer prices of cars, houses and packaged goods would increase by less than 1% to pay for climate neutral materials. A more circular economy and affordable electricity are among the most important factors to keep overall costs of the transition low; Material Economics (2018)[5] finds that many measures promoting the circular economy in the industry sector can, form a societal perspective, 'pay for themselves'. Similarly, the transition to low-carbon industry can be attractive from employment perspective. Overall, circular economy solutions are more rather than less labour-intensive, so implementing them could create additional jobs in the overall value chains[6].

Low-carbon transition emphasising deep value chain integration, continued process and product innovation, and reliance on local end-of-life resources offers a head start in developing solutions that will eventually be needed globally, and the EU would move to a more secure position: a more materials-efficient economy that is less reliant on imported fossil fuels and feedstock, and more attuned to domestic sources of comparative advantage.

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[4] https://media.sitra.fi/2018/11/30103309/cost-efficient-emission-reduction-pathway-to-2030-for-finland1.pdf

[5] https://materialeconomics.com/publications/the-circular-economy-a-powerful-force-for-climate-mitigation-1

[6] A forthcoming study by International Institute for Sustainable Development (IISD) and Sitra looks at the employment and trade implications of circular economy solutions.

4 Crucial enablers needed to implement the solutions

4.1 Clear and shared outlook

Like the energy sector, also the industry must now direct all innovation and investment efforts towards circular solutions and new processes that enable deep cuts in CO_2 emissions. A shared expectation of future development is an important near-term prerequisite for success recognized by both Material Economics (2019) and Sitra & McKinsey (2018). There must be broad commitment to emission reductions and circularity, and good visibility to future regulatory environment as well as available infrastructure and finance.

4.2 Access to affordable necessary inputs and infrastructure

Sitra & McKinsey (2018) and Material Economics (2019) have recognised key inputs and infrastructure needed for the transition.

- Electricity demand will grow significantly due to electrification of processes, production of green hydrogen and also the electrification of other sectors, such as transport and heating. This entails accelerated decarbonization of electricity production, significant investment into new power capacity, integration of intermittent production to the energy system and ensuring sufficient electricity transmission and distribution grids. The better the links between cheap power sources and key industrial demand centres, the more competitive European industry will be.

- Hydrogen becomes an important feedstock. In addition to ensuring its clean production, infrastructure for distribution and storage to supply major industrial clusters must be secured.

- CCS requires infrastructure for transport and storage of captured carbon.

- Biomass will become an important feedstock for chemicals and biogas can offer an option to electrification of some high-temperature processes, but biomass demand is growing also in other sectors. To avoid unsustainable levels of use, the use cases must be prioritised.

- Waste handling infrastructure must enable the mobilisation of waste as a major industrial resource.

4.3 Incentives for material recirculation, efficiency and new business models

Material Economics (2019) points out that many circular economy solutions are held back by market failures. The price of new materials often does not reflect the full cost of environmental externalities, including CO_2 emissions. The extent of materials use is often unknown, and parties best able to avoid the overuse of materials, promote the use of recycled materials, or to design products in a way that enable high-quality end-of-life materials or repairability, have few incentives to do so.

Materials efficiency must thereby be made a part of climate policy, much like energy efficiency is. It must be incentivized and the market failures and barriers need to be

addressed. In addition, clean material flows, traceability of materials and high collection rates must be encouraged and a business case for using recycled materials and feedstock made.

4.4 Incentives for early investment

The European Union Emission Trading Scheme (EU ETS) is important but not enough to drive the required industrial transformation, as concluded by Material Economics (2019), Sitra & McKinsey (2018) and Sitra & Öko Institut (2019)[7]. While the costs are manageable to the overall economy, they can be significant to the companies and far exceed current or expected near-term carbon prices in the EU ETS.

Moreover, many investments in the next 5–15 years would be in 'first of a kind' solutions, which entail larger capital expenses and risks than fully mature solutions, putting early movers at a disadvantage. But due to long investment cycles, commitments to the low-CO_2 path must be made when it is time to next reinvest, or we risk a lock-in to a high-carbon future. Public sector needs to ensure that companies can make those investments with an acceptable level of risk. The EU must therefore 1) ensure an underlying future business case for higher-cost low-CO_2 solutions and 2) provide the certainty required for early commitment to low-CO_2 development and investment.

4.5 Accelerated technology development

Rapidly developing technologies such as industrial internet of things, big data and artificial intelligence enable new circular economy business models. Material Economics (2019) finds that there is also a largely known set of emerging solutions in industrial processes to build upon, with significant innovation momentum, but many key options are not yet commercially viable. We have a very short timescale to bring solutions to full readiness by 2030, and it is unlikely that existing incentives enable companies to commit the resources required for large scale demonstrations. Innovation must thereby be publicly supported.

5 Recommendations for the EU industrial strategy

The following recommendations reflect the solutions, challenges and crucial enablers presented above and aim to accelerate the transition towards a climate neutral EU. Recommendations are based on studies by Institute for European Studies (2019)[8], Material Economics (2019), Sitra & McKinsey (2018), Sitra & Öko Institut (2019), Sitra & Merit Economics (2019)[9] and Sitra, The Foundation of Finnish Technology Industries & Accenture (2018). Note that any policies will need to be carefully designed to avoid distorting competition beyond what is intended, inducing hidden costs or other unintended consequences.

5.1 Develop a joint industry-energy transition strategy

Develop a joint industry-energy transition strategy including a joint impact assessment. Aim for a virtuous cycle between the energy and industry transitions, where both sectors assist each other in the transition to a climate neutral industrial-energy system. Map the needs for transition infrastructure and other capabilities, identify the technical and commercial pain

[7] https://media.sitra.fi/2019/10/07112628/the-role-of-the-eu-ets-in-increasing-eu-climate-ambition.pdf
[8] https://www.ies.be/files/Industrial_Transformation_2050_0.pdf
[9] https://media.sitra.fi/2019/04/16135618/how-to-implement-a-larger-environmental-tax-reform-in-finland.pdf

points to determine priority areas for mission-driven innovation, and map which sectors and areas face changes in employment. Further develop or refine supply and demand side instruments to secure sufficient and competitive electrification of industry. Formulate a strategic infrastructure investment plan and a fair transition plan, ensuring economic cohesion in Europe during the transition.

It is recommended that a joint industry-energy inter-service taskforce be established within the European Commission, and, together with member state experts, develop such a strategy. To ensure high quality outputs and broad acceptance of the results, a new EU-wide platform consisting of industrial actors, research and technology organisations, trade unions, industrial cluster representatives and technology and infrastructure providers should be established to offer active guidance in the mapping and planning of transition infrastructure.

5.2 Reform the EU ETS

A reform of the EU ETS is a prerequisite for a more ambitious emission reduction target for the EU and the required accelerated decarbonisation of the power sector. Hence, it should be planned carefully and aim to secure the needed emissions reductions while maintaining the stability of the emission trading system.

Sitra & Öko Institut (2019) looks at how the ETS objectives should be altered if EU's 2030 emission reduction target is increased to either 55% or 60%, and recommend that the focus should especially be placed on two measures when revising the EU ETS: 1) tightening the cap to ensure that the number of emission allowances entering the market is aligned with the enhanced emission reduction target, and 2) enhancing the Market Stability Reserve (MSR) to address the surplus of emission allowances. Notably, the emission reduction potential of other assessed measures, such as extending the scope of the EU ETS are much more limited.

The EU ETS is the key instrument to decarbonise the power sector and it ensures the underlying future business case for industrial higher-cost low-CO_2 solutions. When selecting the complete industrial policy package, the effectiveness of existing support measures, such as compensation for indirect emission costs, should be critically assessed. Other critical issue to assess is to which extent carbon removal technologies such as CCS/CCU can be utilized under the EU ETS.

5.3 Push for the circular economy of materials

Encourage clean material flows, traceability of materials and high collection rates, e.g. by meaningful fees and extension of products under Extended Producer Responsibility schemes to penalise products that are difficult to recycle, new design requirements on products to facilitate high value recycling and repair, development of material tracing systems, standardization of recycled materials to ensure quality, targets for cutting CO_2 emissions from waste, or updating recycling targets to encompass quality, not just quantity.

Create a business case for using recycled materials and feedstock, e.g. through lead markets that are neutral in terms of recirculated and new low-CO2 materials or tracking and labelling basic materials along the value chain based on the GHG content of production.

Encourage materials efficiency, e.g. by requiring companies to set goals and report on material efficiency or setting material efficiency standards to eliminate inefficient production practices.

5.4 Create competitive lead markets for low-CO_2 solutions

To ensure an initial business case to enable companies to make a near-term strategic choice for low-CO_2 production, four areas can be considered:

- Pricing support to make low-CO_2 products competitive, e.g. through a 'feed-in-tariff' or quotas and tradable certificates for low-CO_2 production. A key challenge will be handling the heterogeneity of products.

- Standards to create a specific low-CO_2 market in material-using value chains. Also redesign existing standards that hamper market access for low-CO_2 products.

- Use public procurement to directly create lead markets. Consider setting up an EU Public Procurement Task Force that works to enhance public procurement practices and capabilities, share best practices and to develop risk sharing instruments for procurement of new solutions which have no references.

- Carbon border adjustments (CBA). The expected impacts of a CBA both within Europe and outside Europe would need to be carefully assessed together with issues related to the implementation. CBA also do not address the issue of enabling first movers within the EU.

5.5 Finance to scale up investments and avoiding high-carbon lock-in

Especially early in the transition, before technical and commercial risk can be fully resolved, financing instruments for direct investment support will likely be required. Fiscal instruments, such as allowing an accelerated depreciation of low-CO_2 production assets, can assist in guiding investments towards low-CO_2 solutions, but also larger EU financing instruments, such as investment platforms, can be considered.

To reduce the risk of carbon lock-in, the introduction of a 'climate neutrality test' (checking that design allows compatibility with climate neutral EU by 2050) to permitting or environmental impact assessment could be considered. It may be necessary to also support brownfield conversions.

5.6 Innovation framework to ensure accelerated technology market readiness by 2030

Enhance innovation governance to create mission-driven innovation and solid innovation chains from basic R&D to commercialisation. Develop an industrial climate neutrality grand challenge to address outstanding R&D gaps – especially to develop technologies that could significantly contribute to the transition to climate neutral industry, but which have little or no near-term commercial potential. Establish a circular economy R&D-programme for the European manufacturing industry under the Horizon R&D programme. Set up an industrial transition observatory to monitor progress and advice course corrections to development and deployment of industrial low-CO_2 innovations.

Accelerate the commercialisation of new technologies by strongly directing public support to piloting and demonstration. A particular focus should be the financing of large, capital-intensive demonstrations nearing commercial scale. Early deployment must be ensured to create faster innovation loops.

5.7 Encourage all member states to adopt environmental tax reforms

The EU should promote environmental tax reforms (ETR) in the member states. ETRs can support both 1) the equal taxing of emissions and natural resource use in all sectors, also in the non-ETS and LULUCF sectors, and 2) the essential public R&D and investment support to low carbon solutions. Further, ETRs can support circular economy solutions and sustainable use of natural resources. For example, Sitra's economic modelling scenarios[10] of different types of ETRs for Finland find that such a reform can support emission reductions but also firms' competitiveness, circular economy solutions and socially just transition to a low-carbon economy even in a country with already relatively high emission taxes.

5.8 Promote development of capabilities and collaboration

Circular economy business models often require adaptation of product and solution design, and collaboration between traditional and new actors. It is also evident that some jobs will be lost but new ones created during the transition.

Initiatives to promote circular economy education, life-long learning and re-skilling, ecosystem building, cross-sector collaboration and other necessary capabilities are needed to both enable the transition and keep everyone on board. The planning of these initiatives should include wide industrial and employee side participation as well as research on the expected changes in different sectors, the required capabilities of the future, and tools to manage the transition.

Moreover, successful cases, such as those on the list of 'the most interesting companies in the circular economy in Finland'[11], can be used as benchmarks to challenge own operations. Learning from those that have already succeeded can smooth the road and enable faster implementation of solutions, as showcased by Sitra's Green to Scale project series[12]. Initiatives that facilitate sharing of best practices can help all go further, faster.

[10] https://www.sitra.fi/en/publications/technical-report-implement-larger-environmental-tax-reform-finland/

[11] https://www.sitra.fi/en/projects/interesting-companies-circular-economy-finland/. Sitra is planning to make a corresponding European list to accelerate the business transition at European level.

[12] greentoscale.net