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Assessment of the final national energy and climate plan of Luxembourg

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1. SUMMARY

Luxembourg's final integrated national energy and climate plan (NECP)¹ sets a 2030 target to reduce **greenhouse gas (GHG) emissions** not covered by the EU Emissions Trading System (non-ETS) by 55% compared to 2005. This target is more ambitious than the one under the Effort Sharing Regulation (ESR)², which was to achieve a 40% reduction by 2030 below 2005 levels. Luxembourg plans to overachieve the ESR target by 15 percentage points while complying with the land use, land use change and forestry (LULUCF) no-debit commitment (i.e. that accounted emissions do not exceed accounted removals). Whereas Luxembourg has a national strategy for adaptation to climate change, there is no indication of how the measures in the NECP interact with the adaptation goals.

Luxembourg's **renewable energy contribution** to the 2030 EU-level target is 25% of gross final energy consumption in 2030. This is considered sufficiently ambitious and is above the share of 22% resulting from the formula in Annex II to Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action (the Governance Regulation³).

In the plan, **energy efficiency** is considered as a top priority in the achievement of both energy and climate objectives. Luxembourg's national contribution to the 2030 EU-level target is considered of sufficient ambition⁴ and is set at a 40 to 44% reduction in final energy consumption, which translates to 3.06 Mtoe. The contribution in primary energy consumption has not been provided. Luxembourg does not explain the application of the 'energy efficiency first' principle in its plan. The plan provides many elements on buildings and includes the aim to renovate all existing houses to net zero emissions by 2050. Luxembourg submitted its long-term renovation strategy on 26 June 2020⁵.

In its plan, Luxembourg sets objectives for **energy security** which consist in: (i) developing more local renewable energy production; (ii) energy efficiency measures in buildings and transport; (iii) free and better public transport; and (iv) strong electrification efforts in transport.

On the **internal energy market**, the final plan notably provides an overview of the development of different sources of flexibility needed to integrate the rising share of renewable energy into the system. The planned **electricity interconnection level** by 2030 is 400%.

The NECP contains ambitious national objectives and funding targets on **research, innovation (R&I) and competitiveness**. Luxembourg aims to become an international hub for startups specialised in climate solutions, and also plans to increase R&I spending and upgrade its related

¹ The Commission publishes this country-specific assessment alongside the 2020 Report on the State of the Energy Union (COM(2020)950) pursuant to Article 13 of Regulation (EU) 2018/1999 on Governance of the Energy Union and Climate Action.

² Regulation (EU) 2018/842 of the European Parliament and of the Council of 30 May 2018 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No 525/2013.

³ The Commission's recommendations with regard to the Member States' renewable ambitions are based on a formula set out in this Regulation. The formula is based on objective criteria.

⁴ In accordance with the methodology as illustrated in SWD(2019) 212 final.

⁵ Luxembourg submitted the long-term renovation strategy pursuant to Article 2a of Directive 2010/31/EU on the energy performance of buildings on 26 June 2020. However, this assessment is only based on the building-related elements provided in the final NECP.

infrastructure. R&I spending is, however, quantified only for 2020 (planned 2.3-2.6% of GDP, up from 0.65% in 2018).

The overall amount of additional (public/private and public) **investment needs** over the time period 2021 to 2030 are not provided. The additional cumulative investment needs compared to the reference scenario are described and quantitatively linked to the energy efficiency (EUR 5.8 billion) and renewable energy (EUR 2.15 billion) targets, but do not include all GHG-related emission reduction measures. There is no distinction between the private and public sources of funding. Therefore, it is not possible to quantify the direct impact of NECP measures on public finances.

The NECP provides a good summary of the **macroeconomic impact** of the planned policies and measures, which is said to be rather minor overall. However, there is limited information on how the measures are financed, including the announcement of a carbon tax, the precise terms of which are not yet available. Without these underlying assumptions, it is difficult to interpret the private consumption and investment figures.

The final plan does not include a list of **energy subsidies, particularly for fossil fuels**, although (fossil fuel) subsidies have been identified in recent Commission analyses on energy subsidies. Subsidies to renewables are described throughout the plan, including the intention to continue them. The final plan does not include actions undertaken and planned to phase out fossil fuel subsidies, but it does refer to national benchmarks and targets, as well as to an ongoing analysis of subsidies and tax breaks that should lead to a review of the existing subsidy policy.




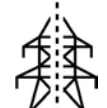
The NECP contains a general section referring to interactions with air policy and stating that planned measures will be fully harmonised with the final national air pollution control programme (NAPCP). However, the plan still lacks a precise analysis of the interactions with **air quality and air emissions** policy and does not present the impacts of policies and measures on air quality.

The final plan considers the **just and fair transition aspects** and provides information on the social, employment and skills impacts of a transition to a climate neutral economy. However, the just transition could have been better integrated throughout the plan, in particular in relation to specific sectors such as the steel industry. On **energy poverty**, Luxembourg reports the number of households affected and the measures to reduce energy poverty.

A **good practice** linked to the plan is the climate pact, in which Luxembourg shared best practices among its 98 municipalities, worked with local authorities to launch projects and mobilised EUR 55.2 million in investment, paving the road for implementation of the NECP. The current climate pact, which will expire in 2020, will continue under the name of Climate Pact 2.0 and will be further developed.

The following table presents an overview of Luxembourg's objectives, targets and contributions under the Governance Regulation⁶:

⁶ 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.

	National targets and contributions	Latest available data	2020	2030	Assessment of 2030 ambition level
	Binding target for greenhouse gas emissions compared to 2005 under the Effort Sharing Regulation (ESR) (%)	-10%	-20%	-40%	More ambitious national target of -55%
	National target/contribution for renewable energy: Share of energy from renewable sources in gross final consumption of energy (%)	9.1%	11%	25%	Sufficiently ambitious (22% is the result of RES formula)
	National contribution for energy efficiency: Primary energy consumption (Mtoe)	4.46	4.48	N/A	N/A
	Final energy consumption (Mtoe)	4.35	20% 4.24	40-44% 3.06	Sufficient
	Level of electricity interconnectivity (%)	X	270%	400%	N/A

Sources: European Commission, Energy statistics, Energy datasheets: EU countries; European Semester by country; Luxembourg's final national energy and climate plan.

2. FINALISATION OF THE PLAN AND CONSIDERATION OF COMMISSION RECOMMENDATIONS

Preparation and submission of the final plan

Luxembourg notified its final national energy and climate plan to the European Commission on 29 May 2020. Luxembourg has not yet submitted its long-term strategy and submitted its long-term renovation strategy after the final plan on 26 June 2020. The plan builds on elements of the two strategies that had already been publicly discussed and agreed.

A **public consultation** on the NECP took place in January 2020, and the plan includes a summary of the public's views and how they have been taken into account. Luxembourg indicates that a strategic environmental assessment (SEA) under Directive 2001/42/EC has been carried out for the NECP.

Consideration of Commission recommendations

In June 2019, the Commission issued nine recommendations to Luxembourg for its final plan⁷. Annex II to this staff working document offers a detailed account of how the different elements of Commission recommendations have been reflected in the final NECP. Overall, the final NECP

⁷ Commission Recommendation of 18 June 2019 on the draft integrated national energy and climate plan of Luxembourg covering the period 2021-2030, C/2019/4416.

partially addresses the Commission recommendations. The main changes introduced in the final plan are the following.

On **greenhouse gas emissions in non-ETS sectors**, Luxembourg **partially addressed** the recommendation to complement the information on planned policies and measures and to provide further details on their scope, timeframe and likely impacts. In particular, a large number of policies and measures concerning GHG emissions have been provided. However, these still often lack details on timeframe and impact. The intended use of its available flexibilities from the LULUCF and the EU ETS sectors to achieve Luxembourg's ESR target has not been made explicit.

On **renewables**, Luxembourg **partially addressed** the recommendations to: (i) provide more detailed and quantified policies and measures; (ii) include an indicative trajectory pursuant to Article 4(a)(2) of Regulation (EU) 2018/1999; (iii) ensure the attainment of the 2020 target; and (iv) explain how such a baseline share will be met and maintained. While policies and measures have been provided, they often lack details on timeframe, scenario and impact. The plan still lacks an indicative trajectory that meets the reference points for the national contribution. An enabling framework for self-consumption and renewable energy communities is provided, and information on the simplification of administrative procedures is included, but is not detailed enough.

On **energy efficiency**, Luxembourg **partially addressed** the recommendation to set its national contribution as a specific value for both primary and final energy consumption, to present the expected savings and set out a more detailed impact assessment of the proposed policies and measures. The final NECP does not include a contribution expressed in primary energy consumption. A new comprehensive set of measures on energy efficiency that cover all sectors has been proposed. However, only sectoral impacts for energy savings are provided and an estimation of the impacts of individual measures is absent.

On **research, innovation and competitiveness**, Luxembourg **partially addressed** the recommendation to clarify the national objectives and funding targets. However, the broad objectives that were already in place remain, with no specific timeline or quantified targets.

Luxembourg **largely addressed** the recommendation to strengthen **regional cooperation**, in particular through initiatives in the Energy Pentilateral forum. The NECP also presents a number of efforts to decarbonise transport from a regional perspective.

On **investment needs**, Luxembourg **largely addressed** the recommendation to provide an assessment of the needs and qualitative information on the likely investment sources. The plan includes details of the various investment needs for energy efficiency and renewable targets but omits some other GHG-relevant reduction measures such as investments in public transport. Extensive details are also given throughout the plan on the various funding sources needed although these are not consistently linked to each policy objective.

Luxembourg **partially addressed** the recommendation to provide a list of energy subsidies and actions undertaken; it plans to phase out energy **subsidies in particular for fossil fuels**. The plan does not include a list of fossil fuel subsidies or concrete details on the planned review of the existing subsidy policy.

Luxembourg **partially addressed** the recommendation to complement the **analysis on air quality**. The NECP contains a general section referring to interactions with air policy, but

quantitative analyses of emission reduction for air pollutants are not included. Luxembourg nonetheless announced its intention to elaborate these further as part of other strategic documents.

Finally, Luxembourg **partially addressed** the recommendation to better integrate the **just and fair transition aspects**, although these aspects have still not been well incorporated throughout the document. In particular, the final NECP does not add further details on the social, employment and skills impacts of the planned objectives, as well as on policies and measures.

Links with the European Semester

In the context of the European Semester framework for the coordination of economic policies across the EU and of the country report 2019⁸, Luxembourg received one country-specific recommendation⁹ on climate and energy, namely to ‘focus economic policy related to investment on fostering digitalisation and innovation, stimulating skills development, improving sustainable transport, and increasing housing supply, including by increasing incentives and lifting barriers to build’. In the 2020 country report¹⁰ adopted on 20 February 2020, the Commission found that Luxembourg had achieved some progress on this recommendation. The report recognises that the Luxembourg NECP supports the recommendations but remains abstract as to how it will implement them.

Due to the COVID-19 crisis, the European Semester country-specific recommendations for 2020 addressed Member States’ responses to the pandemic and made recommendations to foster economic recovery. In particular, they focused on the need to start mature public investment projects as soon as possible and promote private investment, including through relevant reforms, notably in the digital and green sectors. In this context, Luxembourg received a country-specific recommendation¹¹ stressing the importance of focusing investment on ‘the green and digital transition, in particular on sustainable transport and buildings, clean and efficient production and use of energy, contributing to a progressive decarbonisation of the economy’.

The Governance Regulation requires Member States to ensure that their national energy and climate plans take into consideration the latest country-specific recommendations issued in the context of the European Semester. Luxembourg’s national energy and climate plan has the potential to support the implementation of the European Semester recommendations, as it identifies the necessary investment needs and financial resources to meet them.

⁸ The Annex D to the 2019 Country report also sets out priority investments for the 2021-2027 cohesion policy, substantially contributing to the clean energy transition.

⁹ Recommendation for a Council Recommendation on the 2019 National Reform Programme of Luxembourg and delivering a Council opinion on the 2019 Stability Programme of Luxembourg, COM(2019) 516 final.

¹⁰ Commission Staff Working Document, Country Report Luxembourg 2020, SWD/2020/515 final.

¹¹ Recommendation for a Council Recommendation on the 2020 National Reform Programme of Luxembourg and delivering a Council opinion on the 2020 Stability Programme of Luxembourg, COM(2020) 516 final.

3. ASSESSMENT OF THE AMBITION OF OBJECTIVES, TARGETS AND CONTRIBUTIONS AND OF THE IMPACT OF SUPPORTING POLICIES AND MEASURES

Decarbonisation

Greenhouse gas emissions and removals

The final plan indicates a 55% greenhouse gas (GHG) reductions target by 2030 below 2005 levels for sectors not covered by the EU Emissions Trading System (non-ETS). The plan further mentions that sectoral climate targets will be introduced by a climate law, which at the time of writing is still to be published. The final NECP refers to the annual emission budgets based on a linear reduction pathway between the real average GHG emissions from 2016 to 2018 and the 2030 point target. However, the document is not explicit as to whether there is an annual binding trajectory and whether Luxembourg intends to use the flexibilities from land use, land use change and forestry (LULUCF) under the Effort Sharing Regulation.

The NECP provides projections of greenhouse gas emissions and removals with both existing and planned policies and measures until 2040. According to the projections, Luxembourg would achieve with existing measures (WEM) reductions of only 16% in emissions relative to the 2005 base year, while the projection with additional measures (WAM) reflects Luxembourg's national non-ETS target. Luxembourg's plan does not provide long-term targets or objectives beyond 2030 for a reduction in total non-ETS GHG emissions. However, according to its draft climate law, Luxembourg does aim to reach climate neutrality by 2050. Furthermore, the NECP reports that Luxembourg's airport operator is committed to reducing CO₂ emissions to net zero by 2050.

The final plan includes some key cross-sectoral **policies and measures**, such as the introduction of the above-mentioned climate framework law, the further development of the climate pact with municipalities, the introduction of a minimum carbon price, adjustments to the taxation of petroleum products, further development of the sustainable mobility strategy, and a set of financial instruments. However, a detailed elaboration of the measures is not always provided.

The final plan recognises the contribution of **agriculture and LULUCF**. On agriculture, the NECP mentions some measures contributing to GHG emission reductions, including agri-environmental measures laid down under the EU's common agricultural policy. The plan considers measures to reduce nitrogen load from fertilisation and manure management, and sets a targets for organic cultivation to reach at least 20% of agricultural land by 2025 and 100% by 2050. However, it does not describe in detail the policies and measures to reach these targets. It also considers increasing the carbon sink capacities in agriculture and forestry through protection, sustainable management and afforestation, and the introduction of new premiums. Luxembourg indicates that removals from the LULUCF sector are expected to stagnate at around 0.4 million tonnes of CO₂ eq, both in scenarios with existing measures (WEM) and with additional measures (WAM). However, the plan does not explain how Luxembourg is planning to achieve its LULUCF no-debit commitment, nor elaborate on its intention to use the flexibility from the LULUCF sector to the effort sharing sectors.

In **transport**, by far the largest sector in terms of non-ETS emissions, Luxembourg plans to reduce GHG emissions by 2.4 Mt CO₂ eq by 2030 compared to 2017 (WAM scenario). The final plan identifies a broad range of measures in this area, including urban mobility planning and demand-management measures, promotion of public transport and fiscal measures to promote

zero- and low-emission vehicles. However, no estimated reductions from the individual measures are presented; only aggregate figures are provided. Electromobility and the underpinning charging infrastructure is supported by tax incentives and public investments in infrastructure and public transport fleets. A target of 49% for electric and plug-in vehicles is set for 2030. As a key measure supporting alternative fuels, Luxembourg plans to introduce a minimum carbon price from 2021 that would be part of the future tax reform. The tax will apply to fossil fuels, namely diesel, petrol, fuel oil and gas. The starting price will be based on the average value of carbon pricing in the neighbouring countries. Accordingly, for 2021 the price should be around EUR 20 per tonne of carbon, while an increase of EUR 5 per tonne is planned for 2022 and 2023. Based on current data, the revenue generated is expected to amount to around EUR 150 million. These will be distributed ‘in a balanced manner’ between concrete measures to combat climate change, fiscal measures (e.g. tax credit) and social measures. The planned carbon pricing and the increase in excise duties on diesel and petrol should lead to a gradual reduction in the fuel price gap between Luxembourg and the neighbouring countries.

As of 1 September 2020, Luxembourg has not notified its national long-term strategy to the Commission as required under Article 15 of the Governance Regulation.

Renewable energy

The national contribution to the 2030 EU renewable energy target is set at 25% in gross final consumption of energy in 2030, and is considered sufficiently ambitious. This is above the share of 22% by 2030 that results from the formula in Annex II to the Governance Regulation. Luxembourg’s national contribution builds on domestic renewable energy development, by which Luxembourg is set to achieve a figure of 19.6% for renewable energy in gross final energy consumption. This implies that cooperation with other Member States is set to play a role in achieving a higher national contribution and in contributing to the EU renewable energy target. Based on the indigenous renewable energy development together with the cooperation mechanism, Luxembourg is set to achieve its reference point for 2025. Reference points for 2022 and 2027 are not provided.

Assessment of the impact of Luxembourg’s proposed policies and measures shows that a significant increase in the share of renewable energy requires not only direct measures to accelerate the deployment of renewable energies, but also clear action on energy efficiency.

In the **electricity** sector, Luxembourg aims to cover a 33.6% share of consumption from renewable energy sources by 2030. This will be achieved through the development of several wind farm projects by maintaining existing injection/market premium rates and removing existing barriers, and by giving municipalities and citizens the possibility to participate via their own financing. The plan also includes the development of photovoltaic systems through new incentives such as increased feed-in tariffs in order to maximise the use of roofs, integrating the concepts of self-consumption and energy cooperatives into the field of photovoltaics, and creating a national solar cadastre.

For **heating and cooling**, the trajectory in the final draft plan shows an annual average increase for the share of renewables in line with the requirements of the Renewable Energy Directive, even without the role of waste heat being included. The key policies and measures are: (i) the development of heat pump systems through financial support and improved information; (ii) more systematic identification and more consistent consideration of the potential of shallow geothermal energy; (iii) the building of a new urban heating/cooling system based on renewables;

(iv) the supply of low-temperature heating networks from renewables; and (v) the creation of a thermal cadastre.

In the **transport** sector, Luxembourg mainly refers to the role of biofuels and includes the contributions of eligible fuels, as well as the limits for conventional fuel produced from food and feed crops as required in Articles 25-27 of Directive 2018/2001. The key policies and measures are: (i) the development of a comprehensive strategy for the use of sustainable biofuels; (ii) systematic additions of second-generation biofuels; (iii) the development of electromobility; and (iv) production together with the deployment of a European network of ‘green’ hydrogen filling stations.

Energy efficiency

Luxembourg’s **national contribution for energy efficiency** in 2030 is 3.06 Mtoe (35 568 GWh) for final energy, which is considered as sufficient. The value for primary energy is not provided.

The plan provides descriptive information on **policies and measures** beyond 2020, particularly focusing on buildings, while fewer measures are proposed to support investments by the business sector in technologies that generate less GHG emissions. These policies and measures are considered credible in terms of ambition, although their sufficiency could not be assessed as they lack any estimation of each measure’s impact on energy consumption.

The **cumulative energy savings** to be achieved under Article 7 of Energy Efficiency Directive¹² were not presented in the plan. Luxembourg indicates that the energy efficiency obligation scheme will continue with the addition of alternative policy measures, most notably voluntary agreements with industry, an extended energy audit scheme and new financial instruments. These policies and measures are considered credible, but their actual impact on the cumulative energy savings target is uncertain as there is no detailed description of measures including estimated cumulative energy savings and other elements required by Annex III to the Governance Regulation.

The **long-term renovation strategy** under the Energy Performance of Buildings Directive was submitted on 26 June 2020. The final NECP already includes many key elements from the strategy. The plan presents an ambitious target to increase the renovation rate (to 3% per year) and the depth of renovation (deep renovation), with the aim of rehabilitating all existing houses to net zero by 2050. Several measures are presented, notably: (i) a renovation obligation (setting the energy standard of office buildings at energy class C from 2023 onwards); (ii) the phase-out of fossil heating systems (complemented by a fuel oil replacement programme); (iii) a reduced VAT rate of 3% for renovation measures as well as the introduction of an energy passport ‘plus’ in the building stock. Renovation of residential buildings will be supported through a support programme which provides investment aid and interest-reduced or, to support low-income households, interest-free loans.

Energy security

Maintaining a high level of security of supply is a priority in the ongoing transformation of the energy system, with an objective of 33.6% renewable **electricity** system and an increasing share of domestic renewable energy (19.6%).

¹² Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency as amended by Directive (EU) 2018/2002.

The plan makes links with the **emergency plans** for gas, electricity and oil, provided for by the applicable sectoral rules. References are made to the existing preventive action and emergency plans for gas. However, when considering risks, the plan does not take into account the **plans of the other connected Member States**. Moreover, there is no target date for the adoption of the risk preparedness plan.

The plan is still lacking detailed information on further measures and investments in electricity storage, demand response or other **flexibility** measures. The plan does not include considerations on **cybersecurity** in the energy sector. The planned policies and measures are not detailed enough, in particular in terms of specific objectives and their expected contribution to energy security and to the reduction of import dependency.

Internal energy market

The plan states that Luxembourg will have an electricity **interconnectivity level** of 400% for 2030, which is well above the target set at EU level.

The final plan provides an overview of the development of different sources of **flexibility** needed to integrate the rising share of renewable energy into the system. However, this goal is not addressed in a structured way and significant measures to increase flexibility remain absent.

The final plan does not include sufficient policy objectives and measures for the internal energy market (in particular related to storage, aggregation, real-time price signals, and wholesale and retail market concentration levels). Those measures are considered not sufficiently elaborated in terms of how they will contribute to achieving the objectives. Finally, the plan provides an insufficient overview of current market conditions for gas and/or electricity, in particular regarding levels of competition and liquidity of markets. The final plan makes reference to the reports of the Luxembourg Institute of Regulation (ILR) on electricity and gas market, but without giving details of their content.

Luxembourg plans to have by 2020 smart meters installed for 95% of households, enabling them to monitor their electricity consumption better. Further measures to reduce costs for households include fostering competition on the market and promoting switching of supplier, while any renewable energy from self-production or a cooperative will be exempted from electricity taxation and non-discriminatory grid connection fees.

Luxembourg reports the number of households affected by **energy poverty**. The Commission considers sufficient the policies and measures proposed in the plan in relation to the achievement of the target, in light of the existing strong general social policy addressing energy poverty. Furthermore, a number of initiatives are included to alleviate the costs of living; these include renovation and social housing with high energy standards, and promoting switching from fossil fuels to cheaper renewable fuels.

Research, innovation and competitiveness

The plan identifies relevant areas where **research and innovation** efforts are necessary. The plan includes a concentration of R&I efforts for renewables, energy efficiency, and sustainable cities and buildings. The Commission considers these efforts are sufficient in relation to the achievement of the NECPs' objectives as Luxembourg has made green technologies one of the priorities of its national economic diversification strategy.

In its national energy and climate plan, Luxembourg notably clarifies how to deploy hydrogen produced from renewable electricity for use in industry, in the mobility sector and for seasonal

storage of electricity. The steel industry in Luxembourg is already actively developing this. Luxembourg intends to cooperate with other EU countries on identifying demand, policy instruments and practical measures for imports. Luxembourg insists on renewable-based hydrogen and the need to increase production efficiency in electrolysis for hydrogen to be able to play a role in decarbonising transport and provide seasonal storage.

As regards **competitiveness**, the NECP aims to enhance the engagement of the private sector in research, development and innovation. In this vein, some enabling conditions were put in place so that innovation can be put into practice to increase both companies' competitiveness and achieve climate, environmental and energy objectives.

Cooperation with the **strategic energy technology (SET) plan** is not addressed. However, the plan announces steps in cooperation with other European research centres that will result in cooperation over the SET plan.

4. COHERENCE, POLICY INTERACTIONS AND INVESTMENTS

The final plan discusses the **interlinkages** between energy efficiency and decarbonisation, with the impacts of energy efficiency measures on greenhouse gas emissions also taken into account. In addition, the plan considers synergies between energy efficiency and renewable energy goals, acknowledges energy efficiency as directly increasing security, and identifies demand-side measures as potential countermeasures in case of a disruption of supply. Luxembourg indicates an increase in the share of renewable energy and a holistic strategy for the use of sustainable biofuels, including the development of its own sustainability criteria. However, the NECP does not provide details on how climate change risks might affect energy supply. Information is also lacking on adaptation co-benefits for energy efficiency, such as in the thermal management of buildings.

The final NECP lacks a clear description of which policies and measures are included in its reference scenario (i.e. mainly existing policies, but also planned policies). The robustness of the NECP would have also been improved by adding more details on the scope, time frames and impacts of policies and measures, and by clarifying the underlying assumptions of the projections in the reference scenario, as well as the impacts of further planned policies and measures.

The information provided on **investment needs** and mechanisms and funding sources to leverage them are covered in detail qualitatively. However, the sources of funding and corresponding amounts per sector are not systematically indicated, nor is there any description of the methodology used, or any information on how cohesion policy funds could be used.

A description of **fossil fuel energy subsidies** is not included in the plan. A concrete timeline to phase out fossil fuel energy subsidies is not included either, although reference is made to benchmarks, targets and a study to review the existing subsidy policy.

The NECP provides a **macroeconomic assessment** of the energy and climate plan, including the impacts on GDP, the trade balance, employment, disposable income and government consumption. The assessment examines both the direct effects of the stimulus (e.g. direct employment effects of investments in construction), the indirect effects (e.g. the effects via the other industries linked to the direct activity via intermediate consumption) and induced effects (the second-round effects of improved economic growth) on the national economy.

The final plan provides information and analysis on **air quality and air emissions policy**, stating that planned measures will be fully harmonised with the final national air pollution control programme (NAPCP) (which is still not submitted more than one year after the legal deadline). A draft NAPCP explained that the air policy options will be selected only after the adoption of the final NECP, it is therefore impossible to check the consistency of the two programmes at this stage. The NECP provides for an increase in biomass use (the 2020-2030 figures are 192-271 GWh for biomass in electricity, 883-1263 GWh for decentralised heating, and 589-676 GWh for biomass including biogas in distributed heating¹³). The plan also mentions that air pollution reduction commitments in the NEC (National Emission reduction Commitments)¹⁴ Directive should remain achievable. Quantitative analyses of emission reductions for air pollutants are not included; the aim is to be prepared these as part of the final NAPCP.

Regarding the **just and fair transition** aspects, the final NECP does not add sufficient detail on the social, employment and skills impacts of planned objectives, and policies and measures. There is no reference to the Just Transition Mechanism or to the European Regional Development Fund (ERDF) financing possibilities. As for the employment and skills impacts of planned objectives and policies, the only focus is through the third industrial revolution.

The final NECP substantially develops the narrative of the **circular economy** compared to the draft version. The document describes several actions on the circular economy, moving from only waste management to also include resource management. Areas mentioned are buildings and construction, sharing economy and services, circular economy ideas within neighbourhoods, sewage sludge, wastewater recycling, manure in biogas plants (to also reduce methane emissions), food waste, tax measures and changes in lifestyles. However, the document lacks an analysis of the GHG emission reductions that would result from the planned circular economy measures. The NECP gives a target for the circular economy in relation to recycling rates for packaging, which should reach 70% by 2022. Other strategic aspects will be laid down in the context of a 'Null Offall Lëtzebuerg' (zero waste) strategy or a circular economy. The NECP mentions that the development of the 'Null Offall Lëtzebuerg' strategy has already started and has been accompanied by public inquiries. Future NECPs reviews could further quantify the actual impacts of the circular economy on GHG emissions reduction, in line with the most recent scientific evidence.

The plan acknowledges the links between climate and **biodiversity**, and mentions different synergetic policies, notably on agriculture. It also includes commitments to strengthen the sustainability criteria for bioenergy. A summary of the findings on the strategic environmental assessment already conducted, would have been welcome.

The final NECP reflects and incorporates elements of the European Green Deal for **agriculture**, such as reduced use of fertilisers. The plan indicates an increase in the share of renewable energy and a holistic strategy for the use of sustainable biofuels with the incorporation of obligations and cooperation.

¹³ The planned increased use of biomass in Luxembourg will be steered by a strengthened cascading principle and a planned own sustainability label. Luxembourg announces that it will develop stricter sustainability criteria for biomass, which will include mostly supplies from the national territory or from a radius corresponding to its size, and will apply these criteria to facilities above 10MW (currently >20MW).

¹⁴ Directive (EU) 2016/2284

There is no clear interaction with climate **adaptation** policies. In the context of waste and water management, the plan mentions Luxembourg's 2018-2023 climate change adaptation strategy, which sets out recommendations for action to integrate climate change aspects into the design of sewerage systems. The NECP also reports that through forward-looking adaptation to climate change, Luxembourg's agriculture and forestry sector should be able to maintain or increase its production and public services in the long term. However, no further goals, targets or policies and measures of the climate adaptation strategy are elaborated on. In relation to climate finance, the plan mentions that the international climate financing (ICF) funds provided by the Climate and Energy Fund should be 40% for mitigation, 40% for adaptation and 20% for forestry (REDD +)¹⁵.

The application of the '**energy efficiency first**' principle is an important element that Luxembourg puts into practice by placing emphasis on the renovation of buildings, the leading standards already in place for new buildings, free public transportation throughout its territory and ambitious road transport electrification.

There are several examples of **good practices** in Luxembourg's final energy and climate plan. One of these is a planned reform of the taxation of energy and resources, including the announced introduction of a progressively increasing minimum carbon price in 2021. This might also include reforms to the treatment of unsustainable tax privileges that are harmful for the climate. While the precise terms of the reform are not yet known, the revenues from the carbon pricing are intended to offset the additional expenditure for the plan. It is still to be confirmed by an assessment of actual investment needs, by institutional and productive sectors, to ensure the reforms sufficiently support households and firms' investment in sustainable infrastructure and technologies to achieve the climate objective.

5. GUIDANCE ON THE IMPLEMENTATION OF THE NATIONAL ENERGY AND CLIMATE PLAN AND THE LINK TO THE RECOVERY FROM THE COVID-19 CRISIS

Luxembourg needs to swiftly proceed with implementing its final integrated national energy and climate plan notified to the Commission on 29 May 2020. This section provides some guidance to Luxembourg for the implementation phase.

This section also addresses the link between the final plan and the recovery efforts from after the COVID-19 crisis, by pointing at possible priority climate and energy policy measures Luxembourg could consider when developing its national recovery and resilience plan in the context of the Recovery and Resilience Facility¹⁶.

¹⁵ Reducing Emissions from Deforestation and forest Degradation, plus the sustainable management of forests, and the conservation and enhancement of forest carbon stocks.

¹⁶ On 17 September 2020, the Commission has put forward the Annual Sustainable Growth Strategy 2021 (COM(2020) 575 final), as well as guidance intended to help Member States prepare and present their recovery and resilience plans in a coherent way, without prejudice to the negotiations on the proposal for a Regulation on the Recovery and Resilience Facility in the European Parliament and the Council (Commission Staff Working Document. Guidance to Member States – Recovery and resilience plans, SWD (2020) 205 final).

Guidance on the implementation of the national energy and climate plan

In the plan, Luxembourg states a non-ETS target for greenhouse gas emissions reduction by 2030 of 55% compared to 2005. This is 15 percentage points higher than the 40% reduction target in the Effort Sharing Regulation and would be reached with the additional measures specified in the plan. It is important for Luxembourg to proceed swiftly with implementing the measures for reducing GHG emissions, in particular in the transport sector, as the sector accounts for about half of the country's greenhouse gas emissions.

Luxembourg's contribution to the EU 2030 renewables target is sufficiently ambitious when compared to the share resulting from the formula in Annex II to the Governance Regulation; Luxembourg's contribution to the 2030 energy efficiency target is sufficient. However, Luxembourg's plan still leaves scope to further develop and strengthen policies and measures on both renewables and energy efficiency so as to contribute more to the EU climate and energy targets and boost the green transition.

On **renewables**, Luxembourg committed to increasing the share of renewables in gross final energy consumption to 25% by 2030. However, Luxembourg would benefit from further developing renewables on its territory to reduce energy import dependency, while creating local jobs and value added. Efforts in building renovation will go hand in hand with renewable technologies including heat pumps, photovoltaics (planned fivefold increase up to 2030) and waste heat reused from data centres. Further cooperation within the North Seas Energy Forum and the Pentalateral Energy Forum (PLEF) could facilitate the further use of cooperation mechanisms to ensure that Luxembourg meets its trajectory and contribution.

On **energy efficiency**, actions that would help ensure achievement of the overall targets include most notably a quantitative assessment of impacts of planned policy measures under Article 7 of the Energy Efficiency Directive (EED), including all elements required by Annex III to the Governance Regulation, and a comprehensive approach to the renovation of central government buildings in line with Article 5 EED. In addition, the policy framework would benefit from full implementation of the 'energy efficiency first' principle in related policy and investment decisions.

Improving energy efficiency in buildings has much potential for speeding up energy savings and contributing to the recovery of the economy after the COVID-19 pandemic. Building on the momentum of the '**Renovation Wave**' initiative¹⁷, there is scope for Luxembourg to intensify efforts to improve the energy performance of the existing building stock with specific measures, targets and actions. Further support for the renovation of public and private buildings could be provided through increased public funding and by leveraging EU and national budgets with private money, combining grants, lending, guarantees and loan subsidies. Luxembourg would need to underpin the substantial energy saving potential of the existing building stock by

¹⁷ Communication 'A Renovation Wave for Europe – greening our buildings, creating jobs, improving lives', COM(2020)662 and SWD(2020)550.

implementing the long-term renovation strategy, in accordance with Article 2a of the Energy Performance of Buildings Directive¹⁸.

As regards **energy poverty**, Luxembourg is encouraged to consult the Commission Recommendation of 14 October 2020 on energy poverty and its accompanying staff working document providing guidance on the definition and quantification of the number of households in energy poverty and on the EU-level support available to Member States' energy poverty policies and measures. Energy poverty could be addressed through social economy by applying socially innovative solutions (energy-awareness campaigns; retrain unemployed to energy poverty advisors; buy energy-saving appliances to rent out).

On **energy security**, Luxembourg would benefit from further developing measures supporting the energy security objectives, including measures on diversification of energy sources and reduction of energy dependency. Likewise, Luxembourg is invited to develop specific measures to preserve and strengthen cybersecurity in the energy sector.

Concerning the **internal energy market**, Luxembourg would benefit from setting forward-looking objectives and targets concerning the further development of the internal market for electricity and gas, including market integration, in particular measures to develop more competitive wholesale and retail markets. Luxembourg would also benefit from setting objectives and supporting policies and measures to lower barriers for new market entrants and to facilitate uptake of the different sources of flexibility.

Likewise, Luxembourg would benefit from aligning the priorities of its **research and innovation** programmes and necessary funds with its energy and climate ambitions. The ecosystems already in place for competitive development of new products and services and startups are a useful first step in this regard. Further strengthening of the link between the competitiveness objective and the policies and measures to be put in place for the different sectors by 2030 would also be beneficial.

The plan does not assess the overall amount of (public/private and public) **investment needs** for the period 2020-2030. The additional investment needs compared to the reference scenario are described and quantitatively linked to the energy efficiency and renewable energy targets, but do not comprise all greenhouse gas emission reduction measures. Therefore, it remains unclear whether the level of investments is sufficient to reach the climate objective. There is no distinction between the private and public sources of funding. Therefore, it is not possible to quantify the direct impact of NECP measures on public finances. The external costs of not acting are estimated at EUR 700 million per year (EUR 6 billion in total).

The NECP provides a good summary of the **macroeconomic impact** of the planned policies and measures, which is said to be rather minor overall. However, there is limited information on how the measures are financed, including the announcement of a carbon tax, the precise terms of which are not yet available. Without these underlying assumptions, it is difficult to interpret the private consumption and investment figures. Appropriate modelling of the investment needs to meet energy and climate objectives would enable Luxembourg both to calibrate its R&I needs

¹⁸ Luxembourg submitted the long-term renovation strategy in accordance with Article 2a of Directive 2010/31/EU on the Energy Performance of buildings on 26 June 2020.

and to identify funding needs and origins, facilitating the advancement of ambitious green measures and investments. Luxembourg could also further develop its role as a green financing hub.

Regional cooperation is important for Luxembourg to ensure security of energy supplies and to build further renewable energies, particularly in the North Sea¹⁹. The NECP also refers to a shared vision of decarbonised electricity supply by 2050 with reference to cooperation within the Pentalateral Energy Forum (PLEF). Luxembourg is invited to continue ongoing efforts on regional cooperation with a view to intensifying exchanges and initiatives that will facilitate the implementation of its national energy and climate plan, in particular as regards relevant cross-border issues. Luxembourg would notably need to continue promoting a cross-border approach to solving the mobility issues which contribute to GHG emissions. Luxembourg is encouraged to make further good use of regional forums, EU support and the upcoming EU offshore renewable energy strategy.

Luxembourg is invited to extend the reporting on **energy subsidies** as it would benefit from adequately quantifying fossil fuels subsidies and intensifying action to phase them out. Especially in the transport sector, fossil fuel subsidies are a major distortion and impediment to a cost-efficient energy transition, reducing greenhouse gas emissions and cutting environmental pollution. The green transition in Luxembourg would receive a further boost from rapid phase-out of fossil fuel subsidies identified in recent Commission analyses. This would involve further development and implementation of concrete plans with associated timelines, coupled with measures to mitigate the risk of households' energy poverty.

For all investments implementing the national energy and climate plan, Luxembourg is invited to ensure these are in line with national, regional or local plans for **air pollution** reduction, such as the National Air Pollution Control Programme (NAPCP), and relevant air quality management plans.

In implementing its plan, Luxembourg is invited to make the **best possible use of the various funding sources available**, combining scaled-up public financing at all levels (national and local, as well as EU funding) and leveraging and crowding in private financing. Tables 1 and 2 of Annex I provide an overview of EU funding sources which should be available to Luxembourg during the forthcoming multiannual financing period (2021-2027), and EU funding addressed to all Member States and companies. For the forthcoming period, the European Council has committed to the mainstreaming of climate action into all EU programmes and instruments and to an overall target of at least 30% of EU funding to support climate objectives. At the same time, EU expenditure should be consistent with the Paris Agreement and the 'do no harm' principle of the European Green Deal. At EU level, funding will be available for Luxembourg from the Innovation Fund, and will also be based on revenues from the auctioning of allowances under the EU emissions trading system.

¹⁹ In this context, the Commission will help address related issues in a strategic manner in its upcoming Strategy for Offshore Renewable Energy by identifying key actions in the area of maritime planning, upscaling technologies, and a new approach to infrastructure planning and offshore renewables capacity building.

Link to the recovery from the COVID-19 crisis

The vast majority of Member States' final national energy and climate plans were drafted before the COVID-19 crisis, and the present Staff Working Document assesses Luxembourg's plan in that context. Nevertheless, the implementation of Luxembourg's final integrated national energy and climate plan will need to fully take into account the context of the post-COVID-19 recovery.

In the context of the Recovery and Resilience Facility, which is expected to be operational on 1 January 2021, **the final plan constitutes a strong basis for Luxembourg to design climate and energy-related aspects of its national recovery and resilience plan**, and to deliver on broader European Green Deal objectives.

In particular, **mature investment projects outlined in the plan, as well as key enabling reforms that address inter alia, investment-barriers, should be frontloaded as much as possible**. The link between investments and reforms is of particular relevance for the national recovery and resilience plans, to ensure a recovery in the short to medium term and strengthening resilience in the longer term. In particular, Member States' recovery and resilience plans should effectively address the policy challenges set out in the country-specific recommendations adopted by the Council.

In addition, **the Commission strongly encourages Member States to include in their recovery and resilience plans investment and reforms in a number of 'flagship' areas**²⁰. In particular, the 'Power up', 'Renovate' and 'Recharge and refuel' flagships are directly related to energy and climate action and to the contents of the final national energy and climate plans. Measures under the 'Reskill and upskill' flagship are also essential to foster the climate and energy transition in all Member States.

In turn, the Recovery and Resilience Facility will provide opportunities to accelerate Luxembourg's green transition while contributing to economic recovery. In order to follow the commitment of the European Council to achieve a climate mainstreaming target of 30% for both the multiannual framework and Next Generation EU, Luxembourg's recovery and resilience plan will have to include a minimum of 37% expenditure related to climate. Reforms and investments should effectively address the policy challenges set out in the country-specific recommendations of the European Semester, and will have to respect the principle of 'do no harm'.

Based on Luxembourg's final national energy and climate plan, and on the investment and reform priorities identified for Luxembourg in the European Semester, **the Commission services invite Luxembourg to consider, while developing its national recovery and resilience plan, the following climate and energy-related investment and reform measures:**

- Measures supporting energy efficiency in buildings and in businesses' production systems; measures to support the supply of energy-efficient affordable housing;
- Measures to support investments on renewables, in particular to support systems based on renewable technologies in buildings and industry;
- Measures to support investments in sustainable mobility, in particular related to urban public transport and cross-border rail; measures to incentivise the purchase of electric

²⁰ Cf. Annual Sustainable Growth Strategy 2021 (COM(2020) 575 final), pp. 9-12.

vehicles and accelerate the deployment of recharging and refuelling infrastructure; reforms to adjust taxation to better reflect environmental and climate concerns.

The above mentioned measures are indicative in nature and not meant to be exhaustive. They aim to orient reflections in the development of the national recovery and resilience plan. They do not prejudge the position of the Commission on the actions to be proposed. This position will, inter alia, need to comply with the agreed legislative text on the Recovery and Resilience Facility.

**ANNEX I: POTENTIAL FUNDING FROM EU SOURCES
TO LUXEMBOURG, 2021-2027**

Table 1: EU funds available, 2021-2027: commitments, EUR billion

Programme	Amount	Comments
Cohesion policy funds (ERDF, ESF+, Cohesion Fund)	0.1	In current prices. Includes funding for European territorial cooperation (ETC). Does not include amounts transferred to the Connecting Europe Facility.
Common agricultural policy – European Agricultural Fund for Rural Development, and direct payments from the European Agricultural Guarantee Fund.	0.3	In current prices.
Recovery and Resilience Facility	0.1	In 2018 prices. Indicative grants envelope, sum of 2021-2022 and estimated 2023 commitments. Based on the Commission’s summer 2020 GDP forecasts.
Just Transition Fund	0.01	In 2018 prices. Commitments both under the multi-annual financial framework (MFF) and Next Generation EU.
ETS auction revenue	0.02	Indicative: average of actual 2018 and 2019 auction revenues. The amounts in 2021 to 2027 will depend on the quantity and price of auctioned allowances.

Table 2: EU funds available to all Member States, 2021-2027, EUR billion

Programme	Amount	Comments
Horizon Europe	91.0	In current prices. Includes Next Generation EU credits.
InvestEU	9.1	In current prices. Commitments both under the multi-annual financial framework (MFF) and Next Generation EU. Includes the InvestEU fund (budgetary guarantee to public and private investment) and the advisory hub (technical advice). Does not consider appropriations available to beneficiaries through implementing partners, such as the European Investment Bank.
Connecting Europe Facility <ul style="list-style-type: none"> • Transport • Energy 	24.1 5.8	In current prices. The commitment for transport includes the contribution transferred from the Cohesion Fund. Excludes Connecting Europe Facility Military Mobility funding for dual use infrastructure.
Recovery and Resilience Facility	360.0	In 2018 prices. Non-allocated commitments for loans. Loans for each Member State will not exceed 6.8% of its gross national income.
Technical Support Instrument	0.9	In current prices.
Programme for Environment and Climate Action (LIFE)	5.4	In current prices.
European Agricultural Fund for Rural Development	8.2	In current prices. Commitments under Next Generation EU.
Innovation Fund	140.0	Approximation: 7/10 of the allocations of ETS allowances to provide revenue to the Innovation Fund for 2021-2030 and assuming a carbon price of EUR 20 per tonne.

Note to both tables

The figures provided by programmes under the EU budget include both the proposals under the forthcoming multiannual financial framework, and the reinforcement of these under the Next Generation EU instrument outside the EU budget.

The figures quoted in this document are based on the conclusions of the European Council of 17-21 July 2020. They however do not prejudge the outcome of the ongoing discussions between the European Parliament and the Council on the elements of the recovery package, such as the Multiannual Financial Framework, the sectoral programmes, their structure and budgetary envelopes, which will be concluded in accordance with their respective adoption procedure.

For most of the above funds, support to the climate and energy transition is one objective among others. However, for the forthcoming period, the European Council has committed to the mainstreaming of climate action into all EU programmes and instruments and to an overall target of at least 30% of EU funding to support climate objectives. EU expenditure should also be consistent with the Paris Agreement and the 'do no harm' principle of the European Green Deal.

Some of the programmes listed in Table 2 provide funding through open calls to companies, not public administrations.

ANNEX II – DETAILED ASSESSMENT OF HOW COMMISSION RECOMMENDATIONS HAVE BEEN ADDRESSED

Recommendations		Assessment	
Decarbonisation - GHG	Complement the information on planned policies and measures for the intended ambitious reduction of greenhouse gas emissions in sectors not covered by the EU emissions trading system and the achievement of the commitment under Regulation (EU) 2018/841 of the European Parliament and of the Council hat land use, land use change and forestry (LULUCF) emissions do not exceed removals.	Largely addressed	A large number of policies and measures to reduce GHG emissions have been provided, such as the introduction of a climate framework law, the continuation of the climate pact with the municipalities, the introduction of a minimum carbon price, the adjustment of the taxation of petroleum products, further development of the sustainable mobility strategy and a set of financial instruments. The NECP also mentions support programmes to improve the protection and sustainable management of forest ecosystems, ensure sustainable timber production, improve forest care and adapt the forests to climate change. However, a detailed elaboration of the planned policies and measures is not always provided, in particular in connection with LULUCF.
	Provide further details on their scope, timeframe, likely impacts and any intended use of the flexibilities between the effort sharing and accounted LULUCF and emission trading sectors.	Partially addressed	The scope of the planned policies and measures has been elaborated on. However, the NECP often lacks details on the timeframe and impact, while the intended use of flexibilities has not been explained.
Decarbonisation - renewables	Underpin the welcomed level of ambition of Luxembourg's 23-25 % renewable energy share for 2030 as contribution to the Union's 2030 target for renewable energy by detailed and quantified policies and measures that are in line with the obligations laid down in Directive (EU) 2018/2001 of the European Parliament and Council in a way that enables a timely and cost-effective achievement of this contribution.	Partially addressed	The national contribution to the 2030 EU renewable energy target is considered sufficiently ambitious. The NECP presents a number of policies, self-consumption and energy community concepts, as well as the creation of solar and heat cadastre that will be developed to achieve this level of ambition. However, the plan still lacks sufficient detail on how these initiatives will be administered and implemented.
	Include an indicative trajectory that reaches all the reference points pursuant to Article 4(a)(2) of Regulation (EU) 2018/1999. Ensure that the renewable energy target for 2020 set in Annex I of Directive 2009/28/EC of the European Parliament and of the Council is fully met and	Partially addressed	Based on its indigenous renewable energy development, Luxembourg is not set to achieve the reference point for 2025. However, it already anticipates the use of cooperation mechanisms to maintain its baseline and achieve its reference point for 2025. Reference points for 2022 and 2027 are not provided.

	maintained as a baseline from 2021 onwards and explain how such a baseline share will be met and maintained.		
	Put forward detailed measures to meet the transport target and electrification penetration described in the draft integrated national energy and climate plan, in line with Article 25 of Directive (EU) 2018/2001.	Largely addressed	When setting the transport target in the final plan, Luxembourg mainly refers to the role of biofuels and does include the contributions of eligible fuels, as well as the limits for conventional fuel produced from food and feed crops as required in Articles 25-27 of Directive 2018/2001. The key policies and measures to achieve this are: (i) the development of a comprehensive strategy for the use of sustainable biofuels; (ii) systematic additions of second-generation biofuels; (iii) the development of electromobility; and (iv) production together with the deployment of a European network of ‘green’ hydrogen filling stations.
	Provide additional details on simplification of administrative procedures and on the enabling frameworks for renewable self-consumption and renewable energy communities, in line with Articles 21 and 22 of Directive (EU) 2018/2001.	Partially addressed	Details on new legislation to support renewable self-consumption and renewable energy communities have been provided. Measures to support the simplification of administrative procedures are still under discussion, and have not been provided in the final plan.
Energy efficiency	Define its contribution as a specific value for both primary and final energy consumption.	Partially addressed	This recommendation was partially addressed. The value for final energy consumption was established, but the value expressed in primary energy consumption is absent.
	And clearly present the expected savings and a more detailed impact assessment of the proposed policies and measures.	Not addressed	A new comprehensive set of measures on energy efficiency that cover all sectors has been proposed. However, only sectoral impacts on energy savings are provided, while an estimation of impacts on measure level is absent. The information on buildings is much improved, presenting many key elements of the long-term renovation strategy, which was submitted on 26 June 2020.
Energy security	No recommendation	N/A	-
Internal energy market	No recommendation	N/A	-
Research innovation and competitiveness	Clarify the national objectives and funding targets in research, innovation and competitiveness, specifically related to the Energy Union, to be achieved between 2020	Partially addressed	The plan identifies relevant areas and objectives for R&I and competitiveness. However, these objectives do not have a specific timeline or quantified targets. In addition, any specific policy or

	and 2030, so that they are readily measurable and fit for purpose to support the implementation of targets in the other dimensions of the integrated national energy and climate plan.		measures on energy and climate research and innovation will run only up until 2023, not the entire 2020 to 2030 period. Competitiveness is of high importance to Luxembourg and is linked to piloting 'green development', but without measurable objectives having been provided.
	Underpin such objectives with specific and adequate policies and measures, including those to be developed in cooperation with other Member States, such as the Strategic Energy Technology Plan.	Not addressed	Cooperation with the SET Plan is not addressed.
Investments and funding sources	Provide a comprehensive assessment of overall investment needs to achieve the objectives, as well as information on the financial sources to be mobilised for implementation of the existing and planned policies and measures.	Largely addressed	The plan presents an overview of the different policies and measures to achieve the public investment needed to reach the 2030 and 2050 targets in energy, transport, buildings and research. The total amount of investments for the planned policies and measures is not provided, only those for key sectors such as energy efficiency (including e-mobility charging infrastructure) and renewables. In addition, there is no information on how cohesion policy funds could be used. The macroeconomic impact on the main variables, including the general government balance, is estimated to be minor over the projection period and to record a deficit of EUR 60 million in 2030. This is because the additional expenditure is forecast to be mostly offset by higher revenues from carbon pricing, the precise terms of which are not yet known. The estimated amounts of public finance resources are not detailed, although carbon pricing revenues are estimated at EUR 150 million per year. In 2030, government debt would be around EUR 80 million higher, while the financing sources (own resources, national borrowing or EU funds) are not specifically stated. According to the final plan, the tax measures estimates are preliminary and would be analysed before their final adoption, in the context of the forthcoming tax reform.

Regional cooperation	Intensify the already excellent regional cooperation within the Pentalateral Energy Forum based on the political declaration of 4 March 2019 to extend this regional cooperation to specifically include the development and monitoring of the national energy and climate plans in particular as regards relevant issues for cross-border cooperation.	Largely addressed	The NECP also refers to a shared vision for decarbonised electricity supply by 2050 with reference to cooperation within the Pentalateral Energy Forum (PLEF ²¹). In the context of the forum, Luxembourg is also working to: (i) reinforce cross-border cooperation on renewable energy; (ii) foster the integration of electromobility options and services without regional constraints; (iii) explore options for carbon pricing and their cross-border impact on electricity prices; and (iv) strengthen cooperation in the supply of electricity, gas and hydrogen.
	Consider specifically efforts to decarbonise transport from a regional perspective.	Largely addressed	To decarbonise transport, the NECP focuses on regional cooperation through: <ul style="list-style-type: none"> • the development of a climate pact with municipalities; • the development of the sustainable mobility strategy; • cross-border issues (including reducing cross-border traffic congestions, by front-loading sustainable mobility projects: urban public transport, tram and cross-border rail, fleets and multimodality); • supporting teleworking by frontier workers (on a voluntary basis) with an appropriate tax treatment and with the creation of co-working spaces; • developing electric mobility, developing cross-border inclusive city (including at neighbourhood level) and spatial planning); • reducing lorry traffic (e.g. through the Eurovignette) and facilitating the shift of freight transport to alternative powertrains and to rail (the Lean + Green initiative); • implementing electromobility, second-generation biofuels and green hydrogen.

²¹ Consisting of Austria, Belgium, France, Germany, Luxembourg, the Netherlands and Switzerland.

Energy subsidies	List all energy subsidies	Partially addressed	In comparison to the draft NECP, the final plan adds only general information on the review of existing subsidy policies. General information on the categories of renewable energy subsidies has been provided.
	List in particular fossil fuels subsidies	Not addressed	A list of fossil fuel subsidies is not included in the final plan.
	List actions undertaken as well as plans to phase them out	Partially addressed	The plan refers to benchmarks, targets and an ongoing study to review the existing subsidy policy. However, concrete details on what these benchmarks and targets entail, as well as a timeline on the finalisation of the study, are not included.
Air quality	Complement the analysis of the interactions with air quality and air emissions policy, including the required information about the projected air pollutants emissions under the planned policies and measures and reinforcing quantitative analyses.	Partially addressed	<p>The NECP contains a general section referring to interactions with air policy, stating that planned measures will be fully harmonised with the final national air pollution control programme (NAPCP) (not submitted at the date of analysis and still overdue more than a year after the legal deadline). The NECP provides for an increase in biomass use, while mentioning that the air pollution reduction commitments under the NEC Directive should remain achievable. Quantitative analyses of emission reduction for air pollutants are not included, but are to be developed as part of the final NAPCP.</p> <p>However, a draft NAPCP explained that the air policy options will be selected only after adoption of the final NECP; it is therefore impossible to check at this stage whether the two programmes are consistent.</p>
Just transition and energy poverty	Integrate just and fair transition aspects better, notably by providing more details on social, employment and skills impacts of planned objectives, and policies and measures.	Partially addressed	<p>Compared to the draft version, the final NECP does not add sufficient detail on the social, employment and skills impacts of planned objectives, and policies and measures. There is no reference to the Just Transition Mechanism or to the ERDF financing possibilities.</p> <p>Regarding the employment and skills impacts of planned objectives and policies, the only focus is through the third industrial revolution.</p>

	Further develop the approach to addressing energy poverty issues, including by specifying the assessment as required by Regulation (EU) 2018/1999.	Largely addressed	Social impacts are targeted through the building renovation strategy; measures include other interest-free loans for lower incomes and the introduction of free public transport from 1 March 2020.
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