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Think 2050, Act 2020: Bringing European ambition and policies in line with the Paris Agreement

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EXECUTIVE SUMMARY

Background

Tackling the threat of climate change demands nothing less than a fundamental transformation of human societies and economies in the coming decades. A key challenge for current policymakers is reconciling short-term policies and measures with long-term ambition. Long-term vision and short-term actions are mutually supportive if consistent: decarbonization can be triggered by choices made today and long-term thinking may not only reveal optimal near-term actions but also inform and galvanize stakeholder support. The Paris Agreement reaffirms this by introducing two governance "vehicles" to steer countries towards the collective goal of limiting global warming to well below 2°C: national long-term strategies (Art. 4.19) and short to mid-term "nationally determined contributions" or NDCs (Art. 4.2). The European Union (EU) pays heed to both: after submitting its NDC prior to the adoption of the Paris Agreement in 2015[1], it is developing a long-term strategy to 2050 and could revise its NDC for 2020. As it stands, following negotiations on the 'Clean Energy for all Europeans' legislative package, many key elements on governance and levels of ambition have already been enshrined in law. Such an explicit link between short-term climate action and long-term ambition is new to EU climate governance. Still, while the Paris Agreement has undoubtedly shifted the focus from incremental change to fundamental transformation, the success of this realignment is hindered by several challenges.

Five key challenges for the 2050 transformation

The EU's current climate ambition to 2030 and 2050 is not aligned with its commitment to the Paris Agreement. The existing 2050 target (laid forth in the "2050 Roadmap" in 2009) is now out of date and must be adjusted to account for the newer global objectives of limiting warming to *well below* 2°C, striving for 1.5°C, and achieving net zero global emissions by the second half of the century. Moreover, the EU is not yet on track to reach the existing 2030 targets—much less those for 2050— and progress across Member States remains inconsistent with key economic sectors (e.g., agriculture, transport, buildings) yet to commence meaningful decarbonization.

The current system of effort sharing by EU Member States is not the most conducive to enhancing collective ambition. Adverse incentive structures, a myopic focus on 10-year periods, and the lack of an adequate reward system for those Member States that do show willingness undermine the effectiveness of EU climate and energy policy as a whole. The EU's broader climate governance architecture should be broadened to incentivize a "race to the top".

There is a lack of dialogue (with both Member State and non-governmental entities) across implementation scales. The long-term success of EU climate and energy policy relies to a significant degree on their ownership by stakeholders at all levels and by political parties across the spectrum. Stakeholders must be involved at the onset and continuously thereafter using a regionally-tailored, sector-specific and transparent approach to ensure buy-in into the collective decarbonization vision for decarbonization. A permanent dialogue at EU level should be established towards this end.

Current strategy development lacks a proactive, comprehensive and sustainable transformation approach. Beyond the GHG, renewables, and energy efficiency targets, the EU has not yet pursued

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[1] The current NDC commits the EU to limiting its domestic GHG emissions to "at least 40%" by 2030.

comprehensive sector-specific strategies for decarbonization. Furthermore, more attention needs to be dedicated to synergies and cross-sectoral solutions.

Gaps and obstacles remain in enabling conditions, which are horizontal policies that are indispensable to facilitate transformation across sectors. For example, significant additional investment is required to meet the current 2030 targets, and the current system of EU funds, including the proposed Multiannual Financial Framework (MFF) for 2021-2027 is not up to the task.

Policy recommendations

To ensure broad transformational change, EU institutions must both "think 2050" but "act 2020". The recommended improvements to existing policies and financial frameworks can be grouped into four clusters: 1) the substance of the 2050 vision, 2) the process for establishing the 2050 vision, 3) the policies to trigger the transformation to 2030 and 4) the means of adjusting enabling conditions.

SUBSTANCE: Offer a vision for a "Paris-compatible" pathway towards 2050

This includes (1) developing a comprehensive mid-century strategy to achieve net zero GHG emissions by 2050 and negative emissions thereafter, (2) revising the EU NDC for 2020 to reflect this long-term ambition, (3) defining a mechanism for the further development of the EU's NDC by 2025 that is informed by a long-term vision embedded in the revision process of Member State's National Energy and Climate Plans (NECPs), (4) ensuring that the EU strategy aligns with the Sustainable Development Goals.

PROCESS: Build ownership for the 2050 strategy

To enhance buy-in and ownership of the EU long-term vision for decarbonization involves (1) creating an inclusive process for strategy formulation and a permanent dialogue on the transformation, (2) elevating the topic to a key strategic goal of the EU by linking the strategy with parallel processes, such as the Sibiu Summit in 2019 and (3) further supporting regional (also across borders) and local climate action through EU policy instruments, including for dedicated support for a just transition.

POLICIES: Create transformative measures to implement the 2050 vision

In addition to aligning the 2030 milestones with a new long-term target, the EU must ramp up its policies accordingly. This includes (1) designing integrated, mission-oriented sectoral industrial policy strategies with specific objectives and (2) adopt policies to implement them under an overarching EU-level coordination mechanism to support national action as well as (3) aligning infrastructure (primarily European energy and mobility networks) policies and related investment funds with the long-term vision and (4) designing a regulatory framework for the enhancement of natural sinks and for negative emission technologies.

CONDITIONS: create European-level enablers

EU-wide instruments that ensure minimum action across the board should be better complemented via regional cooperation and dedicated support mechanisms that foster subnational climate action. This includes (1) establishing direct linkages between the MFF and the 2050 agenda by increasing the climate mainstreaming target, (2) helping Member States and sectors identify investment needs and then matching them with financing, (3) creating financial incentives in MFF conditions and programming for enhanced national ambition, and (4) increasing green public procurement, that looks beyond transport/energy efficiency and includes e.g. low carbon construction materials. Furthermore, (5) mission-oriented innovation support as a component of a revamped EU industrial policy should focus not only on technological advances but also on potential product substitution and business model innovation.

1   Status

1.1   Why think 2050?

Climate action requires both a long-term vision and consistent policies and actions over time to turn the vision into a reality. Clear conclusions can be drawn from the work of the Intergovernmental Panel on Climate Change (IPCC): to have a credible chance of limiting the global average increase in temperatures well below 2°C compared with pre-industrial levels, the world needs to reach a balance between man-made greenhouse gas emissions and removals by sinks in the second half of the century, entering into a period of negative emissions.[2] The Paris Agreement reflects this understanding and establishes it as a core objective.

Tackling climate change implies a fundamental transformation of our economies and societies in the space of a few decades. Considering the scale of the climate challenge, delaying action or locking us into an unsustainable path with our current choices would make it more difficult, uncertain and costly to achieve the long-term goal. Delays in peaking in emissions would require even steeper rates of decarbonisation thereafter, and even greater use of yet unproven negative emission technologies. Moreover, continuing to build carbon-intensive infrastructure will create costly stranded assets. Transformation thus needs to be triggered by today's policies. Conversely, the purpose of thinking ahead to 2050 is to reveal which actions policymakers need to take in the nearer term to be on a collective path to carbon neutrality. Long-term thinking can also serve to inform and galvanize stakeholder support for transformational change (see Sartor et al (2017) and Duwe et.al 2017).

The Paris Agreement requests countries to develop both the long-term vision and the short-term policies consistent with the collective climate goal. The Agreement is the first international agreement to set carbon neutrality as a global long-term objective (Art. 4.1), thus reflecting a consensus on the scale of the climate challenge (Vallejo et al., 2018). The Agreement also reaffirms the need for all countries to take action and introduces two governance "vehicles" to steer countries towards the long-term goal: national long-term strategies (Art. 4.19) and short to mid-term actions formulated as "nationally determined contributions" or NDCs (Art. 4.2). The European Union (EU) submitted its first NDC prior to the adoption of the Agreement[3] and some Member States[4] stated they aim for the EU to submit by 2020 both a revised NDC and a long-term strategy, in line with its voluntary commitments (Para 23 and 35 of Decision 1/CP.21). It is then bound to submit a new NDC every five years (Art. 4.9) as part of the overall NDC cycle of the Paris Agreement (Bodle et al 2016). On the long-term vision, the EU has enshrined the strategy development into its own new climate and energy governance legislation (Article 14), but still needs to go through the actual process of creating a transformational 2050 strategy.

1.2   State of play

For the first time in the many phases of its climate policy-making, the EU is making the direct connection between short-term climate action and long-term ambition, which is owed to a large part to the Paris Agreement.[5] In 2008, as the EU institutions formally adopted its previous a climate and energy package with targets for 2020, a long-term climate objective to 2050 came as an add-on many

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[2] The recent IPCC Speial Report on 1.5°C reaffirms this notion. It shows pathways for "no and low overshoot" of 1.5°C as well as with high overshoot reaching net zero CO2 emissions already by 2050. The pathways also involve deep reductions of non-C02-Emissions until 2050, but these do not yet go to net zero at that point.

[3] The current EU NDC commits to limiting its domestic GHG emissions to « at least 40% » by 2030, based on the direction decided by EU Heads of State and Government for 2030 Climate and Energy Framework in October 2014. This has since been enshrined in legislation at EU level and is thus legally binding.

[4] E.g. France and Germany, June 2018. https://www.bmu.de/en/pressrelease/svenja-schulze-und-nicolas-hulot-bekraeftigen-die-zentrale-bedeutung-von-umwelt-und-klimaschutz-fuer/

[5] For a history of EU climate policy and its different phases, see Oberthür and Pallemaerts (2010) and Duwe, Prahl, Hoffmann (2014).

months later.[6] In 2014, more than a year before the Paris summit, the European Council laid down many essential elements of the Climate and Energy Policy Framework to 2030, but the 2050 dimension did not feature. The clear long-term objectives of the Paris Agreement, adopted in 2015, have changed the perspective from incremental change to fundamental transformation. In 2018, the EU is attempting to articulate climate policy at both time horizons (2030 and 2050): following negotiations on a comprehensive set of legislative proposals (mostly through the 'Clean Energy for all Europeans' package, 2016), key aspects of the EU's post-Paris framework have become law.[7] In the process, the level of ambition for the energy targets has slightly increased compared to the 2014 European Council conclusions. In addition, the Commission is to propose elements of a long-term climate strategy before the end of 2018. The EU is developing both vehicles in parallel, when in theory the development of short-term policies and plans ought to be guided by a vision for the longer-term which needs hence be developed *first*. However, this time both vehicles will not only constitute EU 'internal' policy, but also form the basis of documents that will be communicated to the UNFCCC and, as such, indicate the EU's political intent to meet its obligations under the Paris Agreement. That is why it is important that their ambition reflect an adequate contribution by the EU to the globally agreed goal of reaching net zero emissions within the second half of this century – as captured in the Paris Agreement.

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[6] Political agreement on the 2020 package was reached in December of 2018 but EU Heads of State and Government only adopted languge on 2050 in November 2009.

[7] Revision of the Emissions Trading Directive, Climate Action Regulation (originally known as Effort Sharing Regulation), Revision of the Energy Performance of Buildings Directive, Renewable Energy Directive, and the Energy Efficiency Directive, as well as adoption of the Governance of Energy Union Regulation (cf. EC progress tracker).

2 Key challenges for the 2050 transformation

2.1 Misalignment in ambition and implementation efforts

The EU's current climate ambition to 2050 and to 2030 is not fully aligned with its commitment to the Paris Agreement. In 2009, EU heads of State and Government agreed on the long-term objective to reduce emissions of reductions by -80 to -95% from 1990 levels by 2050, and considered this to be equitable and in-line with a global 2°C warming limit – citing the IPCC's Fourth Assessment Report. The existing EU "2050 roadmap" document, drafted by the European Commission in 2011, used a pathway in which the EU reduced its GHG emissions by 80% to 2050, which reflects the lower bound of that EU objective.[8] This target is now out of date. The EU has agreed to the Paris Agreement target of *well-below 2°C*, striving for 1.5°C, which implies additional reductions - and the latest science backs up this conclusion (IPCC Special Report 1.5°C). The Paris Agreement also establishes the additional goal of net zero global emissions by the second half of the century, which the EU should reach sooner to provide a fair contribution to this global challenge, when considering its historical responsibility. The distinction between the two bounds is paramount to deciding the correct objective to aim for. The technological and societal choices implied by aiming for -80% or -95% or net zero as end-points can be very different – and so is the actual accumulated carbon balance emitted over time. Accordingly, the 2030 target would also need adjusting – on the basis of both a new long-term target value and related trajectory and considerations of the overall carbon budget being used up by the EU.[9]

The EU is not yet on track to meeting its existing 2030 targets and even further from its 2050 ambition. The EU is largely on track to meet its 2020 targets for energy efficiency and renewable energy, and has already surpassed its GHG reduction target.[10] However, analysis shows that the over-performance on 2020 targets was driven to a significant extent by the economic impact of the financial crisis and structural changes in the sectoral composition of the European economy. Progress across member states has been uneven and inconsistent. In some key sectors – such as buildings, industry or agriculture - structural decarbonisation has not been started (Spencer et al., 2016).

According to the EEA, based on currently existing and planned policies, Member States project the pace of current GHG reductions to *slow down* beyond 2020, indicating, maybe not surprisingly, the need for additional policies to meet the 40% reduction target by 2030. The pace of GHG reductions would need to be increasing even *further* to enable the EU to reach GHG neutrality any time before 2050[11]. The EU and its Member States thus need to double down on both the 2030 emission milestone

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[8] See European Commission communication: COM (2011) 112: A Roadmap for moving to a competitive low carbon economy in 2050 (08 Mar 2011) https://ec.europa.eu/clima/policies/strategies/2050_en#tab-0-1

[9] In this context, it is worthwhile to note that the 2011 low carbon economy roadmap already suggested a 2020 target of -25% (not 20% as is the present target) as a cost-effective milestone – indicating a trajectory with a lower overall budget.

[10] Energy efficiency progress is slowing down, though, putting achievement of the target at risk. See EEA (2017), Trends and projections in Europe 2017: Tracking progress towards Europe's climate and energy targets https://www.eea.europa.eu/publications/trends-and-projections-in-europe-2017

[11] Taking into account the recently adopted increases of the energy efficiency and renewable energy targets to 2030, which mechanically translates into a higher GHG reduction target (slightly over 45%) according to the Commission (Cañete, 2018), the existing gap between the existing commitments and implementation is even higher (Fig. 1). Targets revised in June 2018 from at least 27% to at least 32% for renewables, and from 27% to at least 32.5% for energy efficiency. The renewable energy target is binding at EU level (but not broken down to binding national targets as that for greenhouse gases), the energy efficiency target is indicative and non-binding at EU level.

towards 2050 and the policies required to get there. Incremental change is not only insufficient, but risks being counter-productive.
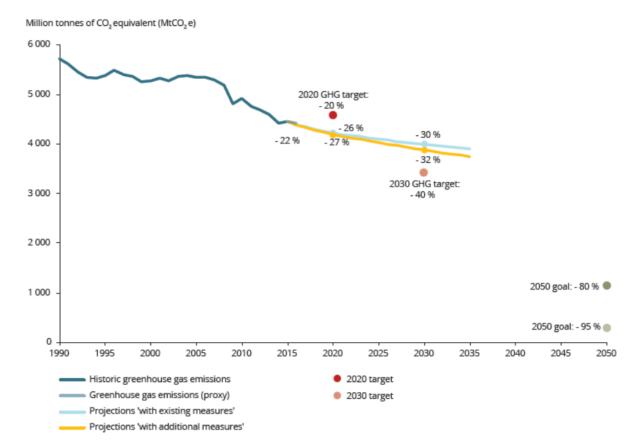
Figure: GHG emission trends, projections and targets in the EU

Million tonnes of CO_2 equivalent ($MtCO_2e$)

Source: EEA, 2017. Note: Projections 'with additional measures' take into account the additional effects of measures reported by Member States as of 2017, but not the latest EU measures adopted from Clean Energy Package.

2.2   Limits on generating ambition in an effort sharing dynamic

The EU has been effective in setting a bar for climate action for all member states, by incrementally raising targets on GHG emissions' reductions, energy efficiency and renewable energy deployment. It has also created different types of policy instruments and refined them over time: market-based tools such as Emissions Trading System (ETS) for carbon-intensive industry and power plants (since 2005) and regulatory instruments such as legislation setting national objectives for non-ETS sectors over 2013-2020 and 2021-2030. These measures, underpinned by a logic of a level playing field in the internal market for traded sectors (ETS) and incremental efforts organised through effort sharing for other sectors, have been implemented to ensure a minimum level of joint action. Despite their checkered history thus far, EU-wide mechanisms will continue to be important in underpinning implementation across the EU.

However, effort sharing – at least in its current form – is not the dynamic, most conducive to achieving greater collective ambition. It has adverse unintended consequences, whereby member states are incentivized to argue that their efforts should be lower, in order to minimize the threat of EU sanction for non-compliance later on. Ambition on the part of willing member states is therefore not rewarded. This negotiation often takes place independently of other EU discussions on opportunities to help member states to increase their ambition, (e.g. via the allocation of climate funds under the EU budget, or other EU policy levers). Moreover, the effort sharing discussion focuses member states on

incremental targets for the next 10 years, rather than the broader set of sectoral transformations that are needed to achieve the EU's (or member states' own) 2050 objectives.

In the context of shifting focus to the larger transformation, the EU should consider a recalibration of the roles played by effort sharing and the ETS in the EU's climate governance architecture. It needs to continue to ensure a minimum of action across the EU through EU-wide instruments but also try to create a new dynamic that incentivizes a "race to the top", that rewards ambition and structural transformation of key sectors, and that engages Member States, or even regions in defining their own positive narrative for action in their respective national or regional context (see for example the current discussion of a coal phase-out plan in Germany). The EU's legislative instruments therefore need to be complemented by an approach that could convince Member States to go further than the EU's regulatory minimum through regional cooperation and dedicated (EU and national) measures, possibly by encouraging regional and local level action – or through a dedicated sectoral focus.

2.3 Lack of dialogue across implementation scale

Implementing net zero emissions requires deep change and will affect stakeholders across society in important ways. Success therefore relies to a significant degree on the acceptance of and willingness to make these changes from stakeholders at all levels and by political parties across the spectrum. This means that there is a need for a political discussion at the very start (and throughout the process) about both the opportunities and threats attached to the transition, in order to foster buy-in into the collective vision for decarbonisation. This ownership is therefore a necessary condition for effective implementation – at all levels of government. As the experience with the 2011 roadmap document has shown, which could never be formally adopted due to resistance from Poland, broad support is needed for a new EU 2050 strategy.

At present, the European Commission has not yet engaged significantly with stakeholders to access their intel to inform its own 2050 planning, and win support for implementation of the EU long-term strategy (goes for both Member States and non-governmental stakeholders), beyond a few workshops, a conference and an online consultation open to general public. This may be due to time pressures or institutional inertia. Nonetheless, such broad debate and the buy-in it can generate is essential to forming a common vision - particularly as the long-term dimension, which should inform current policy-making and target-setting, is currently under-represented in the debate. While Member States have chosen different approaches to including stakeholders in their national long-term climate policy planning, their experience largely supports this point (see e.g. Duwe et al. (2017) and Sartor et al. (2017)).

Moreover, the EU (both the Commission and the Member States) as a whole is already engaged in a process to discuss the "future of Europe" - and the climate transformation and energy transition should be a part of it. As the EU is in search of a renewed common narrative for Europe, developing an understanding of the implications of and a positive vision for a carbon negative society that benefits all of its citizens should be seized upon as an opportunity.

For this, it is necessary to go beyond aggregate GHG emissions or energy use figures, and to analyze the underlying drivers of emissions changes, sector by sector, and Member State by Member State, to spot where EU-level mechanisms can and should support greater efforts.

The PRIMES model currently used by the Commission is frequently criticized for its lack of transparency on modelling inputs and assumptions, which reduces confidence in its results (e.g. Earl et al., 2018). This criticism is potentially an expression of a larger concern over the lack of transparency in decision-making on long-term policy. A shared disaggregated structure describing the key indicators of the transition and an engagement process spanning more than a few months are needed to elaborate meaningful dialogue and narratives. These need to also include additional dimensions (e.g. social and cultural) that are of key interest for stakeholders but often go beyond the capacities of

modelling tools. These narratives should build on the aforementioned political dialogues that need to take place at the national level regarding the transition to a low-carbon and climate-resilient economy.

The time between the November 2018 release of the Commission's "draft" Mid-century vision and its likely adoption in 2020 is an important period where such dialogue should take place. In fact, such dialogue will need to become a repeated feature of EU climate governance, as long-term strategies and short-term climate and energy plans are iteratively revised, both to account for new developments as well as the cycles of the Paris ambition process. The newly adopted Governance Regulation (Article 10a) stipulates that Member States should establish "multi-level climate and energy dialogues" as permanent features of their national policy-making processes. An expression of such a broad stakeholder platform is missing at the EU level.

2.4 Lack of proactive, comprehensive and sustainable transformation approach

The task of creating a credible and politically feasible transformation strategy presents a formidable challenge. It demands the combination of many elements and the integration of several dimensions – which our political and economic systems are not always well equipped for. It requires both attention to sectoral detail as well as a perspective that allows to identify linkages (both synergies and trade-offs) – and consideration of qualities that need to be addressed across all policies (such as sustainability). Some of these elements, currently not or not adequately present in EU climate policy, are highlighted in the following paragraphs:

a) Beyond the GHG, renewables and energy efficiency targets, the **EU institutions have not yet developed comprehensive sectoral strategies to decarbonise** and several sectors have received little overall attention, e.g. agriculture, forestry and land use, and aviation for instance. Such strategies should identify key triggers for the transformation in each of them, and policy packages to address them, including the level at which these are best targeted (EU, regional, national, local) and the types of measures that are required to engage them (e.g. combining regulatory limits on emissions with financial incentives for technology deployment or business model switching).

b) The need to compensate some remaining emissions even under carbon neutrality and to go net-negative in the long run means the EU needs to dedicate attention to the related options, with a focus on enhancing and protecting natural sinks and using eco-based approaches– and maybe explore the risks and shortfalls of capture & storage technologies. The EU does not yet possess the **necessary regulatory framework for the enhancement of natural sinks so that they absorb more carbon, nor for negative emission technology,** and may also need to look into the necessary incentives and boundaries for this technology, including for the related innovations and investments required (see Scott & Geden (2018)).

c) Some negative emission options come with the potential for conflict e.g. over land availability and use and, or public acceptance of underground storage. These are examples of the types of potential impacts that the EU needs to be mindful of in designing sustainable strategies. **Some decarbonisation options may have detrimental effects** on other environmental and societal goals (e.g. on biodiversity, local agricultural productivity, flood protection, or regional livelihoods). An EU 2050 strategy should be in line with the development of a sustainable future, and not be diverted from this objective by the promise of easy fixes that may generate undesired impacts. [12] Where trade-offs may become inevitable, proactive adjustment strategies (e.g. for new economic prospects for emission intensive regions) are needed to create an effective, sustainable and just transition.

d) A sound EU transformation strategy will also need be aligned with the EU adaptation strategy. It should take into account the realised impacts of climate change, as well as the ranges of projected

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[12] The EU still has policy gaps in its bioenergy support framework, for example, that can create negative impacts for biodiversity, soli quality, etc. (see VITO et al. 2017)

impacts in the future – and prepare for them. This includes both taking into consideration projected climate impacts in the types of sectoral strategies being pursued and investments being made (e.g. into major infrastructure, or in reforming the agricultural sector), as well as **including adaptation needs** and policies.

e) The combination of sink capacity, bioenergy potential and adaptation needs in agriculture and forests alone, serves as an example of the multiple dimensions that a coherent 2050 strategy needs to address and connect in a sensible manner. In addition to looking at sectors for their specific context and characteristics to identify tailor-made, targeted approaches, the complexity of the interactions between different sectors (e.g. impact of electrifying transport on the energy system) requires also **dedicated attention to synergies and potential conflicts**. Anticipating and even utilizing relevant interactions could **result in cross-sectoral solutions** that complement and inform sectoral strategies (see for example Wyns et al (2018) for the links between energy transition and industrial decarbonisation). Such an integrated approach could reduce overall cost and unlock greater emission reduction options, and also improve sustainability through use of circularity in production and use cycles.

2.5 Gaps and obstacles in enabling conditions

In addition to the need to develop integrated and inter-related sectoral strategies, the EU also needs to consider explicitly those horizontal policies that are indispensable to enable the transformation across sectors.

A key enabling condition is **access to financing**. Even for the original 2030 targets (40/27/30), estimates (dating from 2016) of the additional investment required are at the order of 20% per annum on top of business-as-usual investment needs.[13] Public sources of funding can play a crucial role in bridging and unlocking larger sources of private finance and in steering them towards the transformation. However, the current setup of EU funds, for example (and also the proposals for establishing the respective next Multi-Annual Financial Framework for 2021-2027) are not geared properly towards that purpose (Duwe, 2018).

A specific example of an area for public funding support is **innovation policy**. Innovation will be required in several dimensions (technological, business models, and social) and in many sectors. Whereas the energy sector, for example, has seen significant change in technology and actors and business models in the last decade, other sectors will require a dedicated policy push to help guide them in that direction (see Wyns and Axelsson, 2016). The EU as a whole currently lacks a sufficiently explicit, targeted and ambitious innovation support strategy, although a number of instruments have been established (e.g. the Innovation Fund for energy and industry project) (see Wyns 2017). The recent proposal for Horizon Europe under the next Multi-Annual Financial Framework includes language on a "mission-oriented" approach, influenced by recommendations of an external report (Mazzucato 2018), but implementation details are yet to be decided.

Regional policy is another enabling policy area to realise the transformation on the ground, and one in which the EU contribution plays an important role, especially for less economically developed regions. EU policy can help guide funding but also help create a vision backed by **concrete projects for regional economic development** that is in line with the transformation. This holds particularly true for regions which may need to undergo structural change as part of the transformation, and which require proactive strategies to achieve a socially just transition. With the 'Coal Regions in Transition

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[13] 178 billion Euro annually in additional investment in the years 2021 to 2030 on top of 944 bn € per annum required anyway (European Commission 2016)

Platform', the European Commission has launched an initiative to address this issue and start providing information to regions concerned, but dedicated additional funding has not been set aside.

Another essential enabling factor is the infrastructure that connects EU Member States across borders and allows free flow of important resources, especially regarding energy and transport and digital networks. This requires prioritization and cross-border coordination on infrastructure (and the related investments) that is designed to make energy and transport networks fit with a decarbonised future. At present, "projects of common interest" and related financing through the "Connecting Europe Facility" are still **largely supporting fossil fuel infrastructure** (Dutton et al. (2017)), such as gas networks. Yet, some future technology options (e.g. hydrogen) may require similar infrastructure.

3   Policy recommendations

There is good news: Policy-makers in the EU have the opportunity to address all of the challenges presented above in the period 2019-2020. To put Europe on a path towards a climate friendly economy, the need to "Think 2050", while "Acting 2030" and make changes to existing policies and financial frameworks. We have grouped the respective actions into four clusters, which tackle

- the **substance** of the 2050 vision,
- the **process** for establishing the 2050 vision,
- the **policies** to trigger the transformation and
- means of adjusting enabling **conditions.**

3.1   SUBSTANCE: Offer a vision for a "Paris-compatible" pathway towards 2050

The coming two years will test how successful the innovative governance mechanisms of the Paris Agreement truly are. The EU, as a champion of a multilateral solution to climate change, must now "walk the walk" and contribute adequately, which means addressing the 2030 time-frame from a 2050 perspective. It needs to develop a long-term vision that is compatible with the international commitments made under the Paris Agreement, i.e. of ensuring post-industrial temperature rises are limited to "well below 2°C" and "pursuing efforts towards 1.5". This implies determining a long-term target to clarify the direction of travel – and in line with the current state of the science (such as the upcoming IPCC Special Report). As the world's largest economic block, the EU's long-term strategy will be an important test of the EU's willingness to deliver on the ambition, and a "test" of the process and internal logic of change underlying the Paris Agreement.

Specific recommendations:

- Develop a coherent mid-century strategy that explores concrete pathways and policy implications to achieve net zero GHG emissions before 2050 and negative emissions thereafter. This should include considerations for action at the aggregate EU level but differentiate between Member States and regions as appropriate.
- Revise the EU's NDC for 2030 based on the implications of the mid-century strategy and submit it in 2020 as per the Paris Agreement's timeline. Revisions in ambition should be both quantitative (higher GHG targets) but also qualitative (highlighting key milestones for sectoral transformation)
- Define a clear mechanism for the future review and further development of the EU's NDC by 2025. This process should be informed by the long-term vision and be based on a collective dialogue with member states that seeks to identify opportunities and conditions for stronger action and embeds these in the revisions of their National Energy and Climate Plans (NECPs), taking advantage of the associated review of most EU climate legislation[14]
- Ensure the mid-century strategy considers how the EU will achieve the Sustainable Development Goals, the projected impacts of climate change and related adaptation needs, but also the development of a regulatory framework for carbon sink enhancement and a regulatory framework for negative emission technology, as well as the extent to which

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[14] NECPs need to be 'updated' by 30th June 2024 with a draft submitted by 30th June 2023. Most legislative files already have review clauses that fall due during this revision period: 2023 for the Renewable Energy and Energy Efficiency Directives, 2023/24 for the EU ETS, 2024 for Climate Action Regulation and the Regulation on cars and light duty vehicles. As an exception, the Energy Performance in Buildings Directive is due to be revised in 2026.

different carbon removal solutions positively or negatively impact other environmental and societal goals.

3.2 PROCESS: Build ownership for the 2050 strategy

The long-term transformation is a process that affects all sectors of the economy and that needs to be conceptualized and implemented with all relevant stakeholders involved. Moreover, any long-term strategy adopted at EU level will only be as good as the actual political and societal backing it has, and the degree to which it is energetically and intelligently integrated into / mainstreamed across all relevant policy areas. The EU needs to create awareness, generate interest and foster buy-in to the EU2050 agenda among its members and vocal stakeholder groups – and link it to the process of discussing the future of Europe. Specifically, the EU 2050 strategy process should be both mindful of national planning processes (existing and underway for both 2030 and 2050) and be useful to them by providing added value (in terms of additional analysis and information – and by identifying flexibilities being opened up by the larger EU level action) and not focus on differences and perceived incompatibilities.

Specific recommendations:

- Create an inclusive process for the formulation of the EU 2050 strategy, with additional windows for debate and inputs and a perspective of continuing this engagement as a permanent structural element of the transformation governance going forward, beyond the adoption of the first version of the strategy – as an EU equivalent of the "multi-level energy and climate dialogues" the Governance Regulation foresees at Member State level.
- Dedicate attention in the future of Europe process and any outcomes of the Sibiu summit in 2019 to the 2050 strategy and the role of the transformation in a vision for the future of Europe, thus further elevating the topic to a key strategic goal of the European Union
- Identify ways to further support regional (also across borders) and local climate action through EU policy instruments, including for dedicated support for a just transition

3.3 POLICIES: Create transformative measures to implement the 2050 vision

In addition to aligning the 2030 milestones to a new long-term target, the EU also needs to ramp up its policies accordingly. For the main GHG emissions related instruments (the Emissions Trading Directive and the Climate Action Regulation) the underlying carbon budgets need to be made consistent with the long-term objectives. Policy-makers will in all likelihood have to reopen the legislation adopted in 2017/2018 and adapt them to the higher ambition levels.

Specific recommendations:

- Define mission-oriented sectoral industrial strategies with specific objectives and fill gaps in the existing EU and national policy frameworks to guarantee the required transformation drivers are triggered so that all sectors realise their contribution to 2050 (including transport, agriculture, industry, buildings, forestry, …). This requires also aligning a degree of integration and coordination, to ensure mutual support where such connections exist (especially between industry and transport or agriculture, for example).
- Design additional EU-level policies and mechanism to implement these strategies, where a coordinated EU approach is most advantageous or required in supporting national action.
- Align infrastructure (European energy and mobility networks) policies and related investment funds with the 2050 objectives, addressing key bottlenecks – notably phasing out of public

funding for fossil fuel infrastructure to avoid further stranded assets in high-emission infrastructure and removing obstacles to investment in clean options.

3.4   CONDITIONS: create European-level enablers

As part of a positive agenda, the EU could not only encourage but, where desired, actively support member states in differentiated ways: helping the leaders exploit new technological opportunities, incentivizing the middle runners to catch up to the leaders, while addressing missing capacity and other barriers that constrain the laggards. Identifying specific opportunities is conditional to developing a new kind of discussion between the EU institutions and the member states about what the conditions are for each member state to go further, and to implement net zero by 2050 in particular. The EU's new mid-century strategy is a key moment to begin this discussion and reveal the needs for finance, innovation, trade regulations, technological cooperation etc. at the EU level to enable the internal transformations at the regional, national and local level.

A key process for the EU in the period 2018-2020 is the negotiation on the next EU budget, the Multiannual Financial Framework (MFF) for 2021-2027. A credible EU2050 strategy and a strong alignment of EU funding with that strategy will also attract further private finance in the same direction.

Specific recommendations:

- Create an alignment of and direct linkages between the MFF and the 2050 agenda, by
    a) increasing the climate mainstreaming target and improving its enforcement and progress monitoring
    b) helping Member States and sectors to identify investment needs and to match them with financing, including private sources (e.g. through capital raising plans as recommended by the High-Level Expert Group on Sustainable Finance)
    c) creating financial incentives in MFF conditions and programming for higher national contributions by Member States to 2030 EU targets and for solid performance in implementing them.
- Develop a comprehensive mission-oriented innovation support component for an EU industrial strategy with focus not only on technological advances but also potential product substitution and business model innovation.
- Increase demand for low carbon products through EU and Member State commitments to green public procurement, that looks beyond transport/energy efficiency and includes low carbon construction materials

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