

# Can current EU climate policy reliably achieve climate neutrality by 2050?

Post-2030 crunch issues for the move to a net zero economy

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# SUMMARY

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The “Fit For 55” package represents a step towards a transformative EU climate policy architecture but **is not yet fully capable of facilitating climate neutrality**. Key issues to be resolved for **post-2030** climate policy include the following:

1. What climate neutrality mean in terms of quantitative targets is not sufficiently defined beyond 2030. **Separate targets for emissions and removals** are needed. An explicit **update to the EU LTS** would clarify the pathway towards them, to inform policy-making and investments (incl. sectoral roadmaps). Overall, EU climate policy needs **shorter, mandatory policy learning cycles** to become both more resilient and flexible on the path to net zero.
2. Member States and their climate policy need to become more aligned to-wards climate neutrality while the system must employ differentiation and solidarity to accommodate different starting points and economic capacity. This requires **a stronger approach to the non-ETS-1 emissions**.
3. To trigger change in these sectors **additional sector-specific action at EU level is needed** in buildings and international transport, beyond carbon pricing. Harmonized EU measures are also needed in agriculture and LULUCF, for both emissions reductions and **incentives for carbon dioxide removal**, which requires better accounting and a reliable regulatory frame-work. Efforts to reduce emissions from agriculture are currently insufficient and need to become a priority going forward.
4. Market demand and infrastructure are key enablers for the move to **net-zero industrial production** which are currently not being supported sufficiently and require additional attention at EU level.
5. While the ETS creates a strong decarbonisation push in electricity production, its realization needs a **coordinated effort on infrastructure and markets** to allow renewables to be deployed at sufficient speed.

## Context and goal: Is “Fit for 55” also fit for net zero?

The EU has committed to achieving net zero emissions by 2050. With the “Fit for 55” legislative package, many EU climate policy instruments have just been updated to achieve a higher target for 2030.

Several elements of the current policy instruments already have an impact beyond 2030. This paper analyses, whether the current toolbox is sufficiently detailed and powerful to trigger the necessary transition along the key pillars of EU climate policy.

### Scope of this paper

With the adoption of the European Green Deal as the new forward-looking strategy in late 2019, achieving climate neutrality by 2050 was made a central guiding plank for EU policy. To be in line with this goal, the 2030 climate target for the EU was increased to a net reduction over 1990 of 55% by 2030 (from previously 40%). Both targets were made legally binding through the European Climate Law (EUCL) in 2021, which specifies that net zero is not an end point, but that the EU “needs to aim to achieve negative emissions thereafter” (Article 2.1 EUCL).<sup>1</sup> This requires a structural change in the overall energy system and for all activities currently producing greenhouse gas (GHG) emissions. These targets are part of the EU’s contribution towards achieving the goals of the Paris Agreement, most importantly halting global warming well below 2° Celsius while pursuing efforts to limit the increase to 1.5 degrees.

This paper analyses **whether the current EU climate policy architecture is structurally able to deliver climate neutrality by 2050**. This analysis was being carried out during negotiations on the “Fit For 55” packages and was able to include the final compromises on the most relevant laws, which define the shape of the policy architecture after 2030. The goal of this exercise was to identify potential **crunch issues on the path towards climate neutrality** by 2050 that the current architecture may not yet be fully equipped to deal with, **and to consider potential solutions**. This is a very dynamic area in EU policy in many respects – but while details on the assessments of individual aspects may change in the months after publication, the fundamentals are likely to stay valid for the period 2023-2024.

The analysis starts with a **description of the post-2030 architecture** (in “Fit For 55” shape), along its main pillars and then **assesses each of these pillars** separately. The aim is to better understand to what

<sup>1</sup> Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 (“European Climate Law”), OJ L 243, 9.7.2021, p. 1–17

extent it can get the covered sectors in line with climate neutrality.

## The shape of EU climate policy architecture with “Fit For 55”

EU climate policy has evolved over more than three decades now. Policy-makers have added and revised targets and instruments several times along the way (Directorate-General for Climate Action (European Commission) et al., 2017; Duwe, 2022; Oberthür & Pallemmaerts, 2010). “Fit For 55” has added new elements and amended others. However, some essential structural pillars have been in place for more than 15 years, ever since the EU devised a system to deliver on its Kyoto Protocol targets of 2008-2012. These are:

1. The **EU Emissions Trading System (EU ETS)** for large point sources in power sector and industry
2. A system of national GHG emission targets for the smaller and diffuse sources of emissions not covered by the original EU ETS, which includes emissions road transport, buildings, waste and agriculture, known historically as “Effort Sharing”
3. Sources and sinks from **land use, land use change and forestry (LULUCF)**

These three pillars have changed their legal shape<sup>2</sup> and their emission coverage<sup>3</sup> over time, but largely remain unchanged. The Commission’s proposed adjustments via “Fit for 55” included three significant changes.

- One is a sectoral addition to the EU ETS. The system should in the future include emissions and other climate impacts from both **aviation and maritime transport** (as separate from land-based transport modes). Aviation was already covered, shipping is new.
- The second is an **additional, separate Emissions Trading System (ETS 2)** for upstream emissions in the road transport, buildings and process heat sectors. Up to 2030, the emissions covered by the

ETS 2 remain part of the Climate Action Regulation (Effort Sharing).

- Thirdly, the Commission had proposed that emissions from agriculture should be merged with the LULUCF pillar after 2030 – with the goal of these elements together becoming climate neutral by 2035. This proposal was not accepted by the legislators. Such a change would have affected both the existing LULUCF pillar and the Effort Sharing pillar, creating a **new AFOLU dimension** (agriculture, forestry and land use). However, the respective legislation includes a review clause that rather explicitly keeps the proposal relevant for future revisions of post-2030 climate policy.

At the time of writing, the negotiations on the package were ongoing, and then compromises were reached before the end of 2022 for these elements. The authors have taken the final agreements into account. Accordingly, the first two changes (ETS 1 scope extension and introduction of ETS 2) have been included in the analysis for this paper, the third one is not.

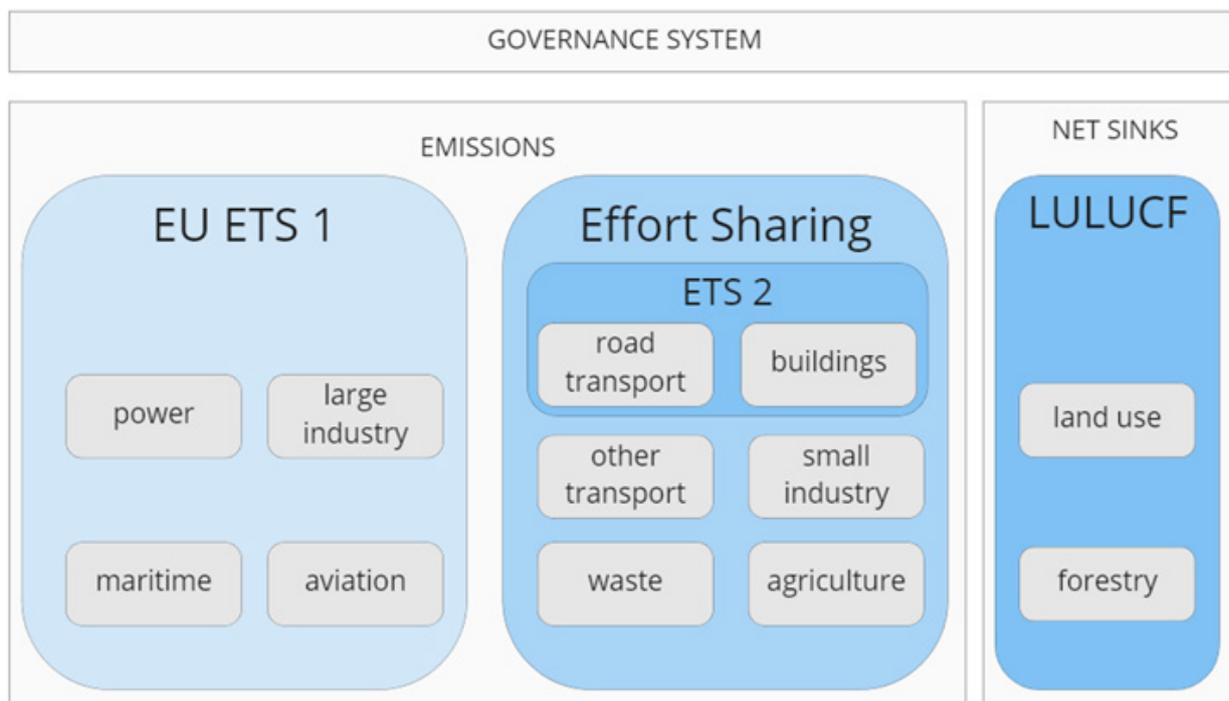
Lastly, there is an arch that extends across the pillars, which are the main processes that govern how interaction between the EU level and Member States is organised and that monitor progress and create cycles for strategies and policy planning. The current system of **climate governance** is also discussed separately as a necessary element to facilitate policy-making aligned with climate neutrality. Figure 1 shows all proposed elements and their respective place in the overall landscape. This paper analyses each in turn in chapter 2.

This lens of looking at the larger question “Is EU climate policy fit for net zero?” was chosen to provide a clear and structured methodology for the assessment. While many horizontal, cross-sectoral policy instruments and initiatives have been included in this “three pillar approach” in the analysis of the sectors and their decarbonisation triggers, **some dedicated policy areas that function as essential enablers for the transition** (e.g., sustainable finance) **are not explicitly captured** and deserve additional consideration going forward.

<sup>2</sup> The national binding targets under the Effort Sharing pillar until 2020 were adopted as a Decision, but for 2030 the form was changed to that of a Regulation.

<sup>3</sup> The EU Emissions Trading System has changed coverage several times over the course of its different trading phases.

**Figure 1: Main pillars in EU climate policy including “Fit For 55”**



Source: own visualisation (Ecologic Institute 2022).

### EU climate policy is already looking beyond 2030

The title of the “Fit for 55” package indicated clearly that its purpose was to revise EU climate policy such that it can deliver the increased target for 2030. As the scope of this paper is specifically to look at the period beyond 2030, it is important to note that several elements of the existing set of laws and the revisions through the package already shape the time after 2030. These include the following:

- **Post-2030 Targets:** The EU Climate law includes not only the overarching goal of climate neutrality by 2050, but also a process for the setting of a 2040 target, which should be proposed by mid-2024 (Article 4.3 EUCL). In addition, to comply with a decision taken at COP 26 in Glasgow the EU will need to submit a target for 2035 under the Paris Agreement (so-called nationally determined contributions) by 2025.<sup>4</sup>
- The climate governance system is also set to explicitly continue post-2030. All Member States must submit **national energy and climate plans** (NECPs) covering the next decade, e.g., 2031-

2040 by 1 January 2029, as per Article 3.1 of the so-called Governance Regulation (GovReg)<sup>5</sup>, for example. National long-term strategies must also be updated and cover 30 years into the future (Article 15 GovReg).

- Member States need to provide emissions **projections** for six five-year intervals into the future (Article 2.7 GovReg) so currently up to 2050 – submission every two years.
- **In the ETS 1:** the system has no sunset clause, meaning it is set to continue beyond 2030 (when the current trading period ends). At the suggested rate of reduction, the cap would take **emissions to zero before 2040** for stationary sources.<sup>6</sup>

<sup>5</sup> Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action, amending Regulations (EC) No 663/2009 and (EC) No 715/2009 of the European Parliament and of the Council, Directives 94/22/EC, 98/70/EC, 2009/31/EC, 2009/73/EC, 2010/31/EU, 2012/27/EU and 2013/30/EU of the European Parliament and of the Council, Council Directives 2009/119/EC and (EU) 2015/652 and repealing Regulation (EU) No 525/2013 of the European Parliament and of the Council (Text with EEA relevance.). OJ L 328, 21.12.2018, p. 1-77

<sup>6</sup> Own calculation (updated on the basis of the compromise) using the open-source model by CLIMACT – available at <https://climact.com/en/is-the-eu-ets-proposal-fit-for-55/> - last accessed on 6. March 2022

<sup>4</sup> FCCC/PA/CMA/2021/10/Add.3 (Decision 6)

- The LULUCF Regulation revision proposal<sup>7</sup> set a goal of **net zero emissions by 2035** for the combined sectors of agriculture, forestry and land-use, summarised under the abbreviation **AFOLU**. This post-2030 element was, however, rejected by the legislators. A review clause foresees consideration of the contribution of the sectors towards climate neutrality beyond 2030 though, which points beyond current targets and keeps the option of a different sectoral combination open for the future.
- In the transport sector, a **ban on the sale of combustion engine vehicles by 2035** was agreed between Member States and the European Parliament in the revised legislation on CO<sub>2</sub> emission performance standards for cars and vans<sup>8</sup> (Article 1.5.a).
- This list demonstrates that **several elements are already in place for the post-2030 climate architecture of the EU** and that they are set to act as signposts on the way towards climate neutrality.

<sup>7</sup> Proposal for a Regulation of the European Parliament and of the Council amending Regulations (EU) 2018/841 as regards the scope, simplifying the compliance rules, setting out the targets of the Member States for 2030 and committing to the collective achievement of climate neutrality by 2035 in the land use, forestry and agriculture sector, and (EU) 2018/1999 as regards improvement in monitoring, reporting, tracking of progress and review. COM/2021/554 final

<sup>8</sup> Proposal for a Regulation of the European Parliament and of the Council amending Regulation (EU) 2019/631 as regards strengthening the CO<sub>2</sub> emission performance standards for new passenger cars and new light commercial vehicles in line with the Union's increased climate ambition. COM/2021/556 final

## What does climate neutrality mean for the main pillars of EU climate policy architecture?

While EU climate governance has been improved substantially since 2015, there are several weaknesses that need addressing, both in implementation and in the underlying legislation.

These remaining issues all concern the way in which the long-term focus of EU policy on climate neutrality is maintained, and how current policy can be designed accordingly. They include the formulation of targets, the relationship between NECPs and LTS.

This chapter analyses the main pillars of EU climate policy in their post-2030 shape including “Fit For 55” and assesses each of them for the way in which they can activate the respective decarbonisation triggers in the sectors they cover.

### 2.1 Governance as horizontal arch to the policy pillars

#### Assessment summary: strengths and remaining crunch issues

- **PLUS:** Long-term dimension integrated visibly, interim targets planned, new mechanisms for progress assessment and policy consistency, scientific body
- **MINUS:** Long-term target implications not sufficiently informing short-term policy-making through deficiencies in the strategic planning processes.
- **MINUS:** Current monitoring system does not have the right information to assess if there is sufficient progress in making the structural changes needed for net zero.
- **MINUS:** Post-2030 goals not differentiated into separate targets for GHGs and CDR – creates uncertainties over future pathways and impacts policies.

#### Description

The EU climate governance framework has been revised and expanded since the adoption of the Paris Agreement. It now includes the long-term dimension more strongly and mainstreams climate action into other policy areas, especially energy, through integrated planning and reporting. The adoption of the European Green Deal has added an overarching narrative and made climate neutrality by 2050 a central guiding objective for all EU policy.<sup>9</sup> Main laws that define the current system of policy planning,

<sup>9</sup> This section draws strongly on Duwe (2022).

reporting and progress assessments (as essential governance mechanisms) are the Governance Regulation (GovReg) and the EU Climate Law (EUCL). In combination with the main policy instruments that organise near-term target distribution (the EU ETS and the Climate Action Regulation (CAR), containing national non-ETS targets) and their respective compliance systems, these laws establish a rather comprehensive framework that organises interactions between EU level and Member States and assigns differentiated responsibilities for climate policy. The effective implementation of this framework is essential to getting on a path to climate neutrality.

### **What does EU climate governance look like post-2030 after “Fit For 55”?**

As described above, there are several governance elements looking beyond 2030 and towards 2050 in the current system. These overarching EU climate governance processes are mainly inscribed in the GovReg and the EUCL, neither of which are part of the Fit For 55 package of revised laws. In September 2020, having reviewed the final set of NECPs, the European Commission had signalled that a revision of the Governance Regulation (foreseen in the legislation only in early 2024) would be useful for improvements to the system and stated that it would be included in the package of laws to implement the higher 2030 target (European Commission, 2022g, p. 27). In contradiction of its own assessment, the Commission ultimately decided not to review the Regulation in 2021. Accordingly, in the overall governance framework hardly any procedural or institutional elements, that look specifically beyond 2030 were changed under “Fit For 55”.<sup>10</sup> A regular review must be published of both the EUCL and the GovReg in the first half of 2024.

<sup>10</sup> This excludes changes in scope, such as the inclusion of maritime transport emissions in the EU ETS 1, which represents a significant change in the governance of these emissions. Neither does it include the introduction of a cap-and-trade system for the emissions from road transport and buildings as the EU ETS 2 – which again represents a change in governance and the introduction of new procedures and target management.

### **Assessment**

Despite the overall progress, there are several concerns regarding EU climate governance.

**Implementation issues** have been identified since the adoption of the GovReg, which **weaken the alignment of near-term policies with the long-term goals**, specifically in the planning documents. This is evident, e.g., in the content and process of several national energy and climate plans (NECPs), whose main purposes is to communicate targets and policies for 2030 – in the context and aligned with the longer-term objectives. Several NECPs suffer from a low level of detail on policies and investment needs and the development process revealed a lack of public participation in their drafting (European Commission, 2020a; Knodt et al., 2021; Serafini, 2019). In addition, many Member States were late in submitting their national long-term strategies (LTSs), with five Member States having yet to produce a strategy (as of July 2022), more than 2.5 years after the deadline on 1.1.2020. Several older LTSs that have not been revised following key policy decisions are now already outdated and can no longer sufficiently inform current policy-making. This aggravates an existing design flaw in the legislation, which set the timing of (draft) NECPs before that of LTSs. Without the right sequencing, LTSs cannot fulfil their core function to inform decisions on short and medium-term policies, such as those spelled out in NECPs. Moreover, the information contained in many national LTSs is insufficiently detailed and tangible. At EU level, the EU LTS (“Clean Planet for All”) (European Commission, 2018) was highly influential for the setting of the climate neutrality goal, but is now outdated on several accounts, and can no longer sufficiently guide policy-making further, a dedicated update is not mentioned in the legislation and not anticipated by the European Commission at the time of writing. However, at COP26 in Glasgow Parties adopted a call for regular updates to LTSs – and updates to relevant modelling and scenarios are being carried out in the context of the development of a proposal for an EU 2040 target.

This could also inform sectoral strategies, which several associations have been developing. They are specifically mentioned in the EUCL, but no process prescribes how and when to produce these or how to integrate them with other planning documents. Moreover, there is no clear implementation process for a provision in the EUCL (Article 10) to facilitate the development of sectoral roadmaps.

Furthermore, the **potential of several promising new mechanisms is still unproven** and will only show in implementation. The problem is a lack of specification on content and process in the respective laws (mainly the EUCL) and low transparency on their implementation thus far, as the European Commission is the main actor mandated to organise them. This concerns, for example, a new progress assessment for climate neutrality (due by end of September 2023), a policy consistency assessment regarding climate neutrality at both EU and national levels (same due date), and the process leading up to the calculation of an indicative carbon budget for the EU and the presentation of a 2040 target proposal for the EU (due by mid-2024). Last and not least among the innovations is the creation of a European Scientific Advisory Board on Climate Change (EU Climate Advisory Board) as a new institution under the EUCL, which has the potential to strengthen the scientific underpinnings of EU climate policy<sup>11</sup>. The mandate given to the Board by the law is very broad and provides few specific intervention points. Its impact will thus strongly depend on the work programme that its members decide to give themselves and the way they define their own function in the various EU climate policy processes<sup>12</sup>. The benchmark for success that these new EUCL processes will need to meet is: are they revealing **the right information about current policies and measures** to improve them towards reaching climate neutrality (in terms of current progress and consistency) in the context of a further specification of the pathway towards 2050 and beyond.

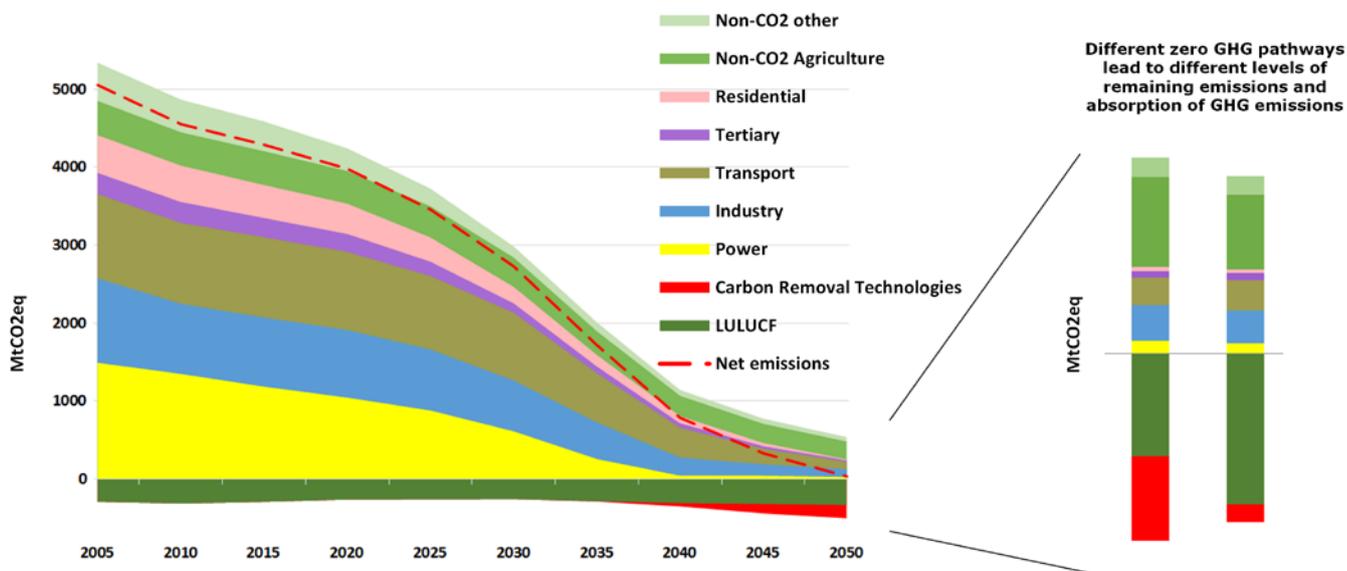
11 The members of the Board were announced by the EEA in late March 2022 (see EEA website at <https://www.eea.europa.eu/highlights/new-european-scientific-advisory-board> - last accessed 11 April 2022)

12 The EU Climate Advisory Board published its initial priorities for work in June 2022 (see EEA website at <https://www.eea.europa.eu/about-us/climate-advisory-board/2022-work-programme-of-the/view> - last accessed 11 December 2022)

Another **structural weakness lies in the target architecture for the post-2030 period**. The EU Climate Law specifies a maximum amount for carbon dioxide removal for the achievement of the net 55% reduction in GHGs by 2030 (Article 4.1), thus essentially determining also the maximum volume of allowable emissions. This division between emissions and removals has, however, not been specified for the 2050 goal, nor is it explicitly mandated for the proposal of the 2040 target (Article 4.3 EUCL). This is problematic insofar, as there are significant policy implications from different assumptions about the volume of remaining emissions and in which sectors they would still occur (Duwe, 2022) (Meyer-Ohlendorf, 2020). The same is true for different assumptions about the potential of natural and technical sources for Carbon Dioxide Removals (CDR). The Commission's own LTS showed that there can be quite different net zero futures in 2050, both in terms of emissions vs sinks but also concerning the path to get there (see Figure 2). However, as mentioned above, there is no updating process for the LTS itself, which has become out of date on several accounts. The European Commission has started exploring the issue of carbon dioxide removal (CDR) further in its communication on sustainable carbon cycles, published in December 2021 (European Commission, 2021d).

Lastly, one overarching concern for post-2030: is EU climate policy **able to absorb new information while staying the course** towards climate neutrality by 2050? The need to adapt (quickly) to external shocks was evident during the pandemic and is now in the face of the Russian war on Ukraine. Unplanned changes have been made to both targets (e.g., for 2030) and policies (e.g., addition of the MSR to the EU ETS) over the past years also due to other new insights. The ability to respond is stronger if regular cycles for policy learning and updating are built into the system, so that updating happens more frequently, enhancing the validity of the plans. Five-year cycles are the basis of the Paris Agreement governance, and in some places (e.g., updates to NECPs and LTS) these have been integrated into the EU system.

Figure 2: GHG emissions trajectory in 1.5C scenarios of “Clean Planet for All” 2018



Source: Clean Planet for All communication November 2018 (European Commission 2018)

Progress reporting by Member States is every two years, the progress report by the Commission annual. However, the formal regular cycles for policy review at EU level within six months after each Global Stocktake under the Paris Agreement, so every five years are not timed well (“Fit For 55” had to be done three years earlier).

And the more long-term assessments of progress towards climate neutrality overall and for the consistency of EU policies with the net zero emissions goal are due only every five years. Mandatory LTS updates at national level only need to be submitted every decade. Clearly there is room to enhance resilience through more regular review and update cycles, to **avoid ad hoc adjustments**.

## 2.2 ETS 1: the Emissions Trading System and its impact on large stationary sources

### Assessment summary: strengths and remaining crunch issues

- **PLUS:** Decarbonisation of the pillar by 2040 through the ever-decreasing cap is a feature of the system. The carbon price signal should be sufficiently strong trigger for change in electricity production (pending sufficiently rapid renewables deployment).
- **MINUS:** Industry needs more pull from the market (e.g., CCfDs) and several additional complementary actions (e.g., build-up of infrastructure for hydrogen), which is not there yet – although there is a positive dynamic.
- **MINUS:** Complementary efforts needed to realise renewable power system (infrastructure, markets, access to finance) and to allow for integration with other sectors for direct/indirect electrification.

### Description

The ETS 1 has been in operation since a pilot phase in 2005-2007 and is currently in its fourth trading period (2021-2030). Originally, it covered only large point sources of CO<sub>2</sub> from power production and the manufacturing industry, but it was gradually expanded to cover additional gases (e.g., N<sub>2</sub>O from fertiliser production and SF<sub>6</sub> in aluminium smelting) as well as the aviation sector (for flights inside the EU). It covers a significant but decreasing share of GHG emissions (around 38% in 2021) (EEA, 2021a, 2022). It is a cap-and-trade system, that sets an overall maximum limit on the emissions each year, that are distributed in the form of EU “allowances” (EUAs). Allowances are mainly auctioned, but in the current period, some allocation also takes place for free to emitters in specific sectors. In the course of the ETS’s history to date, discussions over the effectiveness of the system and the price of

allowances have dominated, caused by significant surplus in the system.<sup>13</sup> Targets are defined against 2005 as a historic base year and annual allocations defined along a linear path (see chapter on the ETS in (Directorate-General for Climate Action (European Commission) et al., 2017). Emissions were reduced by almost 33% between 2005 and 2019, significantly more than required under the target of 21% by 2020.<sup>14</sup> Before “Fit For 55”, the ETS 1 target for 2030 was -43%, the additional reduction required would have been only 10%.

This section focuses on its impact on stationary sources – emissions from maritime transport and aviation are covered in a separate segment (2. e)) further below.

### What does the ETS 1 look like post-2030 after “Fit For 55”?

Under the revised ETS Directive<sup>15</sup> (now “fit for 55”) the target for 2030 for stationary installations will be -62% from 2005 levels. The Linear Reduction Factor (LRF) will be increased from 2.2 to 4.4% over time (Council of the European Union, 2022b). This means that the cap is reduced by 86 Mt per annum at the end of this decade, compared to 43 Mt per annum in the previous one. Assuming a linear continuation beyond 2030 (the EU ETS Directive has no sunset clause, that would assume the system ends), this would lead to a negative cap by 2040. Free allocation of allowances to some industrial installations is to be phased out gradually until 2034 (European Parliament, 2022c).

As a complementary measure, the Commission has proposed the introduction of a Carbon Border Adjustment Mechanism (CBAM) to protect EU industrial products from international competition

13 The Market Stability Reserve was introduced to allow the ETS to manage a surplus and balance supply overall. EUAs were traded at prices below 10 € for most of the third trading period and remained under 30 € essentially until the end of 2020. In 2021, they increased steadily to close to a peak of around 90€ in December 2021. Markets were showing close to 100 € just before the Russian invasion in the Ukraine, after which the price slumped to around 65€ at the time of writing (Trading Economics, 2022).

14 The reduction in 2020 was 41%. The significant additional change in 2020 shows the effect of the pandemic. Figures are for the EU 27 only (EEA Data Viewer – accessed 20.07.2022)

15 Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL amending Directive 2003/87/EC establishing a system for greenhouse gas emission allowance trading within the Union, Decision (EU) 2015/1814 concerning the establishment and operation of a market stability reserve for the Union greenhouse gas emission trading scheme and Regulation (EU) 2015/757. COM/2021/551 final <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021PC0551>

producing without comparable carbon constraints and to avoid so-called carbon leakage (a reduction in production capacity in the EU at the expense of an increase in imports from other parts of the world, shifting emissions outside of the EU) (German Environment Agency, 2021). Compromise agreement on the CBAM was reached in mid-December 2022, confirming the start of the mechanism with a transition phase from 1 October 2023 – and the introduction of actual payments on imports starting in line with the free allocation phase out (European Parliament, 2022b).

### **Assessment: challenges on the path to decarbonisation?**

The ability of the ETS in its likely post-2030 form to adequately contribute to climate neutrality needs to be considered separately for the two main sectors covered.

#### **Power sector**

Historically, the power sector has reduced emissions fastest of all sectors and is expected to do so post-2030 (Directorate-General for Climate Action (European Commission) et al., 2021). Prices for renewable energy technology are still going down and have been competitive with traditional sources for new built capacity for some years (IRENA, 2021). The increased carbon price further drives fossil fuel-based generation out of the market and makes renewable energy even more financially competitive (Ember, 2022). The urgent push to reduce gas consumption in Europe to reduce dependency on imports from Russia (European Commission, 2022d) has a mixed effect, at least temporarily. While it provides additional support to renewable energy deployment, it also provides an incentive for coal power use and leads to investments into additional fossil fuel infrastructure, such as LNG terminals. (Amelang, 2022; Waldholz et al., 2022).

The remaining issues to be resolved for the realisation of an emissions-free power sector lie mainly outside of the EU ETS and concern the **speed of renewable energy deployment** (barriers include licencing and planning processes, access to financing) as well changes to **infrastructure** (grid

integration measures, including grid extension) and an **integration of energy markets**. Renewables deployment is supported through separate EU legislation with national targets (Buck et al., 2019). Market rules enabling further integration of renewable energies and storage are laid down in the Electricity Market Regulation<sup>16</sup> and the Electricity Market Directive<sup>17</sup> as well as in a number of specific EU grid codes. Moreover, the EU co-finances cross-border infrastructure through the Project of Common Interest (PCIs). One key question in the context of climate neutrality across all sectors is the likely volume of additional demand for emission-free power stemming from **electrification** in other areas (transport, heating, industry). Another key question is the time lag in decarbonisation of heating and cogeneration plants. Large scale renewable heating production shows very slow progress and thus will build a residual of emissions in this subsector if not tackled with more speed (see section on buildings below).

The response to the energy crisis in 2022 has provided additional **dynamic to the question of the pace of renewables deployment**, which may go some way towards removing existing barriers. In May 2022 the Commission proposed REPowerEU Plan, which is meant to speed up the energy transition and enhance energy independence, i.a. by mobilising an additional 300 billion Euros through grants and loans to but also through overcoming non-financial barriers (European Commission, 2022e). With a combination of higher targets, faster permitting and additional financing, this push from the EU level could go some to addressing the necessary enablers.

In sum, in combination with the roll-out of renewable energy, the ETS 1 is a significant trigger for the move to a net zero emissions power sector.

16 Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity (Text with EEA relevance.) OJ L 158, 14.6.2019, p. 125–199

17 Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on common rules for the internal market for electricity and amending Directive 2012/27/EU (Text with EEA relevance.) OJ L 158, 14.6.2019, p. 125–19

## Manufacturing industry

The picture is more complex for manufacturing industry included in the ETS 1. Through the combination of a higher carbon price and the phasing out of free allocation of allowances, the EU ETS is creating economic pressure for change in the industrial activities covered – but this is not sufficient on its own to facilitate the transition to net zero emissions industry (Kivimaa & Kern, 2016). Decarbonisation of high-emission industries depends on the **availability of respective technologies** (incl. corresponding infrastructure) as well as new **business models** to support low emission production and lastly a **demand** for climate-friendly (but more expensive) products (e.g., green steel or cement). There is also scope for industrial emissions to be **captured** and stored to avoid emissions, but there is no common understanding of the storage volumes required and whether the underlying potential is sufficiently high (for a comprehensive overview of decarbonisation challenges in industry see (de Bruyn et al., 2020). This section looks at the main issues in the transition in turn and considers the current state of EU policies, which complement the impact of the EU ETS 1 on the covered industry sectors. The proposal for a Green Deal Industrial Plan, which emerged just before publication of this analysis, is considered towards the end.

One overriding concern in the transition to a climate friendly industry are the implications for international competitiveness. Increases in production cost through the carbon price and/or investment in clean alternatives could lead to **carbon leakage**, which could act as a disincentive into investments into clean production facilities in Europe and has long been raised by industrial sectors as a significant barrier. To protect against this, through the “Fit For 55” package a Carbon Border Adjustment Mechanism (CBAM) was introduced (for background see German Environment Agency, 2021). Industrial activities being supported through the mechanism will no longer be eligible for free allocation of EUAs (which is being phased out anyway by 2034), which would increase the carbon price signal. This additional mechanism (if indeed it can be applied as intended under international trade law) could go some way

towards securing investments into zero emission industry in the EU.

Regarding support for research and development to advance **technological progress**, the EU has developed dedicated financing opportunities, such as the Innovation Fund (sourced from the sale of EUAs) to support projects that advance technology readiness (European Commission, 2022c). The funding volume expected by the Commission is 38 billion Euro<sup>18</sup>. The Modernisation Fund could add even 48 billion according to the European Commission.<sup>19</sup> Several other EU level funds could also contribute to the additional investment in new industrial capacity and low carbon production technology. However, the existing financial instruments still do not generate the level of **additional investment needed** (de Bruyn et al., 2020, p. 9).

Electrification is an option for the decarbonisation of individual industrial processes (most secondary steel production is done through electric arc furnaces already (EUROFER, 2021), while the use of renewably sourced hydrogen could be another (e.g., as substitute for coal in primary steel-making). Hydrogen is already in use in industry in several industrial processes as a feedstock and these could similarly be reduced in carbon intensity through **green hydrogen**. The European Commission outlined a potential EU strategy for green hydrogen in 2020 (European Commission, 2020b) and followed up as part of “Fit For 55” in December 2021 with the Hydrogen and decarbonised gas market package. The shift in perspective following the Russian invasion of Ukraine meant that the December 2021 package and its underlying approach were out of date, as a faster transition away from gas is now required (Hanoteaux, 2022). In consequence, the REPowerEU plan aims to significantly accelerate the deployment of hydrogen; by 2030, 10 million tonnes of renewable hydrogen are to be produced domestically (European Commission, 2022d). Financing is in part meant to come from a European Hydrogen Bank, announced by Commission

18 The estimated volume is calculated at 75 € price per EUA – see European Commission website on the Innovation Fund at [https://ec.europa.eu/clima/eu-action/funding-climate-action/innovation-fund/policy-development\\_en](https://ec.europa.eu/clima/eu-action/funding-climate-action/innovation-fund/policy-development_en) - last accessed October 23, 2022

19 The sum is calculated based on a price of 75€ per ton. See Commission website at [https://climate.ec.europa.eu/eu-action/funding-climate-action/modernisation-fund\\_en](https://climate.ec.europa.eu/eu-action/funding-climate-action/modernisation-fund_en) - last accessed on 23 October 2022

President von der Leyen in her State of the Union speech in September 2022 (European Commission, 2022f). In parallel, the European Commission has proposed legislation to speed up the permitting of renewables. Faster deployment of renewable power would be a prerequisite for green hydrogen production.<sup>20</sup>

Another way to reduce emissions in industry is the advancement of **circularity** in production and consumption, for example through increased recycling rates (Agora Industry, 2022). Increased circularity was also a key emission reduction vector in one of the two climate neutrality pathways in the EU LTS of 2018 (see previous section). As a policy field, it has developed slowly, but is picking up speed (Langsdorf, 2021). The European Commission adopted a Circular Economy Action Plan in 2020 and has launched a series of more specific legislative proposals since, with the most recent packages of measures in March and November 2022 (European Commission, 2022a, 2023). The legislation proposed could be the start of a more significant movement towards reduced resource use, that could also reduce industrial emissions. The legislative measures aim to significantly expand the EU product policy framework and strengthen market surveillance as part of the Ecodesign for Sustainable Products Regulation; one measure is the use of regular checks carried out by member state authorities to detect any cases of non-compliance (European Environmental Bureau (EEB), 2022). However, critical observers point out that, for example, the Construction Products Regulation falls short of providing legislation that can tackle the construction sector's carbon footprint (European Environmental Bureau (EEB), 2022). While the measures are a step in the right direction, it remains to be seen how many of the ambitions indicated in the plan will be delivered on. Moreover, there are currently few dedicated EU level mechanisms to support uptake of low carbon industrial products, such as **carbon contracts for difference** (CCfDs) (Hauser et al., 2022) or a dedicated push for climate neutral public procurement. In the EU's 2020 hydrogen strategy

the Commission mentioned the possibility of CCfDs for a variety of potential applications connected to industrial production (European Commission, 2020b, p. 13). In the New industrial Strategy published in 2021, CCfDs were considered as a complement to the EU ETS (European Commission, 2021b). However, in the revised ETS Directive under "Fit For 55" they are only mentioned as a national instrument that should in future receive support from the Innovation Fund. There seems to be a growing recognition of the use of the instrument but not yet a targeted EU level approach to it. Individual Member States have started to redirect their own public procurement processes towards climate friendly products (e.g., Germany has set the goal of making its governmental administration climate neutral by 2030), but the EU Public Procurement Directive has not been updated since 2014 and it presently leaves the greening to national governments (Sapir et al., 2022). In Germany and France alone, public spending amounts to around one trillion Euros per year, an indication of the potential market pull that could be created by **net zero emissions public procurement** but goes largely unutilised at present (Lewis et al., 2022).

Several options for carbon capture and storage (CCS) and even **technical carbon dioxide removal** (CDR) are feasible in principle in industry. CDR would essentially imply capture from large, concentrated emissions sources, based on bioenergy as fuel and stored in geological formations to keep any emissions out of the atmosphere permanently (BECCS). CCS and technical CDR options are still hampered by several issues, including technological development, financing and/or a business case, transport infrastructure, and public opinion. Moreover, they need a regulatory framework to clarify issues of liability and accounting. The CCS Directive of 2009 already provides the start of a legal framework for permanent storage (European Commission, 2021d, p. 16). The Innovation Fund is now supporting four CCS projects financially (European Commission, 2021a) and the size of the Fund could grow. In previous iterations (e.g., under the NER300) projects had been abandoned even after funding had been awarded (Duwe & Ostwald, 2018). The EU ETS is "CCS ready" in principle in that it acknowledges that any captured and stored

20 Proposal for a Council Regulation laying down a framework to accelerate the deployment of renewable energy. COM/2022/591 final <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52022PC0591&qid=1669020920010>

emission does not require an allowance (Article 12.3a ETS Directive). However, it does not provide a further incentive for moving beyond emission avoidance to actual removal (= BECCS) at present (Rickels et al., 2021). In its December 2021 communication on sustainable carbon cycles, the Commission proposes to advance the development of CDR in industry through the adoption of specific goals at EU level for CDR.<sup>21</sup> As a possible step in this direction, the Commission has published a proposal for a regulatory EU framework addressing the certification of both natural and technical options for carbon removals<sup>22</sup>. For industrial CDR activities, the proposed certification frameworks ensures that the quantification of carbon removals is aligned with the rules on the monitoring and reporting of GHG emissions under the ETS. However, the proposed regulation does not specify in what way the CDR framework could or should be integrated with the ETS.

EU efforts to advance the transition to a net zero industry have received additional visibility and political attention in the context of the EU's efforts to respond to the USA's Inflation Reduction Act. On 1<sup>st</sup> February 2023 the European Commission presented its proposals for a "**Green Deal Industrial Plan** for the Net-Zero Age"<sup>23</sup> (expanding on the Industrial Strategy of 2020 and an update of it in 2021) in which several of the essential drivers for the transition mentioned above are referenced. In terms of concrete measures, the Commission announces its intention to present a simplified regulatory framework through a "Net Zero Industry Act" and to simplify access to funding, including through harmonisation via a European Sovereignty Fund. However, at the same time there are signs that previous processes to develop "transition pathways" towards net zero emissions in

key sectors are not being pursued as promised<sup>24</sup> - and enshrined in the EU Climate Law (Article 10). They are not referenced anymore as a building block in the Green Deal Industrial Plan. This could mean that an important instrument is missing that could inform policy and support coordination across sectors and policy areas as well as involve of relevant stakeholders in the process, which in turn can generate support for the outcome.

In sum, the EU ETS 1 as a pricing tool alone can provide a sense of direction and an important economic signal, but it cannot provide the many enabling functions needed. A whole suite of complementary policies are required. Considering the Green Deal Industrial Plan, combined with the push towards hydrogen via REPowerEU and the legislation published in 2022 regarding circularity and carbon removals, for example, there is arguably **a significant dynamic in EU policy-making towards these levers for climate neutral industry**, even if not all necessary elements are addressed adequately yet.

21 The ETS Directive also proposes to consider as an equivalent form of storage a kind of carbon capture and utilisation in which the carbon would be chemically bound to the product which would not be released "under normal use", without further specifying what that means. This has been criticised by environmental groups for its risk of non-permanent storage (Stoefs, 2021).

22 Proposal for a Regulation of the European Parliament and of the Council establishing a Union certification framework for carbon removals. COM(2022) 672 final [https://eur-lex.europa.eu/resource.html?uri=cellar:60d407c8-7164-11ed-9887-01aa75ed71a1.0001.02/DOC\\_1&format=PDF](https://eur-lex.europa.eu/resource.html?uri=cellar:60d407c8-7164-11ed-9887-01aa75ed71a1.0001.02/DOC_1&format=PDF)

23 Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions. A Green Deal Industrial Plan for the Net-Zero Age. COM(2023) 62 final. 1.2.2023

24 Blog post by Climate Action Network Europe "The case of the disappearing energy-intensive industries transition pathway. 02/02/2023" <https://caneurope.org/case-of-the-disappearing-energy-intensive-industries-transition-pathway/> - last accessed 11 February 2023

## 2.3 Climate Action Regulation (Effort Sharing Regulation)

### Assessment summary: strengths and remaining crunch issues

- **PLUS:** Binding annual targets covering most emissions outside of the ETS 1.
- **MINUS:** Strong differentiation of emission targets between Member States not compatible with climate neutrality target. Some Member States will need to achieve annual emission reductions of 10% post-2030.
- **MINUS:** Late compliance cycle might not set a strong enough incentive to act early in the CARE period.
- **MINUS:** The CARE ends in 2030 providing no formal requirements to achieve long-term targets. This is especially harmful in the buildings sector.

### Description

Under the Climate Action Regulation for Europe (CARE, commonly called Effort Sharing Regulation)<sup>25</sup> all Member States committed themselves to binding annual greenhouse gas emissions targets for most of emissions not covered by the ETS.<sup>26</sup> Targets are expressed as a reduction compared to 2005 emission levels and are based on the country's wealth: Bulgaria, the poorest Member State in terms of GDP per capita, has the least ambitious target, a reduction of 0%; the richest countries need to reduce emissions by 40%. In the Fit for 55 package these targets are increased to 10%/50% below 2005 levels respectively.

<sup>25</sup> Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action, amending Regulations (EC) No 663/2009 and (EC) No 715/2009 of the European Parliament and of the Council, Directives 94/22/EC, 98/70/EC, 2009/31/EC, 2009/73/EC, 2010/31/EU, 2012/27/EU and 2013/30/EU of the European Parliament and of the Council, Council Directives 2009/119/EC and (EU) 2015/652 and repealing Regulation (EU) No 525/2013 of the European Parliament and of the Council (Text with EEA relevance.) OJ L 328, 21.12.2018, p. 1–77

<sup>26</sup> Emissions and removals from land-use and forestry are covered by the LULUCF-Regulation (see dedicated section below, 2.0). Emissions from aviation and international maritime transport (see next section) are partially addressed in the EU ETS and partially not covered in any legislation.

Achievement of these targets is the responsibility of Member States but key legislation for the covered sectors such as the efficiency standards for vehicles and appliances and standards for the energy performance for buildings are set at EU level. Most Member States have been able to meet their national targets until 2020 on their own. To achieve the 2030 targets under the CARE, emission reductions need to increase: between 2005 and 2019 emissions of EU-27 have decreased by only 11%. To achieve the proposed 2030 CARE target, another 30% of 2005 emissions need to be reduced over the course of ten years.

### What does the CARE look like post-2030 under “Fit For 55”?

The CARE only sets emission targets until 2030; for a continuation of the mechanism a new legislative act is required.<sup>27</sup> If continued (like the three times national targets have been set under this/similar legislation before) it would require a clear differentiation between countries based on national GDP/capita. The overall target would have to be in line with the EU's long-term climate ambition, i.e. achieving net zero by 2050 at the latest.

### Assessment: challenges on the path to decarbonisation?

When looking at the period after 2030 and the ability of the CARE to contribute to climate neutrality, both the design of the regulation as well as some of its sectors need to be considered.

### Design of the Climate Action Regulation

Several aspects of the CARE are not fit for climate neutrality by 2050. Most importantly, to achieve climate neutrality all energy-related fossil fuels need to be phased out. This requires a full decarbonisation of all transport, the buildings sector and small energy and industry installations. So far, solidarity between countries has been implemented in differentiated targets, i.e., the poorer the country the lower the reduction target. This leads to a **massive challenge until 2050 especially for low-income countries:**

<sup>27</sup> The interaction between CARE and the proposed ETS in the buildings and road transport sector which go beyond 2030 is discussed in the next section.

14 out of the 27 Member States have a reduction target of no more than 20% compared to 2005 by 2030. To achieve climate neutrality, all fossil fuel use also in the sectors covered by the ESR will need to be phased out 20 years later. Taking into account a remaining national budget for agriculture, **year-on-year emission reductions of up to 10% will be required in several countries**. In contrast, historic year-on-year reductions have been around 1%. Any further differentiation between Member States needs to be based on other solidarity mechanisms; intermediate CARE targets until 2050 should be strictly based on the required pathway to avoid even more extreme annual emission reductions towards the year 2050; other solidarity mechanisms would then be required. An alternative which would allow maintaining differentiated emission targets would require negative emission for the richest Member States. So far, emission removals through technical sinks cannot be accounted for in the CARE.

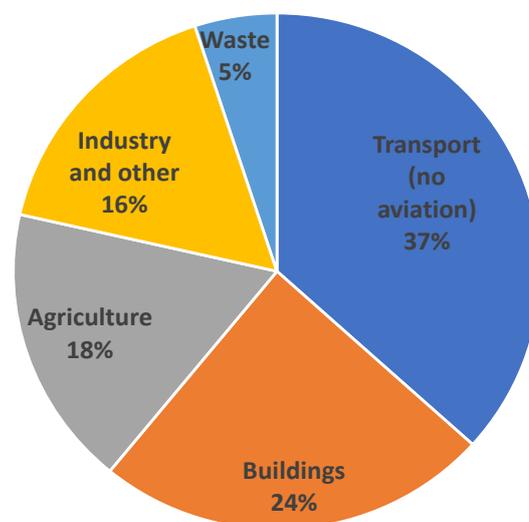
Another design challenge is the diversity of the covered sectors (see below) and the long timeframes. While CARE-targets are annual and binding, compliance is only checked twice: in 2028 for this first time covering the years 2021 to 2025 and five years later for the rest of the period until 2030 (Gores et al., 2019). Short-sighted national governments might therefore not take the CARE targets seriously enough at the beginning of the period; later on, it might be impossible to bring emissions down fast enough to still meet the targets. If a country is found not to be in compliance, the Commission would initiate infringement procedures. These procedures take years to resolve and will be too late to lead to corrective action.

Contributing to this is the **lack of a public price of GHG emissions under the CARE**: there is no price finding mechanism for transfers of emission allocations between member States and the agreed price in bilateral trades is not public. If a country is found to be in non-compliance in 2028, the ensuing infringement procedure will likely take longer than the duration of the current CARE. The second compliance cycle is years after the end of the period. To compensate for this delay, the Commission assesses the progress of each Member States

annually; if deemed insufficient, a corrective action plan needs to be drafted by the concerned Member State. The Commission can give an opinion on the plan that needs to be taken into “utmost account” (Article 8.3). It remains to be seen how effective this mechanism is to ensure short term emission reductions if required. As a result, the emission targets might not be met leading to the EU missing its climate goals overall. The planned ETS-2 can alleviate parts of these concerns but similarly can only play a limited role in ensuring target achievement (see section 2.d).

Despite these shortcomings in the design of the law, the **binding national targets under the CARE play a crucial role in driving the adoption of additional climate policy** at the Member State level – and also provides justification for more sectoral EU action. For example, it is one of the purposes listed in the German climate framework law and has been a strong argument for the strengthening of the vehicle efficiency standards at EU level. Even if it has less direct “bite” than the ETS, it cannot be ignored by policymakers at the EU level and in the 27 capitals. It puts pressure on national governments to adopt climate measures which is very important, given the complexity of decarbonising the covered sectors. The situation for each of the three main sectors are analysed below.

**Figure 3: CARE emissions by sector (2019)**



Source: European Environment Agency 2021

## Road transport

Emissions from road transport have not declined significantly since 2005 and are the largest single source under the CARE. Without fast and stringent action in this sector, Member States will find it very challenging to meet their 2030 targets. The revised vehicle standards adopted under “Fit For 55” require that from 2035 onwards all new cars need to be zero emission vehicles. With the typical lifetimes of vehicles in Europe, this implies that **almost all cars would be emission free by 2050**. It is assumed, that this will be achieved essentially through electrification. Accordingly, to facilitate this transition, electricity generation from renewable energies needs to be scaled up and the charging infrastructure needs to be deployed. For freight transport there are signs that a similar development is possible. While current targets for heavy duty vehicles (HDV) in the EU fall short of the required ambition, most major manufacturers plan to phase out fossil fuel trucks by 2040. This would lead to an emission reduction of 96 % by the year 2050 compared to 2019 (ICCT et al., 2022). To ensure this phase-in of zero emission HDV the relevant legislation needs to be adopted. Emission standards for vehicles are regulated at the EU-level; Member States can support the transition towards zero-emissions vehicles e.g., through emission-dependent vehicle tax rates, fuel taxes and providing the required infrastructure.

At the same time, merely exchanging a fossil energy source with a carbon free source will not reap all the benefits which would come with a true green transition of transport. Redesigning cities for non-motorised transport, improving public transport both in urban and rural areas, reducing transport demand, a modal shift also for freight transport, all of these changes are indispensable for target achievement. A direct incentive for these urgent but small-scale and partly high investment structural changes is not included directly in the CARE. Moreover, it will be the emission standards for vehicles which will bring down CO<sub>2</sub> emissions from road transport; the CARE is only playing a secondary role in this sector so far.

## Buildings

Due to the long lifetime of buildings, it will not be enough to only regulate carbon emissions from new buildings – a key difference compared to road transport. The **existing building stock needs to be improved**, mainly through better insulation and a substitution of fossil-based heating system with heat pumps using renewable electricity or more connections to district heating grid. In the Energy Performance of Buildings Directive minimum standards are defined but Member States can and need to go beyond those standards to achieve climate neutrality by 2050. Importantly, all new buildings should be true zero energy buildings which produce as much energy as they consume over a year. In addition, Member States need to set sufficient incentives and regulations to achieve a constant and high renovation rate until 2050. The Commission published a renovation wave strategy which aims to double energy renovation rates across the EU in the next 10 years (European Commission, 2020c). Apart from reducing CO<sub>2</sub> emissions this would also reduce energy poverty, increase comfort and quality of life and produce additional green jobs.

Bringing the buildings sector towards climate neutrality requires long-term planning and agreement on policy targets. The **CARE with its limited lifetime until 2030 does not provide a strong obligation** for Member States to act according to the 2050 target and to incentivise infrastructural investments.

## Agriculture

Emissions from agriculture have remained constant since 2005 and represent about 18% of all GHG emissions in the CARE sectors. Compared to 1990, emissions from agriculture were down by 21% in the year 2021 (EEA, 2021a).<sup>28</sup> Agriculture is expected to remain an emission source and might become the main remaining source in a climate-neutral EU (see Figure 2). This is due to non-CO<sub>2</sub> emissions from current agricultural practices: 90% of emissions from agriculture are methane emissions from enteric

<sup>28</sup> Here, agriculture only refers to emissions not related to energy consumption. This includes emissions from fertilizer use, from soil and enteric fermentation of manure from animals.

fermentation and manure management as well as nitrous oxide emissions from soils. These emissions are closely linked to meat and milk production and cannot easily be reduced with current consumption patterns. The Common Agriculture Policy (CAP), the main EU instrument in the sector, has not been effective in reducing emissions (EEA, 2021b). At the same time, the major share of agricultural emissions is directly and indirectly linked to livestock. A study for Germany found, that emissions could be decreased by over 70% if the demand for meat and dairy products would be minimised (Scheffler & Wiegmann, 2022).<sup>29</sup> Just reducing production but not demand within the EU would lead to carbon leakage of agricultural emissions and would not reduce atmospheric concentration of GHGs. In other words, a **key driver to reduce GHG emissions from agriculture would be a change of diet** in the general population.

Currently, the CARE does not directly lead to incentives to introduce less-emitting practices nor for the dietary change required to really reduce emissions. Strengthened targets will force Member States to take action on emissions from agriculture eventually, but a change in EU level policies will be required alongside these.

<sup>29</sup> These numbers are based on a reduction of animal stock by over 70% for cattle, 84% for pigs and 29% for poultry.

## 2.4 Emission trading for road transport, buildings and small industry (ETS 2)

### Assessment summary: strengths and remaining crunch issues

- **PLUS:** The ETS 2 is likely to reduce emissions in poorer Member States faster than required by the CARE, supporting them in their transition towards carbon neutrality.
- **PLUS:** The ETS 2 de facto sets a sectoral emission target for road transport and buildings. Due to the strong ETS compliance, this provides clear incentives to reduce emissions.
- **MINUS:** Even a very high carbon price for road transport and buildings alone is unlikely to reduce emissions quickly enough. Together with other regulations and incentives it can contribute to an effective overall policy mix
- **MINUS:** The social impacts of a uniform carbon price across all Member States could undermine the acceptance of climate policy especially. Dedicated programmes supporting poorer households are required to avoid energy poverty.

### Description

The legislative package also includes a second independent emission trading scheme covering road transport, buildings and small energy and industry installations across all Member States. It is supposed to start in 2027. The 2030 target is a reduction of 43% compared to 2005 emissions by these sectors. All allowances will be auctioned. A main difference with the ETS 1 for large installations is the point of regulation: fuel suppliers will be responsible to purchase and submit the allowances for the fuel sold but have only limited options to reduce their emissions; end consumers will only be affected by a price increase of the fuel bought but not participate

in the ETS directly. A Market Stability Reserve and a price stabilisation mechanism are included to ensure that there is no market imbalance. In parallel to the ETS 2 a Social Climate Fund will be established which will receive 65 billion EUR. The revenues will be used to support especially the most vulnerable share of the population to reduce the cost impact, e.g., by improving public transport or with energetic refurbishment of their dwellings.

The **ETS 2 is an instrument to help Member States achieve the objectives of the CARE**. It does not constitute a separate pillar of the EU' climate architecture. In effect, it sets a sectoral target for road transport and buildings which are currently responsible for approx. 55% of the emissions covered by the CARE. In 2005, the share was 60% and the 2030 target is 51% of the CARE target, i.e., emissions from these two sectors need to decrease somewhat faster than those from the other sources covered by the CARE.

### **What does the ETS 2 look like post-2030?**

Like the ETS 1 legislation there is no end-date for the ETS 2. If unchanged, the cap would reach zero in the year 2043. The separation between the two ETSs is an initial measure to avoid negative impacts on the ETS 1 and in the ETS 2 sectors. Uncertainties with regards to data quality, market behaviour and price levels could undermine the effectiveness of the ETS 1 considering the high emissions from road transport and buildings. Depending on the developments of the ETS 2 and the experience gained in the first years both trading systems might be merged into one in the future.

### **Assessment: challenges on the path to decarbonisation?**

A carbon price can impact emissions by creating an incentive to use cleaner alternatives if available (e.g., fuel switch for electricity generation), to reduce demand and by influencing investment choices (Acworth et al., 2021). For the ETS 2 this could mean a modal shift (i.e., more public transport and non-motorised transport), fewer trips, smaller cars and electric vehicles. For heating, except for wood stoves

in some households there is no already installed alternative with less carbon-intensive fuels in almost all buildings. Immediate saving efforts (i.e., lower room temperature or unheated rooms) is the main short-term response to carbon prices, in the medium term the CO<sub>2</sub> costs would lead to investments in carbon free heating systems (e.g., heat pumps) and better insulation (demand reduction, lower flow temperatures). For small energy and industry installations the most cost-effective measure will often be a switch to less carbon-intensive or renewable energy sources. In theory, the ETS ensures that the most cost-efficient abatement options are identified and utilised first. However, compared to the ETS 1 **there are structural barriers**: instead of relatively few high-emitting entities there are several hundred million individuals each responsible for small point sources. Many of those individuals have very limited capabilities to react to a carbon price, either due to lack of financial resource, lack of knowledge or lack of alternatives. For example, a tenant cannot change the heating system or improve the insulation of the rented dwelling and too many (especially rural) places are not adequately connected to public transport systems. In addition, even very high carbon prices are expected to have only a limited impact on emissions. A recent study for Germany estimates that even a price of 200 EUR/t CO<sub>2</sub> in 2023 rising to 350 EUR/t CO<sub>2</sub> in 2030 would only decrease emissions by 17 % in the transport sector and 14% in the building sector compared to the base case with a carbon price of 23 /125 EUR/t CO<sub>2</sub> respectively for those two years (Harthan et al., 2022). A **carbon price in these sectors** can support and supplement other policies to reduce emissions if the policy mix is designed wisely but **will not be the main driver of abatement** by itself. It could mainly help to set the correct incentives if investment decisions are compared: The use of conventional technologies and fuels needs to be less financially attractive than an alternative new low or zero emission technologies.

Despite these limitations the **ETS 2 might prove to be a very important instrument** to achieve the EU's climate targets. First, it applies uniformly to all Member States, but is within the CARE. This means that countries with a lower emission reduction

target under the CARE may overachieve their targets due to the reductions in the ETS 2. This would help these countries on their path to achieving climate neutrality by 2050, and annual emission reductions after 2030 would not be as extreme as based on the CARE targets only (see previous segment). Second, the same countries would also profit from the associated sale of emission quantities under the CARE, i.e., by overachieving their targets due to the ETS 2 they would be able to receive additional funds which can be used to further reduce emissions or address energy poverty. Third, the ETS continuously adjusts its price incentive according to emission developments and the target path. It is thus much more immediate than many other policies and measures. Last, it has a much stronger compliance regime than the CARE. The ETS 2 together with the CARE thus creates a much higher certainty that emission reductions in road transport and buildings will take place.

The drawback of such an EU-wide uniform approach is the vastly differing capability to pay for higher energy prices, invest in climate-friendly alternatives and associated potential negative social impacts. A price which might already lead to fuel poverty in the poorer regions of the EU might not have a real impact in high income areas. Compared to household expenditure, the impact of a carbon price of 55 EUR/t CO<sub>2</sub> is about twice as high in the lowest-income compared to the highest-income Member States (Fiedler et al., 2022). A social imbalance could undermine the public acceptance of stringent climate policy. Beyond 2030, the funds and programs to help the poorest population with energy efficiency and a transition towards renewable energies across the EU need to be strengthened to minimise any adverse impact of the carbon pricing on this share of the population.

## 2.5 International transport

### Assessment summary: strengths and remaining crunch issues

- **PLUS:** International transport is included in the EU's climate neutrality target
- **PLUS:** ReFuelEU Aviation/Fuel EU Maritime targets set the right approach but are not in line with decarbonisation of aviation and shipping by 2050.
- **MINUS:** Aviation routes between the EU and third countries are under no adequate emission control regime.
- **MINUS:** Non-CO<sub>2</sub> related climate impacts of aviation are not regulated
- **MINUS:** Carbon leakage is potentially a risk (same as for industry)

### Description

Emissions from international aviation and shipping have risen constantly over the last decades. Despite this, they are not included in the GHG emission targets of most countries worldwide. In the EU, aviation was partially integrated in the EU ETS 1 from 2013 onwards. The scope of included flights is limited to those within the European Economic Area (EEA). The initial plan was to also include all flights to and from third countries. This was put on hold due to strong international objection. Instead, the International Civil Aviation Organisation (ICAO) was supposed to deliver a global agreement. The resulting Carbon Offsetting and Reduction Scheme in International Aviation (CORSIA) aims to halt the growth of emissions from international aviation but is not in line with the required emission reductions to achieve the goals of the Paris Agreement (Schneider & Wissner, 2022).

Through the "Fit For 55" Package the ETS 1 is going to be expanded to maritime shipping covering all trips within the EEA, 50% of emission from routes to/from third countries and all emissions at berth (Umweltbundesamt, 2021a). For aviation, the scope of the ETS will be expanded for the implementation

of CORSIA. This will extend the scope of emissions covered by the ETS to also include all flights by EEA carriers in third countries that participate in CORSIA.<sup>30</sup> In addition, flights to and from countries that do not participate in CORSIA will also be included in the ETS (Umweltbundesamt, 2021b).

The Commission also proposed minimum energy tax rates for fuel supplied to intra-EU aviation and shipping. So far, both sectors are exempt from energy taxes. In addition, the fuel needs to become increasingly carbon neutral. For shipping, the CO<sub>2</sub> intensity of fuels has to decline gradually to 75% below the 2020 reference value until 2050. For aviation, the share of sustainable aviation fuels is supposed to increase to 63% by the same year. As part of this target a sub-quota for e-fuels is defined; the largest share can be achieved by biofuels.

The inclusion of emissions from international transport within the EU's updated NDC is not yet decided. In the initial NDC, all fuel sales for civil aviation were included in the EU's 40% target, emissions from international shipping were not included.<sup>31</sup> The EU's climate neutrality objective as defined in the EU Climate Law has a clearer scope: It covers GHG emissions by sources "regulated in Union law" (Article 2.1 EUCL). The EU ETS by definition regulates greenhouse gas emissions, i.e., to the extent that **these sectors** are included in the ETS they **are also included in the climate neutrality objective**.

For aviation, the actual climate impact is approx. three times as large as the CO<sub>2</sub> effect only; the main contribution to the non-CO<sub>2</sub> impacts is aviation induced cloud formation (Lee et al., 2021). The ETS, CORSIA and the climate law only cover CO<sub>2</sub> emissions from aviation, i.e., two thirds of the full climate impact is excluded.

For shipping, there are additional climate impacts from methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O) emissions as well as effects from black carbon. These account for additional 9% of GHG emissions

(although black carbon is technically not a GHG but a climate pollutant) (Faber et al., 2020). Black carbon emissions are not addressed by any current emission targets but regulations at EU level and the IMO on fuel quality standards and sulphur content will reduce black carbon emissions as cleaner fuels (distillate fuels like marine diesel oil) produce fewer black carbon emissions upon combustion. Methane and nitrous oxide emissions might be addressed at EU level if they are included in the FuelEU Maritime Initiative and the EU ETS for the maritime sector.

### **What does EU policy for the climate impact of international transport look like post-2030 after "Fit For 55"?**

Under current legislation, the cap under the ETS 1 will reach zero around the year 2040. This will also apply for the covered emissions from aviation and shipping. For aviation, the ETS scope might extend to all flights leaving and entering the EU after 2035, if CORSIA is not extended nor another regime is agreed at international level. The requirements for sustainable fuels in aviation and CO<sub>2</sub> intensity in shipping will decrease emissions from these sectors, but **both targets will not lead to a complete phase-out of fossil fuels by 2050**.

### **Assessment: challenges on the path to decarbonisation**

The adopted EU legislation is a **big step towards the required contribution of both sectors**. The inclusion in the EU's climate neutrality target and the quotas for sustainable fuels set the right framework. Yet, gaps remain. Firstly, the fuels used in international transport will still contain fossil shares in 2050 requiring offsets from other sectors. The main challenge here is the supply of sufficient renewable fuel. The demand from these sectors is in competition with industry for green hydrogen hydrogen-derived fuels and feedstock and renewable electricity. A concerted effort will be needed to ensure a supply that meets full demand. Secondly, only CO<sub>2</sub> emissions from aviation are regulated. While significant, it is only one third of the true climate impact of aviation. Climate neutrality can only be achieved if these emissions are dealt with as well. Thirdly, emissions

30 For these flights, operators are permitted to use CORSIA units instead of EU ETS allowances.

31 UNFCCC (2021). [https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/European%20Union%20First/EU\\_NDC\\_Submission\\_December%202020.pdf](https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/European%20Union%20First/EU_NDC_Submission_December%202020.pdf)

from flights to and from non-EEA countries are not adequately covered. CORSIA has a minimal benefit for the climate and carbon prices are expected to remain too low to have a measurable impact on demand. By including these emissions in the objective but shielding them from the full ETS impact the EU is at risk of missing its target.

A **challenge for the period after 2030 will be the risk of carbon leakage** if other relevant countries do not take similar steps. Long-distance flights with a stop-over outside of the EU will have lower costs from EU climate legislation because the sustainable fuel shares are linked to fuel uptake in the EU. In addition, the energy tax and the ETS only cover intra-EEA flights. Under current prices, the impact is minimal; looking towards 2050 especially the sustainable fuel share could be a significant cost contribution (Öko-Institut (forthcoming) et al., 2022). It might therefore be necessary to implement some carbon leakage protection to eliminate evasion. This could take place in form of a ticket tax which differentiates on the basis of climate regulation instead of differentiation between distances as applied currently in most countries. The ticket tax depends on the final destination of a passenger, higher rates for routes which are largely outside of the EU's climate regime could then have a higher tax. This would also be an incentive for third countries to also implement measures in the sector to not be penalised by the higher ticket tax.

## 2.6 LULUCF: carbon dioxide removals through natural sinks

### Assessment summary: strengths and remaining crunch issues

- **PLUS:** EU legislation on the land use sector introduced absolute net targets for the EU and individual Member States that increase the focus on both emissions and removals from the sector.
- **MINUS:** Simple “net” targets imply a one-to-one “exchange rate” between removals and fossil fuel emissions and make gross emissions invisible, which urgently need to be tackled. Both aspects pose fundamental risks for the environmental integrity and permanence of climate action.
- **MINUS:** An integration of natural sinks into a common accounting framework requires robust quantification, especially when involving carbon markets. There are, however, still substantial methodological shortcomings regarding completeness and accuracy of reporting in Member States.

### Description

Natural sinks generated by forests and other land use covered by the LULUCF sector currently form the only option to generate net CO<sub>2</sub> removals. Such “negative emissions” through CDR are needed alongside the structural transition to emissions-free technology and practices to compensate any remaining emissions from fossil fuels and to realise net zero and eventually net negative emissions in sum. The importance of natural CDR was recognised in the EU Climate Law through, among other, an explicit target for 2030. This is also reflected in the 2030 target for the LULUCF sector, which increases the overall ambition by two percentage points to a reduction of 57% below 1990 (European Parliament, 2022b).

As a means of financing the enhancement of natural sinks and to cover costs for mitigation measures in the

land sector, **many actors involved expect additional funding** that could be provided by new support schemes (e.g., state payments for ecosystem services), the redirection of existing subsidies (e.g., Common Agricultural Policy), or revenues from carbon credits through certified carbon removals (e.g., Carbon Farming).

Achieving climate neutrality by 2050 requires a **considerable enhancement of net sinks** in ecosystems. Net removals through natural sinks can be achieved by addressing gross carbon removals by expanding forest area, changing forest management, and improving forest adaptation, as well as converting of cropland into grassland and expanding agroforestry systems and organic farming. Similarly important and often **even more effective are measures addressing gross emissions**, such as reducing deforestation and grassland conversion to cropland and settlements and the restoration of wetlands by rewetting of organic soils.

The realisation of both types of mitigation potentials relies on effective mechanisms and policy instruments. Some improvements are visible. The European Union agreed on a revision of the EU LULUCF Regulation EU (2018/841) as part of “Fit For 55”. The revision can be considered **a gradually performed paradigm shift regarding the treatment of the LULUCF sector** in the EU’s climate target architecture. The Regulation for the first time formulates absolute EU and national binding targets for the period 2026 to 2030. It also includes the requirement to improve GHG reporting in the land use sector and the use of geographically explicit data for estimating emissions and removals.

Moreover, in December 2021, the European Commission published a Communication on Sustainable Carbon Cycles (European Commission, 2021d), accompanied by a Technical Assessment (European Commission, 2021c), that announced mechanisms for upscaling carbon farming. In November 2022, the Commission introduced a carbon removal certification framework (CRCF)<sup>32</sup>. The proposal provides a definition for removals and sets out rules for the verification of those. It also

includes requirements for recognising certification schemes that can be used to demonstrate compliance with the EU framework.

### **What does the LULUCF pillar look like post-2030 under “Fit For 55”?**

With its proposal for a revision of the LULUCF regulation in 2021, the Commission suggested a new approach for the post-2030 period. It proposed setting a target for agriculture, land use and forestry from 2031 onwards to achieve net zero emissions in this combined sector by 2035. This would have created a land-use pillar including both LULUCF emissions and removals and non-CO<sub>2</sub> emission from the agriculture sector (also referred to as the AFOLU sector, Agriculture, Forests and Other Land Use) (European Commission, 2022b). The Environment Council in 2022, however, adopted a general approach, in which it considered “the introduction of post-2030 targets and the creation of the AFOLU pillar [...] to be premature” (Council of the European Union, 2022a), and the European Parliament similarly rejected the approach. Accordingly, the provision was not inserted into the Regulation. The proposal of an AFOLU pillar would have laid the ground for an increased fungibility of fossil and biogenic carbon and was expected to set the stage for a more integrated architecture with more flexibility for Member States between sectors and mitigation strategies post 2030. However, also critique was raised that such fungibility could potentially harm environmental integrity, i.e., take pressure from the agriculture sector to reduce emissions. The structure post-2030 thus remains what it was for the moment, and no specific quantitative targets for LULUCF as a sector have been adopted yet.

### **Assessment: challenges on the path to decarbonisation**

EU legislation on the land use sector introduced absolute net targets for the EU and individual Member States that increase the relevance of emissions and removals from the sector. Already the integration of LULUCF in the overall 2030 EU climate target and

32 See footnote 22

the EU Climate Law<sup>33</sup>, significantly increased the relevance of the sector by making LULUCF an explicit component of the 2023 GHG emission reduction target through formulating the goal as “net” and by quantifying an upper limit for the contribution of natural sinks. However, a number of shortcomings exist that threaten the integrity of this contribution and the expansion of natural sinks beyond 2030.

To set incentives for enhancing natural sinks and reducing land use emissions, fair and cost-efficient **reduction targets** are needed, that take the future potential for reducing and avoiding emissions and increasing removals into account. The actual mitigation potential in countries depends partly on the area shares of different land uses but also on past practices as well as the ecologic and also economic constitution of the sector. This complexity cannot be reflected by sector wide net targets despite their seemingly simplifying nature.

Reporting of **emissions from LULUCF**, especially from land use categories including organic soils, is still incomplete in many Member States (Bellassen et al., 2022). It is important to focus mitigation efforts on these emissions. To mobilise emission reduction potentials, separate subtargets for LULUCF emissions are required, as they were foreseen in the proposal of the ENVI Committee Regulation (European Parliament, 2022a) but rejected by the EP.

In fact, **reliable information** for specific land use categories can often only be provided periodically, e.g., through forest inventories or soil surveys, spanning over years and decades even. To ensure that monitoring and reporting systems in place in EU Member States cover impacts of mitigation measures and thus achieve measurable emission reductions and sink enhancements to achieve national targets, to be quantified in national GHG inventories, reporting needs to be sufficiently granular and accurate, which is still a challenge for Member States.

There is the expectation that farmers and foresters

could generate additional revenues from the **sale of carbon credits** on voluntary carbon markets, helping to cover the costs for removals and emissions reductions. Still, specifications on how such markets ought to be organised EU-wide have not yet been formulated or agreed. However, analysis sees still a number of challenges and limitations for incentivising removals through natural sinks in **market-based mechanisms** (COWI et al., 2021). These include potential higher financial risks and uncertainty for farmers if the framework does not clarify liability for carbon credits. Overall, high transaction costs can be expected as challenges regarding monitoring, reporting and verification (MRV) of results and issues of non-permanence are still unsolved.

Building on natural sinks bears **potential conflict over land** for food, biomass for material or energetic use and other ecosystem services. EU policies addressing natural sinks should also take into account the considerable differences between mitigation options with regards to their expected impacts on biodiversity, soil protection, food production, and the climate resilience of ecosystems, e.g., comparing afforestation with fast growing monocultures or restoration of natural ecosystems.

33 The EU's 2030 climate target of -55% greenhouse gas emission relative to 1990 levels is a 'net' target that includes LULUCF in the base year and target.

## 2.7 Going beyond greenhouse gas emissions

### Assessment summary: strengths and remaining crunch issues

- **PLUS:** The EU's 2050 climate neutrality target goes beyond the classic greenhouse gases and – in theory – includes all anthropogenic climate impacts.
- **PLUS:** Some of the EU policies on climate, health and other topics already reduce emissions from some other climate pollutants.
- **MINUS:** Addressing other climate pollutants has not yet been a focus of EU policy and there is limited knowledge about this issue, including about effective policies and measures to reduce them.

### Description

The EU Climate Law specifically aims at **climate neutrality** by 2050. This specific formulation **has implications for the scope of what is included under the goal**. It goes beyond mere greenhouse gas neutrality, which only includes emissions covered by the reporting and accounting requirements of the Paris Agreement (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, F-gases and NF<sub>3</sub>). Through this choice of wording, the objective covers also other anthropogenic climate impacts, such as hydrogen emissions, soot, water vapor, the change of the surface albedo<sup>34</sup> and non-CO<sub>2</sub> effects of aviation. Compared to current CO<sub>2</sub> emissions, these contributions are small, but this picture will change with the envisaged emission pathway until 2050. Emissions of particulate matter/soot will decrease in step with the decrease of burning fuels, but the planned transformation of the industry will lead to higher hydrogen emissions which do not play a role at the moment. A recent study estimated, that the GWP<sub>100</sub> of hydrogen is 11, about half as much as the GWP<sub>100</sub> of methane (Warwick et al., 2022). So

<sup>34</sup> Albedo describes the reflectivity of the earth's surface. Lighter colours will reflect more light into space, where-as darker colours absorb the light and convert it into heat.

far, there is policy addressing particulate matter emissions for health reasons but very little for the other climate impacts.

### Assessment: challenges on the path to decarbonisation

To become truly climate neutral, the **EU will need to take action on** these (and potentially other) **anthropogenic climate impacts**. As a first step, better understanding of the sources, effects and policy options for these contributions is necessary. Fast action is especially opportune for hydrogen, where production and usage are expected to increase significantly over the next decades. Any requirements reducing leakage would reduce negative impacts from the beginning avoiding potentially costly measures in the future. At the same time, these climate drivers are minor compared to the other sources, i.e., the focus of political action should remain on reducing carbon dioxide, methane and N<sub>2</sub>O.

# 3

## Addressing crunch issues towards net zero

While the current architecture creates a comprehensive framework for the changes needed to move to net zero, a number of gaps have been identified, that need to be addressed.

These include i.a. further specification of the path towards 2050 and its targets, more regular progress assessments, additional support for the implementation of national targets, markets and infrastructure for climate neutral industry, and a strong focus on action in the agriculture sector, plus incentives for carbon removal.

The analysis by main pillar (and the essential sectors covered by them) has identified the key strengths and weaknesses of their respective ability to get the EU on a path towards climate neutrality. The **current architecture creates a comprehensive framework that already addresses many decisive elements** and has kickstarted several of the necessary changes. However, **a number of gaps have been identified, that need to be addressed** to reliably move toward net zero emission. Potential ways to address these crunch issues are discussed below, starting with overarching issues and moving to sector and instrument specific issues.

### **3.1 Climate neutrality should be defined more concretely for policies beyond 2030 to be designed effectively now**

Climate neutrality gained political backing because it does two things at once: it conveys a clear long-term ambition (no additional GHGs added to the atmosphere) but is also a rather broad concept. Climate neutrality can be achieved in different ways, as shown by the (now outdated) EU LTS, which provided the impulse to adopt the target of climate neutrality for the EU (see section 2.a). The LTS presented two distinct pathways to different net zero futures. While one pathway focused on technical CDR and greater direct and indirect electrification (1.5TECH), the other used stronger circularity in production, some change in behaviour and relied more on natural sinks for compensation of remaining emissions (1.5LIFE). While an effective strategy towards climate neutrality may need to bet on several options in parallel for a while, **some of the potential solutions may start contradicting each other. A choice will have to be made**, which in turn informs policies and directs investments. What and when are these decision points for the EU?

To answer this, the concept of climate neutrality needs to be more clearly defined over time in

terms of both targets and pathways so that tailored policies can be adopted, and progress measured accordingly. In the meantime, measures may be needed that maintain all possible options. In parallel, the development of sectoral roadmaps (a concept contained in the EUCL and pursued by many industrial sectors) needs to be integrated and strengthened. These sectors need the information from an economy wide strategy to consider their technology pathways and corresponding investments. Specific actions could be taken to overcome this issue for the post-2030 framework:

1. **Update the EU LTS** as part of the process for proposing the 2040 target in 2024
2. **Set separate targets for remaining emissions and CDR** for all post-2030 milestones on the basis of this analysis (at least for 2040 and 2050).
3. **Devise a distinct CDR strategy** and incentive framework (beyond certification) to ensure the negative emissions dimension is being realised, in a sustainable and reliable fashion.
4. Create a **dedicated sufficiency component** in the policy architecture so that the 1.5LIFE pathway remains a possibility.
5. Create a **dedicated dialogue with relevant sectors** on long-term planning and transition pathways and integration of their roadmaps with EU strategies.

### **3.2 Resilient policy for the long-term needs regular cycles, and better integration of the net zero goal**

EU climate policy has been characterised by the need to respond to political developments and unexpected external shocks in the past five years: higher 2030 targets after Paris, Covid 19 related economic recovery, gas price increase and import dependency priority. The review of legislation carried out in the form of the “Fit For 55” package(s), for example, was originally foreseen for 2024, not 2021 – it was done earlier to account for essential changes to the 2030 target. At the same time, the long-term direction has

been clearly locked in by enshrining climate neutrality in the EGD and the EUCL. This was done despite the overall dynamic situation and the need to respond to unforeseen crises – and arguably because it can make a contribution to a more resilient economy. For example, the REPowerEU initiative triggered by the Russian invasion of Ukraine has led to proposals for higher targets for renewable energy and energy efficiency and for expedited permitting.<sup>35</sup> Crisis responses can be integrated with forward looking policy-making.

While the climate policy landscape and its targets have thus come out of the situation stronger (for now), and the flexibility shown was necessary and a positive reaction, the repeated **ad hoc adjustments are not good policy per se**. As is evident in the current need to phase down gas consumption, existing EU strategies were not set up to inform a change in speed adequately. Most policies and strategies in EU climate policy are assumed to be valid for ten years, which is clearly too long and too rigid. **The speed of change required for climate neutrality and a dynamic reality both require regular information for better preparedness** and the ability to react in a planned and not an erratic fashion. The flexibility shown in the past needs to be combined with predictable, regular and shorter cycles of monitoring and review to create resilience to external dynamics.

The international climate regime has also strengthened the regular five year-cycle for new targets (NDCs) established in the Paris Agreement through a decision at COP26 in Glasgow<sup>36</sup>. The EUCL already establishes a review of the 2040 target (Article 4.6) in 2029. Strategies and policies need to be reviewed at least as often as the targets – and progress monitoring needs to happen more regularly than that (providing information on whether the actions target actually work), with the option to trigger an early review, if needed.

35 At the time of writing, the Commission's proposed raise of the renewable energy target to 45% from 40% (in 2030) is supported by the European Parliament but not by the Council – see Energy Council announcement of 19 December 2022 at <https://www.consilium.europa.eu/en/press/press-releases/2022/12/19/repower-eu-council-agrees-on-accelerated-permitting-rules-for-renewables/>

36 Decision 6/CMA.3 “Common time frames for nationally determined contributions referred to in Article 4, paragraph 10, of the Paris Agreement” contained in FCCC/PA/CMA/2021/10/Add.3

In addition to more regular cycles, the **underlying planning documents need to improve in quality and temporal alignment** to effectively inform policy decisions. The integration of near-to medium-term policy planning via NECPs and longer-term pathway development via Long-Term Strategies is currently hampered significantly. Several factors create this problem: the sequencing putting NECPs before LTSs, the greater political attention and capacity provided to NECPs and the lack of detailed rules and stringent process for LTS to ensure that they contain the necessary level of detail and information. **National LTSs need to be strengthened** to enable them to play their role.

Lastly, the existing EU acquis still contains policies that create emissions and counteract actions towards the transition. The EUCL provides a new mechanism to help identify these (assessments of policy consistency), which could act as a trigger to properly mainstream the climate targets into all EU policy – and make them fit for net zero. This new tool needs to be used to advance mainstreaming of climate goals across all relevant policy areas.

Specifically, the following actions could be taken:

- 1. Adopt mandatory five-year update cycles for NECPs and long-term strategies** (both national and EU) and integrate the two more strongly (synchronised timelines, similar process, common indicators - essentially one process).
  - a.** The updating could be prioritised, allowing partial updates more frequently, where necessary – reducing the overall effort.
  - b.** National planning processes should also be facilitated through linking them with relevant EU level strategies.
- 2. Create a Long-Term Strategies “booster package”** of stronger substance requirements, high-level political attention, a Commission quality check with an iterative process, direct support for Member States with lower technical capacity plus a shared resources for a common LTS development toolbox – and a dialogue forum or working group – all of which can be done in the revision of the GovReg.

- 3. Increase frequency of progress measurement towards climate neutrality** and of the policy consistency assessments to every two or three years rather than five (Article 6.1 EUCL) – and develop a comprehensive methodology for this assessment. Results should be used to inform regular policy reviews and ad hoc policy development, where gaps are identified
- 4. Thorough implementation of the EUCL’s policy consistency assessments** to identify counteracting policies and phase them out (e.g., fossil fuel subsidies).

### **3.3 EU policy is not yet creating the right markets and infrastructure for net-zero industrial production**

The CO<sub>2</sub> price is an important element to incentivise emissions reduction in industry. However, it will not be sufficient to create a vibrant but climate neutral industrial sector in Europe. Even the power sector needs complementary measures, but the list of additional elements that need to be realised is longer and more complex for the manufacturing industry. Action is needed to support cleaner technology development and deployment, including the build-up of the right infrastructure (e.g., for green hydrogen) and the creation of markets for net zero products as an incentive to shift production and not simply shut down operations. **All of these elements have essentially already been recognised** and included or at least considered in the current policy landscape **but will need significantly greater focus and specification** to really advance European industrial production towards climate neutrality.

The most important actions that could be taken in this context are:

- 1. Creation of a green hydrogen** production and transport network (which may have been kickstarted by REPowerEU...)
- 2. Strengthening circularity** through legislative requirements, as proposed by the European Commission in its circular economy package(s)

3. An EU system for **Carbon Contracts for Difference** to help clean products into the market
4. A new **initiative for climate neutral procurement**, that creates demand for the respective products
5. If (BE)CCS is meant to be part of a net zero strategy for industry, a **clear regulatory framework for storage or CDR** will be needed (incl. considerations questions of liability (and permanence), and accounting).

### **3.4 Squaring the circle: employing differentiation and solidarity among Member States while aligning them towards a joint target**

The CARE targets for low-income Member States for 2030 are not compatible with a sound pathway towards climate neutrality by 2050. In the case of Bulgaria, 90% of 2005 emissions are still allowed by 2030. The **differentiation of ambition levels based on ability to pay is unfeasible if the target is (almost) zero emissions for all** countries. Even with the ETS 2, which can help to bridge the large differences between Member States, it seems unlikely that such steep emission reductions until 2050 are feasible. One option to keep a differentiation based on targets would be to have negative emission targets for the high-income countries to leave room for remaining emissions in the low-income countries. However, there is already a need for negative emissions to compensate unavoidable emissions mainly from industry and agriculture; the potential for additional removals to allow for energy related emissions in CARE sectors is very limited to non-existent and mitigation should be clearly prioritised (Dooley et al., 2022). In addition, questions of permanence and leakage make emission reduction preferable to removals. A better option would be to replace the target-based differentiation with another solidarity approach. This easiest alternative would be to set up a dedicated fund. The Social Climate Fund, the modernisation fund, and the redistribution of auctioning quantities in the ETS are examples for such solidarity mechanisms.

Specifically, the following actions could be taken to address this issue:

1. **Reducing the spread in CARE targets** between Member States
2. **Strengthening the ETS 2**
3. Setting up a **new solidarity mechanism**, e.g., based on a financial instrument.

### **3.5 The CARE needs to be strengthened and complemented with more sectoral EU measures**

The CARE plays an important role in obliging Member States to define climate policies in potentially complicated and socially sensitive sectors. It makes sure that EU-wide policies are complemented by national policies. Yet, **the current design of the CARE** is not entirely fit for climate neutrality. While it does – in principle – set the right framework, it is unclear whether it will limit emissions as foreseen: long compliance cycles, uncertainty whether Member States will act decisively enough, and the long timeframes required especially in the buildings sector **could lead to Member States failing to meet their targets**. The strong differentiation between Member States' current 2030 target will require very steep emission reductions in the subsequent decades. All of these points could combine to jeopardize the achievement of climate neutrality by 2050.

No single policy or measure will be able to achieve climate neutrality in the sectors covered by the CARE. The large number of actors with very different capabilities and resources will require a smart combination of different approaches to overcome all barriers and reach the entire population. A carbon price can play a relevant role but by itself would require extremely high CO<sub>2</sub> prices. Even then, some actors would not perceive an incentive to reduce emissions if they can pass the carbon costs through to others who have limited alternatives, e.g., landlords in markets with a housing shortage. In addition, carbon pricing alone can be short-sighted: only a minority of individuals will take carbon

pricing for the next 20 years into account when selecting a new heating system today. Only a smart combination of regulations setting standards for efficiency or emission limits, support programmes and carbon pricing will be able to ensure the required transformation.

One of the reasons for periodic (and late) compliance cycles is the linkage with the land-use sector, where accounting is based on forest inventories which are only assembled every five years. Moving the AFOLU-sector into a separate pillar could have eliminated this complication for the remaining emissions. Another way **to enhance the stringency of the CARE would be to set dedicated sectoral targets**. While making target setting much more complex, it would clearly show the required contributions by each sector and assign responsibility to the respective economic and political actors.<sup>37</sup> **National climate governance systems could also be strengthened**, to enhance the likelihood of sufficient national action – but there are only a few options available at EU level to do so (such as binding national climate neutrality targets).

As an alternative, the **CARE could be complemented with** or even replaced by **more ambitious and binding EU legislation for these sectors**. Banning new internal combustion engine cars using fossil fuels from 2035 onwards is an example for this approach. A similar requirement for light- and heavy-duty vehicles would be the logical next step. For buildings, an EU-wide ban of new heating systems using fossil fuels would have a similar effect. In addition, the energy efficiency standards especially for new but also for existing buildings could be set at a more ambitious level and for all Member States instead of delegating this to national governments.

<sup>37</sup> This approach is applied in Germany for example.

### **3.6 International transport: complementary measures beyond carbon pricing for aviation and shipping + a protective “shield”**

The inclusion of maritime shipping into the EU ETS is a big step forward. The scope includes 50% of emissions to and from third countries. Unfortunately, this is not true for international aviation where no effective emission control regime exists beyond flights within the ETS. For non-CO<sub>2</sub> effects in aviation, responsible for two thirds of the sector’s climate impact, no control regime exists either. Also, for navigation lower but nevertheless important additional effects of black carbon should be considered as well as the impact of other GHGs like methane. The proposals for alternative fuels for both sectors point in the right direction, but the required drop-in quota is too low for 2050. The main challenge is the required production capacity for post-fossil fuels. This is closely linked to the demand for hydrogen and other e-fuels in industry and could be developed in parallel. With increasing stringency of EU climate policy, the danger of evasion increases if key countries outside of the EU do not follow with similar legislation. If this becomes an issue, a type of carbon border adjustment mechanism would be required. This could take the form of differentiated ticket taxes in aviation which take the total carbon cost over different routes into account.

To strengthen the current approach, the following options could be considered

- 1. Extend the obligation to submit ETS allowances** to at least 50 % of emissions on routes to and from third countries in aviation.
- 2. Establish policy limiting the non-CO<sub>2</sub> impacts** of aviation and navigation (non-CO<sub>2</sub> GHG and black carbon).
- 3. Support the production of synthetic and especially e-fuels**, e.g., through carbon contracts for difference, minimum quotas, or purchase guarantees.
- 4. Develop a carbon border adjustment mechanism for international transport** to avoid carbon leakage.

### **3.7 Integrating carbon removals and incentivising action in the agriculture and land use sectors**

For Member States to effectively reduce net emissions from the AFOLU sectors requires aligning national land-use policies with climate goals. This in turn necessitates the redirection of funding into climate friendly land use practices. The Common Agricultural Policy (CAP) is available to reduce the costs for additional carbon removals as well as costs of reducing non-CO<sub>2</sub> emissions. Eventually the task of adjustment falls back to individual Member States to make use of this existing instrument.

To explicitly guide policy, **dedicated separate post-2030 targets for GHG emission reductions and removals** through natural sinks need to be maintained. This is because simple net-targets would imply a one-to-one “exchange rate” between removals and fossil fuel emissions and make gross emissions invisible that urgently need to be targeted by mitigation measures. Continuing the concept of a **maximum allowable contribution of natural sinks** while maintaining an ambitious separate sink target will help to set incentives for both, emission reduction and sink enhancement.

Moreover, there needs to be **visibility of mitigation measures and national GHG reporting**. If the inventories used to assess compliance in the climate policy framework fail to capture the results of mitigation measures, Member States will have severe problems in effectively governing national climate actions.

### **3.8 Addressing the impact of non-GHG emissions**

Achieving climate neutrality requires addressing all anthropogenic climate impacts including those not (yet) included in the Paris Agreement. While some of these issues are already under discussion (e.g., non-CO<sub>2</sub> impacts of aviation, see above) others are not yet looked at. As a first step, **better understanding of the sources, effects and policy options** for these contributions is necessary. Fast action is especially opportune for hydrogen, where production and usage are expected to increase significantly over the next decades.

*Even though the revised laws under the “Fit For 55” package are only just being published formally in the first quarter of 2023 after an extensive 16 months of negotiations, the conceptual thinking about ways in which to address the issues remaining for climate policy cannot start early enough. Implementation of the decisions and advancement of additional policies at national and EU level need to be happening in parallel. The authors look forward to engaging in dialogue on the analysis presented in this paper and discussion on the merits of the potential solutions to resolving the crunch issues identified.*

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