ASSOCIATION
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Analysis note

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Choosing climate ambition, resilience and savings

Analysis of the European Commission's 2040 climate target proposals and scenario comparison

On February 6 2024, in the midst of political turmoil with farmers on European streets and fears of far-right gains in the June European Parliament elections, the European Commission (EC) presented its Communication on a 2040 climate target, based on comprehensive scenario modelling detailed in an Impact Assessment. A review shows considerable deviation between the Impact Assessment's findings and some choices and recommendations put forward in the Communication. Based on an analysis of the scenarios and a comparison with the Collaborative Low Energy Vision for the European Vision (CLEVER)[1] published in 2023, the present note discusses how these choices could lead to higher costs, increased risks and less sovereignty for Europe and its citizens.

Key take-aways:

- **-90% net is a welcome step**, although it remains on the lower edge of recommendations from the European Scientific Advisory Board on Climate Change (ESABCC) and below the ambition required by the Paris Agreement on Greenhouse Gas (GHG) budgets
- The EC's modelling shows that **ambitious energy savings policies will have to continue beyond 2030**, although they are below the potential identified by the CLEVER scenario; if the EU embraced strong demand policies, it could secure the achievement of the climate ambition
- EC modelling **ambition on renewables is consistent with CLEVER's**; if the EU embraced strong demand policies, it could achieve 100% renewables
- The **emphasis on technology choices in the Communication deviates from the Commission's own Impact Assessment**, which:
    - confirms the **higher risks** of such options (as previously advised by the IPCC and ESABCC), relating to pace, scale and costs of deployment, safety, acceptability;
    - finds that **similar climate ambition and higher environmental benefits** could be met at **lower costs and investments** through **more demand-based approaches.**
- **The EU can choose a path of resilience and savings through sufficiency, efficiency and renewables.**

[1] The CLEVER scenario, a bottom-up Paris Agreement compatible scenario for the European Union, was developed through a network coordinated by Association négaWatt of more than 20 partners in numerous European countries, and published in June 2023. https://clever-energy-scenario.eu/#clever-major-publications

A welcome but incomplete climate ambition

The Commission's Communication was awaited as an important step for setting the European Union ambition in the United Nations climate process. First of all, the **Commission's endorsement of a 90% net GHG emissions reduction target is a welcome step for Europe and the world.** The European Commission (EC) chooses the minimum level of what had been recommended by the ESABCC[2], which the findings of the CLEVER scenario are consistent with. The Communication recognises that only a reduction in emissions of more than 90% such as that of its scenario S3 (central to a pathway to 90-95% reductions, with a value of -92% reductions) is compatible with the Paris Agreement and therefore endorses that scenario, although it choses a target of -90% that is on the bottom edge of that pathway.

Other scenarios are detailed and discussed in the Impact Assessment. The scenarios S2 and S1, which achieve only -88%, and even -83%, respectively, show that the lower level of ambition set on various levers falls short of the EU's climate commitment. However, a LIFE scenario, that encompasses lifestyle-oriented changes, is also detailed, demonstrating another possible pathway to meet -93% of net emissions reductions. Surprisingly, this alternative is not even mentioned in the Communication, illustrative of a bias towards some options which weakens the proposed ambition.

This can also be seen through some details on the target's ambition.

First, while the objective of -90% set by the Communication is positive, it is not completely satisfying, as S3's **cumulative emissions do not comply with GHG budgets defined by the ESABCC**, as shown in Annex 1.1. **Neither is S3 aligned with the long awaited objective adopted at COP28 to phase-out fossil fuels,** with 6.7% of gross available energy still coming from fossil fuels in 2050. Scientific evidence and existing scenarios therefore show **the official ambition of the EU should therefore be set above -90%**.

Secondly, the Communication remains unclear on the share of the *net* GHG reduction target that is supposed to come from *gross* reductions in the different sectors on one hand, and from natural and technological carbon sinks on the other hand. It is nevertheless clear in the Impact Assessment that scenario S3 relies on 317 $MtCO_2$ to be absorbed yearly by natural carbon sinks (LULUCF negative emissions) by 2040, but also introduces 340 Mt of CCUS (Carbon Capture Use and Storage) to be achieved by the same horizon. The **cautious approach on natural carbon sinks compares to CLEVER's and is welcome**. But the **ambition on CCUS is a potentially risky and costly bet**, at the very upper edge of this technology's potential, which is still unproven at the projected scale and pace of deployment. On the contrary, a scenario like CLEVER shows that the consistent implementation of **a sufficiency, efficiency and renewables approach would allow Europe to achieve neutrality in 2045 already, complying with ESABCC GHG budgets without relying on such a risky bet**.

[2] ESABCC, 2023: https://climate-advisory-board.europa.eu/reports-and-publications/scientific-advice-for-the-determination-of-an-eu-wide-2040

An insufficient emphasis on energy savings and renewables

Moreover, the chosen pathway doesn't seem to tap the whole potential of the most promising options. The Communication unfortunately omits to quantify the level of action that should be aimed for to achieve the climate ambition regarding the main leverages for reducing gross emissions arising from the use of fossil energy, namely the reduction of final energy consumption through energy savings and the decarbonation of energy uses and fast development of low carbon supply through renewables.

Again, the numbers are to be found in the details of the Impact Assessment. Regarding energy demand, **in scenario S3, final energy consumption (FEC) is reduced by 36% in 2040** compared to 2019 levels (up from about -18% for 2030 with the EED**. This already indicates** that strong **demand reduction policies will have to continue *beyond* 2030**. **By comparison, the CLEVER scenario shows that a reduction of -45% FEC in 2040 is possible, with multiple benefits for Europe**, beyond climate ambition, like further reducing its ecological footprint, enhancing its sovereignty, or reducing the cost of transition. From that perspective, the fact that the Communication doesn't mention the LIFE scenario, which further develops a demand side approach (although in a limited way, see Annex), can be regretted.

Similarly, the contribution of renewable energy sources (RES) to energy supply of EU by 2040 is not quantified in the Communication. As shown in the Impact Assessment, **S1 and S3 deliver 65% and 72% of RES consumption in FEC in 2040 respectively. The underlying levels of deployment of electric renewables and biomass are similar to those of CLEVER, in which their contribution to a reduced FEC reaches a higher 79%**. While the EC recognises that by 2040, the power sector will have to be decarbonised, CLEVER shows that, **through an ambitious approach on demand reduction based on sufficiency and efficiency, the EU can reach full renewable electricity by 2040, and full renewable energy by 2050, doing without new nuclear, BECCS or fossil-fuel-based CCS**.

Finally, the communication's assertion that an extension of current policies could deliver -88% is not substantiated - unless an extension would mean renewable energy and efficiency targets for 2040, and/or extremely high ETS prices burdening consumers and businesses, which the Communication does not refer to**. The latest ESABCC report, underlines that the EU is not on track to neutrality, and that more should be done to reduce demand**[3].

Costly implementation priorities put delivery at risk

The Communication's prioritisation of just transition aspects, of accompanying the transition in the industry and on the role of investments in the Communication is to be welcomed.

But a reduced attention to energy demand and renewables necessarily comes with a reinforced one for other options: **the Communication puts a lot of emphasis on the role of technology and innovation in the target's delivery. The "energy efficiency first" principle,** which recently became part of European legislation through the Energy Efficiency Directive, seems to have been **ignored,** since efficiency only

[3] ESABCC, 2024: https://climate-advisory-board.europa.eu/reports-and-publications/towards-eu-climate-neutrality-progress-policy-gaps-and-opportunities/esabcc_report_towards-eu-climate-neutrality.pdf

appears as second or **third** after supply options including CCS and nuclear energy. Same goes for modal shift in the mobility section.

This **strong focus on technological solutions to deliver the -90% ambition may come at high risk in the long run, and at high costs for Europe and its citizens already in the next few years.**

This technological bias is highlighted by the Communication's endeavour to deploy nuclear Small Modular Reactors (SMRs) "by early 2030" - despite the fact that those do not appear anywhere in the scenario modelling. There is absolutely no evidence to support such an assumption, when 2030 is at best an optimistic deadline to start building pilot SMRs, the industrial and regulatory conditions of their deployment remain a blank page, and the business case is largely unproven. The deployment of new nuclear power plants in recent years in European countries (UK, France, Finland, etc.) has shown delays of more than 10 years and 3-fold or more increases in costs. With projected final overnight costs of more than 8,000 €/kW for the EPR being built in Flamanville or even 16,000 €/kW for those projected at Sizewell in the UK by EDF – the sole domestic European nuclear builder –, nuclear power comes at a rising cost which is more than double that of still decreasing renewable alternatives.

In parallel, the costs and conditions of implementation of the different CCS technologies remain very uncertain, and so are their risks, not only in terms of safe sequestration, but also in terms of timely delivery before 2040. **The CCUS levels proposed by S3 are above those recommended by the ESABCC, further increasing risks** (see annex). As nuclear energy, CCS technologies bear very high acceptability issues, which may further delay their deployment in the next 16 years on European territory.

It is even more arguable that these options are put forward by the Communication when these costs and risks, which had already been highlighted in the IPCC's AR6 report[4], and in the ESABCC recommendations[5], are also further underlined **in the Commission's own impact assessment**: "*high costs and technological uncertainty (DACCS), cost and competition on biomass resource and possible negative impact on LULUCF (BECCS), creation of the transport and storage infrastructure, public acceptance and equitable and sustainable technology scale up*"[6]; "*the transition from R&I stage to the full-scale, replicable, commercial deployment for certain steps of the technology"*[7].

Hydrogen and its derivatives (e-fuels) will be key to decarbonise some sectors (steel, water freight, chemicals, ...), but concerns exist on the speed of deployment achievable and these solutions can also raise sustainability issues (regarding water, GHG, CO_2, land)[8], which increase with their level of deployment. For example, in terms of required CO_2 input, sustainable biomass and air are the only renewable sources that do not cause additional greenhouse gas emissions[9]. However, sustainable biomass sources are limited and CO_2 capture from the air is still in the demonstration and development phase. The **S3 scenario assumes levels of production of e-fuels 3-4 times higher than other studies (and twice higher for hydrogen)**.

Furthermore, the Commission's scenarios continue to rely on fossil fuel import (3100 TWh in 2040, and 1700TWh in 2050 corresponding to 14,5% of consumption, see annex 2.3) **where the CLEVER scenario has none left In 2050, making Europe more resilient in the face of geostrategic dependencies.**

[4] p.38 and 41 https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_SummaryForPolicymakers.pdf
[5] ESABCC, 2023, p.86: "(nuclear power and fossil CCS) bring potential synergies and trade-offs with SDG 6 (clean water and sanitation) as also identified in AR6 (IPCC, 2022, WGII Chapter 17) due to high water consumption, potential synergies with SDG 7 (affordable and clean energy), and potential trade-offs with health (SDG 3) and life on land (SDG 15)"
[6] p.267 of the impact assessment (p. 10 of ANNEX8)
[7] p.277 of the impact assessment (p. 20 of ANNEX8)
[8] Öko-Institut, (2019). Not to be taken for granted: climate protection and sustainability through PtX
[9] Ibid p.21

Choosing resilience and savings

Unfortunately, **this technological enthusiasm seems to be rather fuelled by political turmoil in Europe than by evidence from the Commission's own scenario modelling**.

Scenarios S2 and S3 integrate sufficiency assumptions, such as higher car occupancy and some modal shift[10]. **The LIFE scenario reduces the total energy system costs by 1.4% and 3.6% over 2031-2050 in comparison to S1 and S3 respectively. More climate ambition can therefore be less costly, if supported by a demand focus.** This confirms previous scenario analysis showing the role of demand reduction and sufficiency in reducing costs for investors, consumers and businesses.[11] It also shows substantial further co-benefits, including improvements in air quality, ecosystems, enhanced health, and reduced healthcare costs.

In all the sections of the Communication, the Commission lists and warns about potential risks and barriers to the delivery of the ambition (availability of raw materials, competition for land, acceptance and social justice, increasing energy prices, risks of creating "new vulnerabilities through imports of net-zero technologies or low-emission energy commodities") but **fails to recognise the role of demand reduction in mitigating them - despite recommendations from the ESABCC** according to whom *"pathways with lower energy and natural resource use advance the Sustainable Development Goals and energy security and lower other risks compared to pathways that prioritise supply-side technological solutions*"[12] and "*pathways that reduce energy use reduce risks associated with the upscaling of supply-side options that have comparatively higher transition risks such as nuclear power, carbon capture*".

The Impact Assessment's analysis on raw materials can be welcomed. But it does not underline enough the risks associated with raw materials availability for succeeding in the transition, nor does the Communication take up the issue politically. The supply of critical raw material such as Lithium could put the EU decarbonisation at risk . Evidence from several studies (see annex 3.4) suggest that **only an approach based on sufficiency, efficiency and renewables can keep Europe safe from further supply and environmental risks associated with raw materials criticality.**

EU elections: a chance to choose a resilient pathway

The 2040 Communication remains rather vague in proposing a framework to deliver the target. **A framework based on sufficiency, efficiency and renewable energies is the most likely to produce positive effects today for the climate, energy security and cost control, with co-benefits for health and the environment.** It's the best response to the economic, social, political and meaning crisis that Europe is going through. It is also the fastest one, as **sufficiency, efficiency and renewables are available now and can deliver in the short to medium term, on the contrary to nuclear and CCS that cannot deliver before the late 2030s.** That framework can be delivered through **a strategy for sufficiency to be proposed by the next Commission proposing its integration in a 2040 climate and energy framework extended to materials.**

[10] p.33 of the impact assessment
[11] CREDS, 2021, p. 54 https://www.creds.ac.uk/wp-content/uploads/CREDS-Role-of-energy-demand-report-2021.pdf
Institut Rousseau, 2024, executive Summary p.1 https://institut-rousseau.fr/road-2-net-zero/
[12] ESABCC, 2023
https://climate-advisory-board.europa.eu/reports-and-publications/scientific-advice-for-the-determination-of-an-eu-wide-2040

EU elections are a chance to shift the course of history towards profoundly transforming the European project by choosing a strategy of European renewal and success. When briefed about the climate crisis, citizens chose sufficiency. 40% of all measures recommended by Climate Citizens Assemblies across the EU are sufficiency-related.[13] French citizens even voted sufficiency as their first recommendation in their convention on the future of the EU.[14] While EU leaders have to date failed to recognise this potential, they have an opportunity with the next elections and mandate.

[13] Lage et al., 2023: https://www.sciencedirect.com/science/article/pii/S2214629623003146
[14] https://medias.vie-publique.fr/data_storage_s3/rapport/pdf/282723.pdf

ANNEX: scenario analysis and comparison

The charts and tables in the following sections are based on the scenarios from European Commission impact assessment published in February 2024 (hereafter mentioned S1, S2 S3 and LIFE).

These scenarios are mainly compared to the CLEVER scenario and to the recommendations from the report of the European Scientific Advisory Board on Climate Change (ESABCC) "Scientific advice for the determination of an EU-wide 2040 climate target and a greenhouse gas budget for 2030–2050".

The following scenarios are also mentioned on specific issues:

- "Breaking free from fossil gas", AGORA Energiewende (2023)
- The variant "Global Ambition" of the TYNDP2022

1. GHG emissions

1.1 GHG budget and 2030-2040 targets

As detailed in the table below, the pathways S3 and LIFE do not comply with GHG budgets defined by the ESABCC, which are based on a feasibility approach which leads to higher budgets than an equity approach. These budgets of 11-14 GtCO2e should then be considered as a minimum target to be reached.

This shortfall seems to be mainly related to the lack of ambition on 2030 targets, aligned with the Fit-for-55 ambition.

The difference of ambition for 2030 between CLEVER and the Commission's scenarios mainly comes from domestic transports and agriculture.

	S3*	LIFE*	CLEVER**	ESABCC***
GHG budget 2030-2050 (GtCO2e)	**Up to 16**	**Up to 16?**	**12**	**11 to 14**
2030 Net GHG	-55%	-55%	-65%	****
2040 Net GHG	-92%	-93%	-92%	-90 to -95%

** includes intra-EU international transports and 50% international maritime*
*** includes international transports*
**** Recommendations for setting 2040 targets (pages 10 and 50). Includes only intra-EU international transports*
***** Recommendations for 2030 are not given, but iconic pathways which achieve 11-12 GtCO2 of GHG budgets reach around 1500 GtCO2e in 2030 (corresponding to about -69%/1990)*

1.2 GHG emissions by sector

The 3 scenarios analysed (S3, LIFE and CLEVER) reach similar ambition in 2040 (about -92% GHG emissions in comparison to 1990), which confirm the possibility to reach a reduction higher than -90%, as recommended by the ESABCC. But some differences appear on the levers activated.

<u>Scenario comparison (see next table for details)</u>

- Similar level of net LULUCF removals (natural carbon sinks)
- Beginning of deployment of BECCS/DACCS over 2030-2040 in S3 and LIFE
- Lower emissions from agriculture in LIFE and CLEVER, probably related to diets hypotheses
- Lower emissions related to energy (mainly fossil fuels combustion) in the CLEVER scenario
- Lower emissions from industrial processes in LIFE and S3 through carbon capture and storage (120 and 135MtCO2)

	2030		2040		
MtCO2e	**S1/S2/S3/LIFE**	**CLEVER**	**S3**	**LIFE**	**CLEVER**
Net GHG emissions	**2127**	**1696.6**	**418**	**420**	**389**
Total Gross GHG Emissions (incl. international transports)	**2441**	**2023.6**	**810**	**807**	**740**
Energy (w/o international transports)	1508	1242.6	346	403	266
International transports	251	178	103	106	92
Industry (non energy)**	157	168	14	13	89
Agriculture	361	302	271	209	223
Other	164	133	76	76	70
Removals	**-314**	**-327**	**-392**	**-387**	**-351**
Net LULUCF	-310	-327	-317	-360	-351
Industrial removals	-4	0	-75	-27	0
BECCS	*-4*	*0*	*-33*	*-27*	*0*
DACCS	*0*	*0*	*-42*	*0*	*0*

*** This category includes carbon removals stored underground for S3 and LIFE in 2040: respectively 135 and 120 MtCO2*

1.3 Carbon capture, use and storage (CCUS)

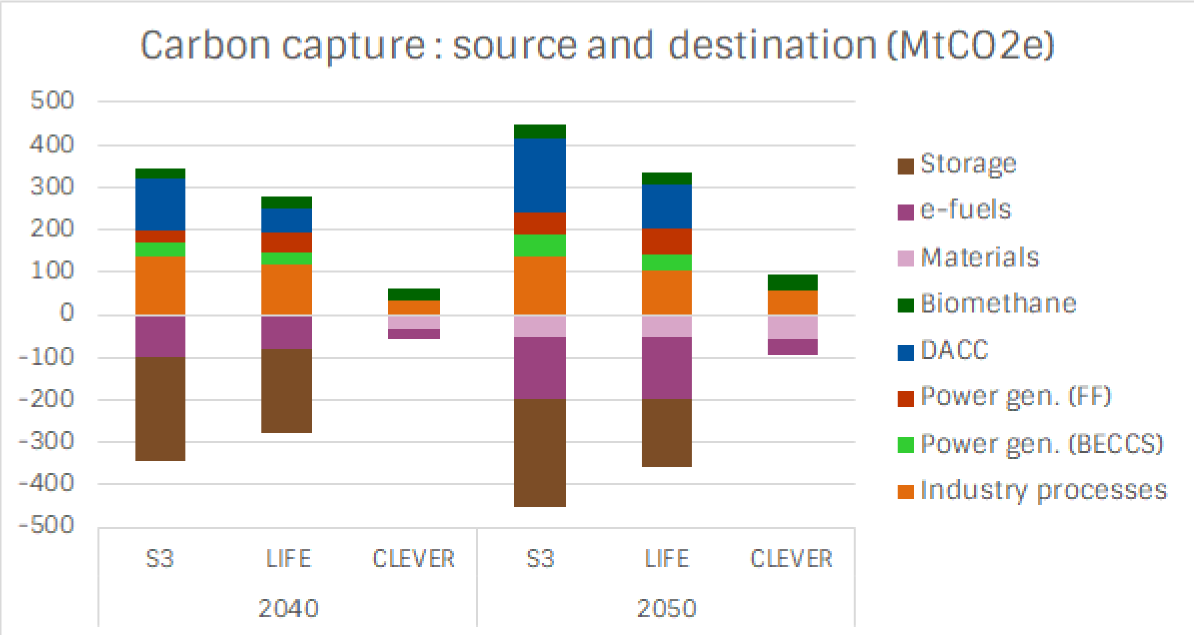
The scenarios from the Commission rely on carbon capture with about 340MtCO2 and 450MtCO2 captured in S3 respectively for 2040 and 2050[15].

These levels raise important feasibility issues and are for example higher than the recommendations of the ESABCC of a maximum of 425MtCO2/year in 2050[16].

[15] Impact assessment, p. 39
[16] ESABCC (2023), page 79

The CLEVER scenario limits the amount of CCUS technologies to:

- Relatively small amounts, in order to minimise the uncertainty on the deployment speed of immature technology.
- Only CCU technologies, avoiding the uncertainties specific to underground storage (risks of leaks, acceptance, ...).
- CO_2 from renewable sources (biomethane), or from unabatable emissions (cement production). CO_2 from fossil fuels being excluded considering the high risk of lock-in effect it could create.



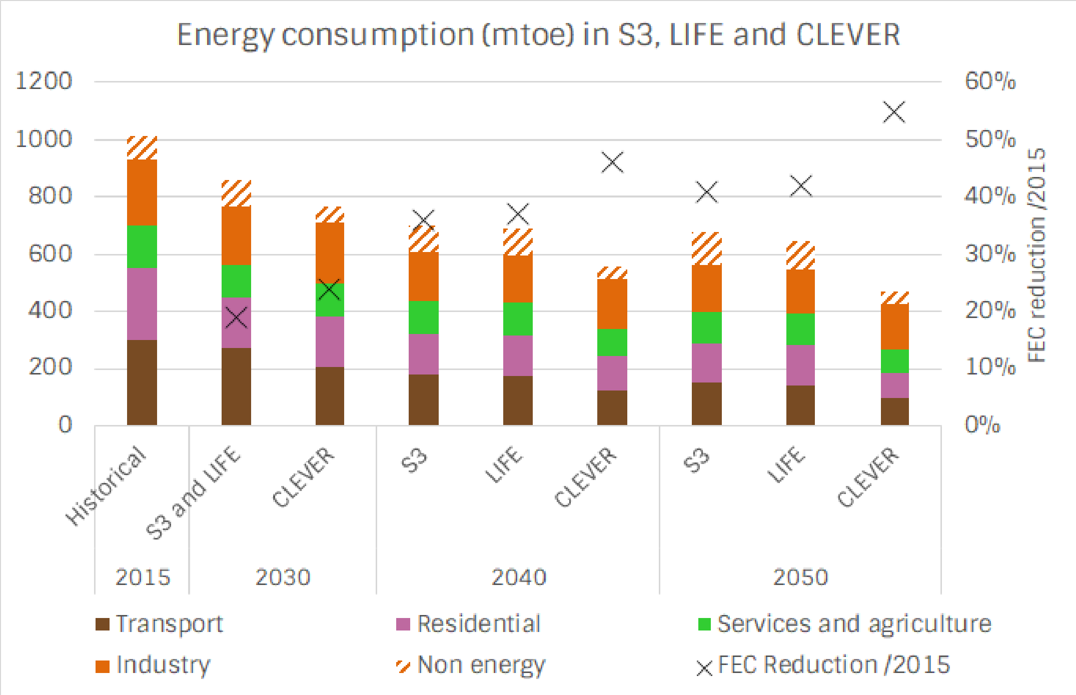
2. Energy demand and supply

The net emissions related to energy sharply decrease in all scenarios by 2040 in comparison to 1990 reaching -89%, -92% and -89%, respectively for S2, S3 and LIFE. For comparison, the CLEVER scenario reaches a 92% reduction in comparison to 1990, without BECCS and DACCS.

The ambition in the S3 scenario to reduce energy-related emissions by 2040 is at the right level to limit cumulative emissions and set a path towards a full decarbonisation of the energy system by 2050, which is indispensable to reach carbon neutrality. But, decarbonisation relies on several levels of technology deployments which remain uncertain: nuclear, carbon capture, H2 and e-fuels, imports...

2.1 FEC could be further reduced

The levers of efficiency and sufficiency have not been exploited enough in the scenarios from the commission. Indeed, the CLEVER scenario reduces even more the FEC: of the S3 scenario by 16% (or 95mtoe) and 22% (or 134mtoe) lower than the S3 scenario, respectively in 2040 and 2050.



2.2 Consistent ambition on renewables

The ambition on electric renewables by 2040 and 2050 is in line with major studies (see next table).

The potentials of biomass (8.8EJ[17] or 2400TWh) considered are also compatible with sustainable supply, even though a further detail on primary sources would be necessary to confirm it.

Electric renewables (TWh)	S2-S3-LIFE*	CLEVER	Others **
2030	~2100	2290	2000-2500
2040	3900-4500	3900	3200-4300
2050	5000-6000	4640	4500-6000

** Values vary between pages 289 and 290 of the impact assessment*
*** Other scenarios: AGORA Energiewende (2023); Strategic perspectives "-90%", TYNDP2022 "Global Ambition", PAC2.0*

2.3 Reliance on uncertain levers: nuclear, CCUS, H2/e-fuels and imports

With the ambition of CLEVER on energy consumption, the amount of electric renewables and biomass assumed in the S3 would be enough to supply the demand (given that they are higher than in the CLEVER scenario), reducing or suppressing the dependance on uncertain levers.

"*pathways that reduce energy use reduce risks associated with the upscaling of supply-side options that have comparatively higher transition risks such as nuclear power, carbon capture*"[18]

[17] Impact assessment, p.75
[18] ESABCC (2023), p.11

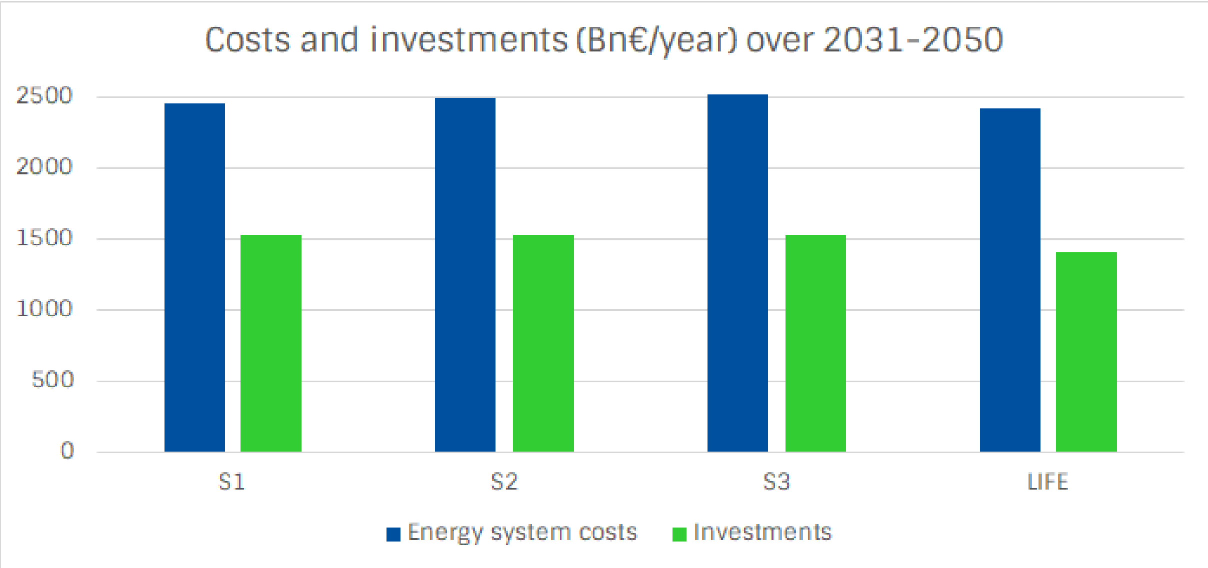
		2021	2040			2050		Comment
		Historical	S2	S3	CLEVER	S3	CLEVER	
Nuclear (TWh)	Nuclear	730	495	495	136	495	0	282TWh by 2040 in TYNDP2022-Global ambition
CCUS (MtCO2/y)	CCUS	0	222	344	-60	446	-95	425MtCO2/y in 2050 as maximum feasibility level (ESABCC)
	Underground storage	0	147	244	0	250	0	
	DACC	0	20	121	0	175	0	7 and 22 MtCO2/y for 2040 and 2050 as max. for DACCS (ESABCC; p.79)
H2/e-fuels (TWh)	H2 prod.		884	1163	614	2152	1052	About 550 and 900TWh in 2040 and 2050 in AGORA scenario
	E-fuels prod.		314	430	98	698	182	About 120TWh of e-fuels production in 2040 and 2050 in AGORA scenario
Net imports (TWh)	Total (excl. Uranium)	9443	3617	3198	1734	1745	119	
	Oil	5338	2326	2210	993	1163	95	
	gas	3301	1047	698	670	465	0	
	H2/e-fuels				71		24	
	Uranium*		1507	1507	414	1507	0	

**Rough estimation based on the efficiency of nuclear plants assumed in CLEVER and gross electricity production in S2-S3 scenarios*

3. Other impacts: costs and investments; environment and health; raw materials

The LIFE scenario integrates sufficiency levers at a low level in comparison to existing studies (e.g. CLEVER) and only through an approach of voluntary behavioural changes rather than through a systemic approach of sufficiency (implying structural societal changes and policies that can drive change).

3.1 Costs and investments



The LIFE scenario reduces total investments over 2031-2050 by 8-8.5% in comparison to S2-S3[19] and energy system costs by 1.4% and 3.6%[20] in comparison to S1 and S3.

Then, in comparison to S1, the LIFE scenario brings similar energy system costs for a higher climate ambition than S1 (e.g. -93%GHG in 2040 vs -78%).

This confirms the positive effects of sufficiency on costs already highlighted by other studies, like RoadtoNetZero[21] estimating that sufficiency can avoid 200 billion euros of imports (8% of energy system costs in S1 or LIFE).

In addition, the cost of climate change is 51-94 Bn€/year lower in S3 (and then in LIFE as it reaches the same climate ambition) than the cost of inaction in S1[22], and 52-93Bn€/year related to air pollution[23].

3.2 Economic impacts

According to EC modelling, the level of climate ambition has little impact on the economic outputs (including GDP) : "*At aggregate level, the three models used in this impact assessment consistently show that a higher level of mitigation in 2040 only has a slightly negative, transitory impact on GDP, while a lower level of mitigation yields a minor positive effect*" (p. 52) "*While estimates of long-term*

[19] Impact assessment, pp. 57 and 416
[20] Impact assessment, pp.62 and 442
[21] https://institut-rousseau.fr/road-2-net-zero/
[22] Impact assessment, p.48
[23] Impact assessment, p.80

economic losses are shrouded with uncertainty and will depend to some extent on our ability to adapt to a changing climate, they all point to impacts [of climate change] that are several times the estimated impacts of mitigation policies." (p.55).

Nothing in the impact assessment indicates that the LIFE scenario could have negative macro-economic impacts. This confirms previous analysis for France showing that **an approach based on sufficiency, efficiency and renewables has positive macro-economic benefits compared to business as usual.**[24]

3.3 Environment and Health impacts

The impact assessment provides evaluations of the impacts of the scenarios on health (mainly from air pollution) and environment (mainly from acidification and eutrophication)[25]. They demonstrate the positive impacts of all transition scenarios and the additional benefits of the LIFE scenario assumptions.

	Change 2015-2040	
	S1-S2-S3	LIFE
Premature mortality caused by PM2.5 and ozone exposure (death cases per year)	-57.60%	-59.50%
Acidification (area where it exceeds critical load)	-80.40%	-87.70%
Eutrophication (area where it exceeds critical load)	-23.40%	-36.30%

3.4 Raw materials impacts

The impact assessment integrates some evaluations of material needs for copper, lithium and cobalt[26]. A more detailed analysis on material needs with an evaluation of sufficiency levers' impacts would be very beneficial. Indeed, several studies[27][28][29] demonstrated how sufficiency and demand reduction assumptions lead to a reduction in various materials on a global, European and national scale. These include wood, foodstuffs, textiles, non-metallic ores for construction and metal products, including critical raw materials such as lithium and copper.

For example, the T&E study and an ongoing négaWatt study reach similar results: **thanks to sufficiency, circularity and technology improvements, they estimate that in 2040 lithium demand could be reduced by 50% to 65% in comparison to a BAU, reaching 40 to 65kt/year in 2040, whereas the Commission's evaluation estimates about 80kt of lithium demand in 2040**.

[24] https://librairie.ademe.fr/cadic/6940/feuilleton_macroeconomie_transitions2050_ademe.pdf
[25] pp.48-51 of the impact assessment
[26] pp. 47 and 406 of the impact assessment
[27] Rauzier, Toulouse, 2022: https://www.negawatt.org/IMG/pdf/220608_ecee_the-material-impacts-of-an-energy-transition-based-on-sufficiency-efficiency-and-renewables.pdf
[28] Cabeza, L. F., Q. Bai, P. Bertoldi, J.M. Kihila, A.F.P. Lucena, É. Mata, S. Mirasgedis, A. Novikova, Y. Saheb, 2022: Buildings. In IPCC, 2022: Mitigation of Climate Change. https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_Chapter09.pdf
[29] Transport & Environment, 2023: https://www.transportenvironment.org/wp-content/uploads/2023/07/Battery-metals-demand-from-electrifying-passenger-transport-2.pdf