LOCOMOTION

Energy security, sustainability and sufficiency in Europe and beyond

LOW-CARBON SOCIETY: AN ENHANCED MODELLING TOOL FOR THE TRANSITION TO SUSTAINABILITY (LOCOMOTION)

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INTRODUCTION

The global climate emergency — and now, the war in Ukraine — calls for the acceleration of the transition to a climate-neutral Europe.

In late 2021, the EU started a process to review its strategy on international energy engagement, which was reviewed in 2011 and most recently in May 2022. The aim of the new strategy is to give people, inside and outside the EU, access to sustainable, affordable and secure energy supplies under changing circumstances. A parallel aim was established: to encourage decarbonisation on a global scale. This scale is necessary, as recent research argues that it is more effective to shift the focus from energy changes in households to the international industrial production system.

Along with the EU's strategy, other energy-related policy files aim to drive higher climate ambition both nationally and internationally. These include for example the Fit for 55 package with the Carbon Border Adjustment Mechanism (CBAM), the EU Emission Trading Systems (EU ETS), and the REPowerEU plan.

Energy equals power — especially in a world of increasing energy demand and decreasing energy return on investment. The global geopolitical power balance is changing fast, and evidence-based alternatives are needed. LOCOMOTION, a Horizon 2020 project, matures at this very appropriate time. Scientists are working on a new Integrated Assessment Model (IAM) to assess the environmental and socio-economic impact of different pathways for a low-carbon future, such as the European Green Deal.

This policy brief presents five conclusions based on new peer-reviewed papers and provides key recommendations for EU policymakers. In short, the EU needs to show leadership and ensure that support can be provided to those who are most affected by the changes in the global energy system. It needs to strive for a wellbeing economy where people and nature can thrive together within the planetary boundaries. Though the room for erring on how the wellbeing economy will be powered is shrinking, the current situation is a fitting moment for an ambitious leap forward towards long-term solutions.

1: THE GREENEST ENERGY IS THE ENERGY WE DON'T USE

The **first saving is on the energy that is not needed**. The REPowerEU plan rightly stresses that energy saving should be a global priority. Indeed, buildings, farms, grids and cities across the globe should follow a "smart design" — one that depends less on fuel and allows people and nature to find a balance in the short and long term.

In the REPowerEU communication from 18 May, the European Commission sees a 5% potential for short-term energy demand savings on oil and gas. The examples that are given are mostly targeting the household level, such as turning the thermostat down a little. However, energy demand can be cut at the production side too, and this should be done as soon as possible. In order to meet the Paris Agreement goal, industry's final energy demand should decrease by at least 33% between 2015 and 2050. In order to do this, industrial production processes need to include both energy savings policies and a shift to renewable electricity (RE). Concerns that this

will slow down GDP growth can be addressed by the fact that energy savings lead to a more stable and resilient economy, and that feasible alternatives to infinite green growth exist.

LOCOMOTION research compared green growth to policies for social equity and to a post-growth scenario. In the green growth scenario, based on technological progress and environmental policies, income inequality and unemployment increased, potentially paving the way for anti-EU sentiments and political extremes. The policies for social equity scored better. However, only the post-growth scenario offered both a sufficient reduction in emissions and inequality — with a higher public deficit-to-GDP ratio[1] above the EUs debt and deficit rules[2] due to costs for social programs and contraction of GDP after 2040. It is worth noting that the latest IPCC report mentions degrowth - including an entire new chapter on demand side solutions — as a crucial pathway for a low-carbon transition in conjunction with social sustainability. This has already been implemented. For example, in 2011, the Japanese government introduced an energy savings campaign that successfully decreased national energy demand whilst avoiding blackouts. This was also done proportionally in the sense that households and small businesses relied on voluntary reductions, whilst companies with a demand above 500 kilowatts were obliged to reduce demand by 15 % or even 30 % for larger companies.

Key recommendations :

- Increase the percentage of energy demand savings above 5% and expand this to the industrial sector.
- Reduce the EU energy consumption by 45% and set an energy efficiency target of 45% by 2030 to align with the 1.5C Paris Agreement trajectory.

2: ENERGY DEMAND MEASUREMENTS DON'T TELL THE FULL STORY

Every year, the International Energy Agency (IEA) publishes its findings on international energy demand. However, LOCOMOTION research on 44 countries found that on average, the 10 highest-ranking countries in the Human Development Index (HDI)[3] actually demand 18.5% *more* energy than measured by the IEA. In contrast, the 10 lowest-ranking countries in the HDI use 1.6% *less* energy than the official data show. The current standard metric, the Total Primary Energy Supply of a country, does not take into account the energy embodied in goods and services imported from other countries. The **perverse outcome is that a country appears more sustainable the more it outsources its energy-intensive industries**. Instead of decarbonisation, this is leading to the carbonisation of countries outside the EU. The culprit is a decades-long practice of "encouraging more migration of the dirty industries to the LDCs (Least Developed

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[1] The debt-to-GDP ratio compares a country's sovereign debt to its total economic output for the year.
[2] There is consensus that the EU fiscal rules are not fit for purpose anymore. The EC opened a review process in October 2021 to reform the framework.
[3] The Human Development Index (HDI) is a summary measure of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable and having a decent standard of living. The HDI is the geometric mean of normalised indices for each of the three dimensions.

Countries)," as World Bank chief economist Lawrence Summers wrote in a leaked internal memo in 1991.

Putting energy out of sight and out of the books simply displaces the problem. The Hidden Energy Flows indicator provides a solution. As other LOCOMOTION publications have shown, insufficient policy action on energy demand reduction may cause an economic and social downturn, exacerbating social tensions and threatening political stability in the longer run. Acknowledging the existence of embodied energy flows is indispensable when formulating new national, European and international energy policies. The Hidden Energy Flow indicator provides a percentage to be added to or subtracted from the Total Primary Energy Used value of a country, provided by the IEA, to get its accurate consumption-based energy requirement. The indicator can help policymakers focus energy transition actions towards less energy consumption as well as effective production changes, improving energy justice and energy democracy.

Key recommendations:

- Improve national and international measurements of energy use by applying the Hidden Energy Flow indicator.
- Discourage practices in the EU that lead to the the carbonisation of non-EU countries (e.g. consumption attitudes and industrial production systems) and promote initiatives such as the 2000-Watt society.

3: THE EU'S ENERGY SUPPLY CAN BE 100% RENEWABLE BY 2040

When it comes to the EU, it is not only our responsibility (given historical emissions) to be a renewable energy zone, but also geopolitically strategic, given the EU's dependency on fossil fuel imports. In 2020, a clean energy scenario developed by civil society organisations (CAN Europe and the European Environmental Bureau) in cooperation with grid operators, industry representatives, economists and researchers has shown that the EU can run on 100% renewable energy by 2040. Doing this would give credibility to EU policy frameworks such as the European Green Deal and can create a multitude of green jobs.

However, many challenges lie in the way, and these need to be addressed. The LOCOMOTION project will offer a more sophisticated integrated assessment model to assess the impact of different scenarios, including the implications of renewable-focused ones. Nevertheless, what is clear already is that **we do not need to wait for a technological miracle or use polluting bridge fuels**: a direct switch from fossil fuels to renewables is possible when combined with demand reduction, enhanced energy efficiency and circularity. It is not enough to expand renewables; and also need the phase-out of fossil fuels.

The EU needs to:

- Strive for a more ambitious **increase in renewable energy use**, in particular with solar PV and wind energy.

- **Move forward with the electrification** of industrial processes, heating and transport, using renewable electricity.
- Use **flexibility options** (such as batteries) to cope with the variability within energy systems.
- **Grant permits** for land use for wind and solar power plants in a reasonable time by removing inefficient bureaucratic procedures — but without watering down environmental protections and while ensuring the meaningful participation of local communities.
- Ensure that renewable energy projects are **eligible under State aid rules** to avoid delays in project planning and conduct a fast roll-out of the needed capacity.
- Make use of the potential of **Green Public Procurement** as a key leverage to upscale demand for renewable power.
- **Quickly phase out fossil fuels**
- Allow only a very **limited role for non-fossil gases** and fuels that are based exclusively on green hydrogen.
- **Exclude** negative emission technologies such as Carbon Capture Storage and Use[4]

In order to achieve a global green and just energy transition, it is key that the EU supports countries outside the bloc through long-term partnerships and adequate financing. This can be done through various initiatives such as the Joint Energy Transition Partnership with South Africa, the Global Gateway, the EU-Africa Green Energy Initiative, and the Global Methane Pledge. All of these should be expanded to benefit more countries and more people and ensure ambitious decarbonisation strategies.

Moreover, the EU needs to take into account potential (global) environmental and social impacts, while it is transitioning to renewables such as solar energy. LOCOMOTION research shows that at 25-80% penetration in the electricity mix by 2050, solar energy may occupy between 0.5% to 2.8% of total EU territory. Until now, such solar energy expansion is found to predominantly replace, either directly or indirectly, land used for commercial purposes (e.g. cropland or commercial forests). This has global implications as for every 100 hectares of solar land in the EU, 31-41 hectares of unmanaged forest may be cleared throughout the world. To **avoid land competition**, and its harmful effects outside of the EU, the bloc needs to ensure that arable land being transformed into solar land is managed as pastures. Moreover, to avoid biodiversity loss, the distance between solar panels matters a lot. There has to be at least 2,5 m of sunny area at noon between the months of May and September. As indicated, best practice examples exist, but policies are needed to make such mixed uses of land the new norm.

Key recommendations:

- Mobilise energy savings through accelerating a deep renovation of buildings and a modernisation of industry and transport, to halve the EU's energy demand by 2050.
- Support implementation of renewables that should cover 50% of the EU's gross final energy consumption in 2030 and 100% in 2040.

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[4] The only exception being some specific industrial processes such as tiles, ceramics, and cement where emissions come from chemical reactions in the production, not from fuels.

- Quickly phase out fossil fuels in the EU, starting with coal by 2030, fossil gas (including LNG) by 2035 and fossil oil products by 2040.
- Expand long-term partnerships and financial initiatives to support countries in their green transition.
- Leave the 1994 created Energy Charter Treaty, which is incompatible with the Paris Agreement.

4: RESOURCE AVAILABILITY CAN UNDERMINE GLOBAL DECARBONISATION

Europe represents under 10% of the world population, yet consumes more than 25% of raw materials globally. One-third of that is for energy use. Research from LOCOMOTION's predecessor model shows that a transition from fossil fuels to renewable energy systems could drive a **steep re-materialisation** of the economy. In a Green Growth scenario[5], cumulated **extraction demand would surpass the current levels of reserves** for tellurium, indium, tin, silver and gallium by 2060 — all of which are key for renewable energy systems. LOCOMOTION research further shows that at present rates of extraction, the available nickel resources - key for constructing solar plants - may go empty within a century. The issue of material availability may pose serious problems to the deployment of some renewable energy systems and alternative technologies in the next decades already, especially in the case of solar. Hence, it is imperative to reduce both material and energy demand as well as focus on recycling.

Recycling is key for the transition to renewables, but it is no silver bullet. In the Green Growth scenario mentioned above, the recycling rate of minerals is generously set at 85% by 2060. However, high recycling rates are based on the premise that we can largely reintroduce waste minerals into the system, which may not always be the case due to material and quality losses as well as health and safety risks, such as with lithium. To reach the ambitious 85% target, a full and rapid paradigm shift in product design, transparency and health measures is necessary. Due to the various difficulties linked to recycling, we need to **lower material consumption** in the first place, do more upcycling through urban mining, and promote repairing and sharing systems.

Mining is highly linked to inequity and unequal exchanges. For example, for several materials—in particular those used in energy technologies such as solar PVs, wind turbines and batteries—the EU is fully reliant on imports, often coming from politically sensitive countries. Behind these 'imports' often lie Europe's ecological debts. For example, Sub-Saharan Africa loses around $100 billion annually due to natural resources not being compensated for in the form of royalties and taxes. This inequity is highly problematic as it may prevent the region from making the switch to renewables due to a lack of necessary investment. The EU also faces many issues to achieve a green transition at home. In order to increase its resource independence, it has shifted its focus on sourcing its materials from European areas - arguing that green mining is possible in Europe. However, so-called 'green mining' is a myth. It not only has high environmental costs but is also socially harmful, as local European communities are not properly involved in the decision-making beforehand. Research shows that more mining simply leads to more conflict.

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[5] A growth-oriented path with a focus on technology, 100% share of renewables by 2060 and high recycling rates

Key recommendations:

- Set targets and plans to **reduce absolute resource consumption** including a binding EU material footprint reduction target of 65% by 2050.
- Adopt **mandatory EU due diligence legislation** and grant communities a genuine **Right to Say No** to mining projects.
- Ensure that **Natura 2000** and other protected areas are strictly protected as 'no go areas' for extractive industries.

5: A GLOBAL ENERGY TRANSITION REQUIRES SOCIAL JUSTICE

The EU positions itself as a climate leader. However, it can only truly lead and achieve the Paris Agreements if it (1) recognises its historical responsibility for climate change and (2) supports and implements a truly just transition inside and outside of the EU. To address the fact that we consume too much energy, we need to tackle extreme affluence. In the 25 years from 1990 to 2015, global carbon emissions grew by around 60%. The EU was responsible for 15% of global cumulative consumption emissions, and the EU's 10% richest were responsible for over a quarter (27%) of the EU's emissions. This is also true for energy consumption which is highly unequal and varies across countries and income groups: the richest 10% in the world consume 20 times more energy than the bottom 10. This demands a focus on energy distributional measures, progressive taxation and fiscal measures. Any financial burden of the energy transformation needs to be shared in a socially just and transparent way. When acute energy shortages threaten to cause power cuts, the first cut needs to be with the most prolific energy users, to reduce their share to a fair share — if that can avoid cutting small users off.

True energy justice is a lot more than the current 'just transition'. Energy justice demands remediations for the social, economic and health burdens for those who are disproportionately harmed by an energy project as well as equal participation in the process and recognition of marginalised communities. It aims to make energy more sustainable, affordable, accessible and democratic. Hence, for a just transition, policies must consider and respect the rights of local communities (within and outside of the EU) and enhance meaningful and inclusive participation throughout the process. The EU should prioritise the implementation of decentralised and/or community-owned energy projects as they increase acceptance of the transition, resilience and energy security in the long term. Yet the energy transition will have to be 'just' in a much broader sense. The EU currently follows a just transition approach that almost exclusively focuses on negative impacts of the transition on specific regions and polluting economic sectors. While this is important, it risks to benefit predominantly male-dominated sectors as men are still overrepresented in sectors like coal. We need a feminist and intersectional approach to a just transition that goes beyond a few temporary distributive measures and seeks to tackle the root causes of the different forms of inequality. It rebalances existing power structures, centring the most marginalised in Europe and globally.

Finally, there's the energy transition's impact on work. The energy transition is expected to generate more than 10 million new jobs worldwide by 2030. Many of the new green jobs will require different skills than previous energy jobs or will be in new locations. As LOCOMOTION research highlights, transition policies must therefore ensure training and reskilling, focus on

education and ensure decent and qualified jobs that deliver wellbeing for people. However, there is also a risk that these new jobs (e.g. in the renewable energy sector) mainly benefit male workers and reinforce existing gender segregation and other inequalities in these sectors and the labour market more generally. That is why the EU must thus move away from an understanding of 'green' or sustainable jobs as employment only related to energy production, energy efficiency and environmental management. Sustainable jobs in a wellbeing economy include all jobs that contribute to preserving the wellbeing of people and nature such as care and education.

Key recommendations:

- Tackle extreme energy affluence by focusing on energy distributional measures, progressive taxation and fiscal measures.
- Apply an intersectional framing to energy policies and the just transition to benefit all people equally and to raise interest and acceptance of the transition.
- Adopt a broader and more holistic concept of sustainability and the green transition and jobs, one that includes environmental, economic but also social dimensions equally and gender justice more specifically.

SUMMARY CHART
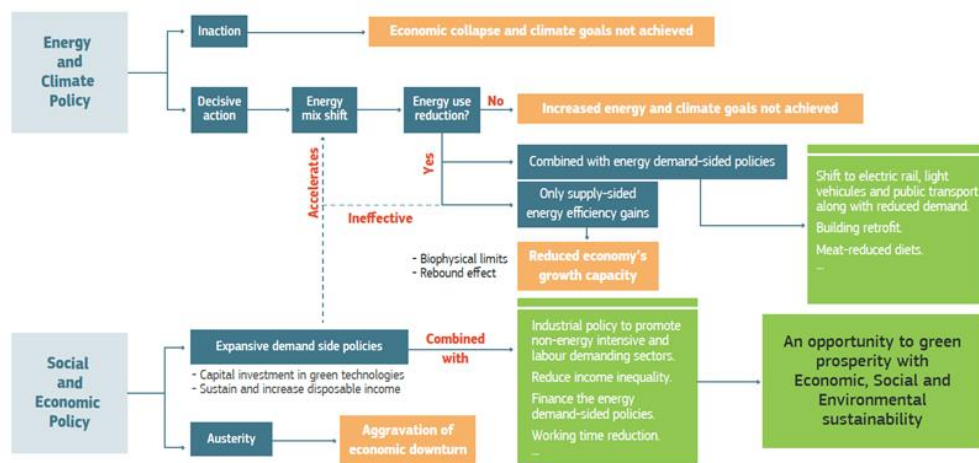
Source: LOCOMOTION-EU publication: Climate action in the post-COVID world - Insights from EU-funded projects on how to build forward better

6: CONCLUSION

Energy discussions are omnipresent: in our homes, as we struggle to pay the bills; in Europe, where decision-makers aim to decarbonise and decrease energy dependence; and internationally, where many still have no access to sustainable, affordable and secure energy supplies.

Europe's economic and even physical security depends on how the energy question is tackled. Everything - from our diplomatic relations to employment, poverty, gender inequality and the environment - is affected. The cost of inaction is too high and narrow-minded policies could be extremely harmful, as demonstrated by the social and environmental impact of mining. Solutions will need to be holistic, focused within but also beyond EU borders, and designed with future generations in mind.

Thankfully, such solutions exist. The latest IPCC report has identified the very practical next steps that need to be taken to ensure that the transition leads to a wellbeing economy where people and nature can thrive together. Results from research projects such as LOCOMOTION can support policymakers in taking more informed decisions and offer them the possibility to create a low-carbon society.

A key take-away is that energy savings are an essential part of a socially and environmentally just energy transition. The Strategy on International Energy Engagement has rightfully made this a global priority. The EU should present an energy savings strategy alongside the Fit for 55 package and EGD measures to introduce energy sufficiency across the whole economic and energy system.

On top of demand-side energy policies, efforts towards global decarbonisation should be increased. In order to transition rapidly and globally, it is essential to understand the international energy scene, and thus measure the energy demand of every country accurately. This is crucial to build trusted, long-term relationships with key allies and countries affected by the transition, and increase collaboration around energy sufficiency and efficiency principles to enable everyone to live well within the planetary boundaries.