Sufficiency's integration into climate and energy strategies

Briefing note

October 2022

Energy and climate transition scenarios are crucial tools to anticipate and plan the necessary **transition towards climate neutral, environmentally compatible, and resilient economies.**

However, most scenarios published to date have sought to achieve the transition through ambitious technological changes, despite the potentially related investments and environmental risks. **Sufficiency, which is about redesigning our societies and needs to rely less on resource intensive services (energy, material, land) to achieve well-being, has been underrepresented in that regard.** It has recently gained prominence in Europe in the context of the energy crisis, calling for rapid energy saving measures, but is still a taboo word in most public policies and political discourse.

This briefing note aims to demonstrate the **potential of sufficiency as a key lever for making economies climate neutral and resilient,** as illustrated by the CLEVER scenario**, a collaborative Low Energy Vision for Europe towards net zero emissions by 2050 at the latest**.

Authors

Writing: Emile Balembois and Stephane Bourgeois.

Proofreading: Edouard Toulouse, Aurore Flipo, Yves Marignac, Nicolas Sizaret, Nicolas Taillard.

The power of sufficiency

A step forward towards genuine sustainability

The European society is at the **end of a cycle of tremendous life improvement** in security, health, comfort etc., thanks to the **ever-increasing use of resource intensive services**. However, the pressing environmental crisis (and especially the climate emergency) highlights that **it is not conceivable to rely on so many services without exceeding the planetary boundaries** and causing irreversible changes to the environment.

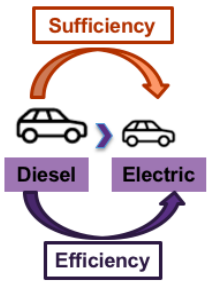
Thus, our society needs to find a new way of living well within these boundaries. In that context, **sufficiency focuses the debate on quality of life instead of quantity of services.** It aims at *fulfilling everyone's need for services (provided by energy, land, materials)* while *adjusting their nature and quantity to maintain demand at a level compatible with the Earth's capacity*[1]. It is a **systemic approach calling for a collective restructuring of our society** through public policies, changes in business models and personal empowerment.

This concept should not be confused with **efficiency, which is focused on technological optimisation** (see Example 1). Thus, sufficiency goes alongside with efficiency to provide multiple and sustainable benefits. They include greater resilience to energy and material crises, higher independence, improved health and social relations, etc.

Example 1: Difference between sufficiency and efficiency in the automotive sector

- **Energy efficiency** gains occur thanks to **technological progress** (e.g. more fuel-effective engines or switching to an electric vehicle).
- **Sufficiency** gain are achieved through **demand changes** (use of smaller cars, lower road speed, car-sharing, home office, slow tourism, etc.).

Both gains contribute to **reducing energy demand** and **greenhouse gases emissions**.



The sufficiency-based approach addresses **deep sustainability** concerns by bridging two strong and desirable values: **social justice and environmental consistency.** On the one hand, it aspires to a **minimum level of basic services** that should be provided to every human to live a decent life. On the other hand, it aims to ensure that this is achieved while **containing the impacts below planetary limits, thus not jeopardizing the capacity of future generations to also fulfil their needs.** These two aspects define a **social foundation** (lower bound) and an **ecological ceiling** (upper bound) of a sufficiency-based economy, that could be represented by the **doughnut economy concept** from Kate Raworth[2] illustrated Figure 1.

[1] See also the IPCC definition: AR6, WGIII, p.41.

[2] Presented by Raworth in this article and illustrated in a dedicated website.

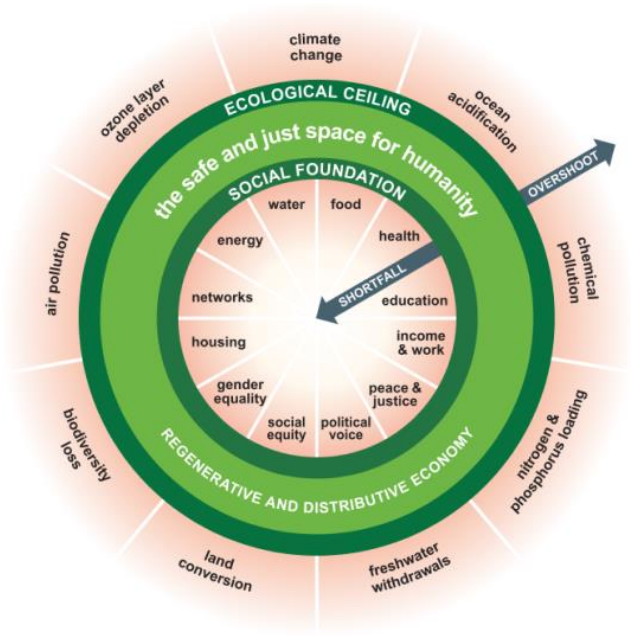


Figure 1: Doughnut economy from K. Raworth[2], bounding a sustainable economy between a social foundation and an environmental ceiling.

Making deep decarbonisation more likely to reach

The move towards genuine sufficiency alongside efficiency offers two major guarantees: a higher **certainty of decarbonisation** and more **security and resilience**. Theses guarantees make sufficiency a **crucial tool both to reach the Paris Agreement Goal of 1.5°C and to answer energy crises** such as the current gas crisis in Europe.

Certainty of decarbonation

Economies that manage to reduce their use of energy and material-intensive services have **less need to rely on risky technical bets to achieve decarbonisation and other environmental goals**. Thus, they also have more space to adapt to technological rollout uncertainties when considering future pathways. For instance, sufficiency-based pathways don't rely on geoengineering technologies which are still uncertain and could have an impact on the environment.

Sufficiency also contributes to realising the **full potential of technological progress in efficiency and greener energies by preventing over-consumption and rebound effects**[3] upstream. For example, in the appliances and cars sectors, sufficiency measures are necessary complements to successful efficiency regulations, which have often been offset by increasing fleets, sizes, and uses[4]. In concrete terms, upstream of energy efficiency, sufficiency policies could reduce the need for cars (e.g. by triggering an increase in soft or collective mobility). In the long term, sufficiency is key to accompany electrification while mitigating environmental risks related to lifecycle emissions and raw material needs for batteries.

Security and resilience

By reducing overall resource needs to a sustainable space, **sufficiency reduces the footprint of a society as a whole**. **Short-term sufficiency measures** could foster quick reduction of the

[3] Rebound effects occur after a technological innovation that reduces the energy intensity of a service (less energy is needed to do the same thing). They are characterised by an increase in the use of that service due to its greater accessibility. This hampers the final resource consumption gains of the innovation. For example, a reduction in energy consumption achieved through building renovation could be reduced by an increase in heating temperature choices.

[4] See this analysis from the European Energy Agency for an illustration of the rebound effect in the cars industry.

resource dependency (**security**) while **long-term sufficiency measures** create a less resource intensive society, which is therefore less exposed to shocks (**resilience**). Thus, sufficiency appears as a **safety tool to respond to energy and resource crises**. That is why sufficiency measures (even if they are not called as such) are, among other policies, currently used to answer the energy gas crisis due to the war in Ukraine (see Example 2).

A key additional lever in energy and climate scenarios

In energy and climate scenarios, sufficiency measures are a **complementary lever to "classical" pathways**. These pathways usually rely on two main strategies:

- First, **energy substitution:** reducing the carbon footprint of energy supply (i.e., through renewables or nuclear energy). If all the efforts are put on energy substitution, the burden of decarbonisation weighs mostly on the supply sector. This could create uncertainties because of technological challenges and hard to predict underlying impacts (raw material needs, land use, biodiversity… etc.).
- Second, **energy efficiency:** reducing the energy intensity of consumption through technological innovations (renovation, electrification…). Although energy efficiency lowers the burden of energy substitution, it may lead to technological challenges and rebound effects.

Energy sufficiency goes beyond these two strategies since it investigates both the demand for energy services and ways to reduce it. **This lowers the needs upstream, making it easier to benefit from efficiency and renewables**.

In concrete terms, energy sufficiency measures lead to **rethinking and redesigning collective and individual practices** thanks to policies, local initiatives, awareness raising, education, dissemination of best practices, etc.

It has an **impact on the construction of an energy and climate transition pathway both in the short and long term**, depending on the nature of societal changes:

- **In the short term**, by fostering energy gains through measures that can be quickly implemented: speed limits on roads, higher levels of home-office, restrictions on some highly energy intensive activities, etc. These are some examples targeted in answer to the energy crisis (some short-term measures are listed in Example 2).
- **In the long term,** by triggering changes in infrastructures, norms and cultures (different urban planning, development of the public transport network, development of local tourism, dietary change, digital sufficiency, etc.).

Because of its short and long-term potential, sufficiency is not new in the energy and climate field. It has already been integrated, though **not highlighted, in some pathways using other terminologies, such as "societal change".** It has been found at the margins of recent scenarios through targeted assumptions focused on consumers behaviour, for example the reduction of flights or meat consumption (IEA's Net-zero 2050 scenario or Agora 2045 scenario for Germany).

Some other European scenarios have targeted a more complete integration of lifestyle changes which also takes into account infrastructure and norm changes (European scenarios such as the Climact "demand-focus" Net Zero 2050 scenario or the Paris Agreement Compatible (PAC) scenario of the NGOs CAN-E and EEB).

Example 2: Short-term sufficiency measures already taken by some EU member states to answer the current energy crisis		
Sector	Country	Sufficiency measure
Mobility	Germany and Spain	**Attractive prices for public transports**: stimulate a lower energy intensive way to answer needs (trains instead of cars or planes).
	France	**Increase of states incentives to buy a bicycle**: stimulate a lower energy intensive way to answer needs (bicycle instead of car).
Residential	Germany	**Mandatory reduction of heat in public buildings to 19°C** and **prohibition of heating in corridors:** reduce energy consumption by scaling the services to the needs.
	Germany	**Shut down of the outside lights of public buildings and monuments;** Private businesses' lightning signs shut off from 10pm to 6am: reduce energy consumption by scaling the services to the needs.

Measuring the impact of energy sufficiency

In the definition of pathways that aim to limit global warming to 1.5°C, assessing the potential of sufficiency measures is thus critical. **The IPCC estimated that sufficiency measures in buildings and transports could save up to 2 GTCO2/year at the world level**[5]. négaWatt estimated in its 2022 scenario for France that **sufficiency assumptions could reduce 2050 France's final energy consumption by 15%** (26% in the mobility sector) compared to the business-as-usual trend which already includes some sufficiency impacts due to price variations[6].

A step that European societies are ready to take

Some sufficiency measures are already under discussion in Europe. In particular, calls for bold sufficiency measures have already been made by every national citizens' convention[7] on climate in the past 5 years, as well as by the Conference on the Future of Europe[8]. **Indeed, some measures have already been taken by many European Member States with positive results[9]. However, the word "sufficiency" is rarely used in that context, with the notable exception of France where it has been highlighted in surveys[10], in the public debate[11] and has been enshrined in law since 2015[12].** Moreover, sufficiency has never been evaluated as such and in its full potential as a decarbonisation lever alongside efficiency and renewables.

[5] IPCC, WGIII AR6, summary for policymakers, WGIII, 2022, p.42 sum of potential in avoiding demand for energy services in building and in shifting to public transportation and to bikes in transports.

[6] See the « sobriété » contribution in the graphs of the scenario.

[7] See the reports of the French Climate Citizens' Convention, the Danish Citizens' Assembly and the UK Climate Assembly. The main sufficiency measures emerging from these reports are linked with alimentation (e.g. reduce meat consumption) or energy (e.g. shift to collective or soft mobility, reduce the use of air travel).

[8] The first key change for Europe in 2035 chosen in France's panel was to "develop energy sufficiency to consume less by stopping the superfluous" (final panel report, p.22). Many sufficiency measures could be found in the final conference report (proposal 3, 4, 18…).

[9] Climate Ticket in Austria ; 2000 Watt target in Zurich since 2008 ; creation of local agencies for collective housing in Germany ; reduction of the speed limit on motorways to 100 km/h in the Netherlands ; interdiction of flights when there is a 2 and a half hours train or bus alternative in France, etc.

[10] In this survey, 73% of French citizen agreed that sufficiency is a desirable solution to combat climate change

[11] In the wake of the last electoral campaign in France carbon neutrality projects focusing on sufficiency have been published: négaWatt 2022 French Scenario ; RTE energy futures ; ADEME 2050 transition(s)

[12] Art 2 of the 2015 Law on the energy transition for green growth

In the research field, sufficiency is becoming a buzzword: **the concept was used in the IPCC WGIII 6th Assessment Report**. A research network, ENOUGH[13] is gathering a community around sufficiency-based research.

The 2022 energy crisis has completely changed the credibility of and interest in sufficiency measures in Europe. It has become more mainstream thanks to major publications from the IEA and the European Commission[14]. **The word was used for the first time – though in footnotes- in the EU Commission's RePowerEU and Save gas communications**[15]. This development has been leading many European countries to take short-term sufficiency measures as shown in Example 2. **However, by being short-term and focusing on individual behaviour, these measures don't encompass the full-scale potential of sufficiency**. They lack the **societal changes needed in infrastructures and norms** (changing urban planning, expanding public transports…) that a comprehensive sufficiency approach requires to address the climate emergency.

The important potential of sufficiency remains vastly underestimated at the European policy level. This has triggered the creation of a network of European energy and climate scenario experts to build the "CLEVER" pathway, under the leadership of the French negaWatt association.

The chapters below describe the CLEVER approach to constructing a sufficiency-focused scenario for Europe and how this approach could be tailored to other regions and countries.

[13] Webpage of the network.

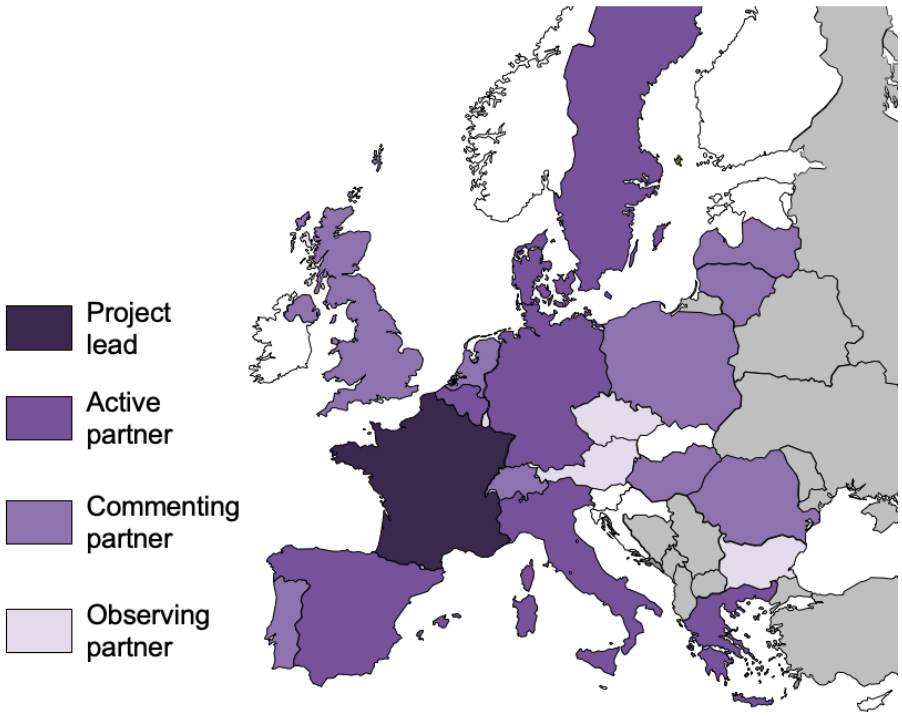
[14] Sufficiency measures discussed in IEA plan to cut oil use and publication with the European Commission to reduce reliance on Russian energy

[15] Sufficiency explicitly mentioned in the EU Save energy plan, note 2 and in the "Safe gas for a safe winter" plan, note 5

CLEVER: a European sufficiency-based and bottom-up pathway

A network of organisations was built around a common interest for sufficiency and energy and climate modelling and policies. **This network is composed of more than 24 organisations from around 20 European countries** (including 18 EU Member States, plus the UK and Switzerland as detailed in Figure 2). The diverse organisations are involved in a **technical dialogue** to build the CLEVER energy and climate scenario: a **bottom-up European sufficiency-based scenario,** aiming at meeting the EU targets on greenhouse gases, renewables, and energy efficiency for 2030 and 2050 at the minimum, and **carbon neutrality as early as possible and by 2050 at the latest, in line with the 1,5 degrees objective, together with 100% renewables.**

Figure 2: The partners network of CLEVER scenario project



Country	Organisation	Country	Organisation
AT	EEG TU Wien	**IT**	Politecnico di Milano
BE	negaWatt Belgium, ICEDD	**LT**	Lithuanian Energy Institute (LEI)
BG	Za Zemiata; Sofena	**LU**	Consortium Cell/List
CH	negaWatt Switzerland	**LV**	Green Liberty - Zala Briviba
CZ	Charles University Environment Centre	**NL**	Positive Worlds
DE	EnSu (Wuppertal Institut für Klima, Umwelt, Energie, Europa-Universität Flensburg, Öko-Institu)	**PL**	WiseEuropa
DK	INFORSE Europe	**PT**	ZERO
ES	Ecoserveis Association	**RO**	Energy Policy Group (EPG)
FR	negaWatt Association	**SE**	Air Clim Coalition
EL	National Observatory of Athens (NOA)	**UK**	CREDS ; Center for Alternative Technologies
HU	Environmental Planning and Education Network (EPEN)		

A sufficiency-based pathway in practice

The CLEVER scenario is based on **the Sufficiency-Efficiency-Renewable (SER) framework developed by the French association négaWatt**.

This framework focuses on the **demand-side** by scaling the energy needs to **what is essential to maintain a defined level of services** (*sufficiency*). Then, once this level is established, a **reduction in energy intensity** is achieved through technological improvement (*efficiency*). These two steps make it possible to define the national and European levels of energy consumption: the CLEVER scenario, though not finalised, already reaches a **reduction of 50% of European energy consumption by 2050 compared to 2015**.

Finally, the energy supply chain is considered to fulfil the remaining energy needs with **100% renewable resources by 2050 at the latest** (substitution with *renewables*), since renewables are considered essential to reach deep sustainability pathways. An application of this framework is given in Example 3.

Example 3: The SER framework for the packaging sector

1. **Energy Sufficiency**: Reducing the need for new packaging by rethinking consumption to increase reuse:

2. **Energy Efficiency**: Optimising the energy intensity of the remaining needs (in glass, paper and plastic industry).
3. **Renewable energy**: Suppling the remaining energy consumption needs with renewable energy.

Building a trajectory with the "SER framework" requires **tracing back the energy production chain, first focusing on demand (sufficiency) then on intensity (efficiency), before considering supply changes (substitution with renewables).** This contrasts with more **traditional scenarios that first consider the potential for decarbonisation of energy supply** and then complement this potential with efficiency, and possibly look at sufficiency measures as a last adjustment.

Figure 3: The approach of scenario-building and energy and climate policy making through the SER framework starting with assessing energy demand, in contrast to more traditional policy and modelling approach using (efficiency and) sufficiency as adjustment variables.

The origin of the contrast between these two approaches is the opposition between the **quest for quantity in today's society** (emphasis on supply without scaling the needs) and the **quest for quality through sufficiency** (scaling the needs to reach happiness within planetary boundaries).

The need for a bottom-up approach

The sufficiency-based scenario for Europe is structured **bottom-up**, starting with **national trajectories** which are then **aggregated into a European pathway**.

Each national trajectory is built or validated by the network partner of the given country, and as sufficiency is a holistic concept new to many energy-climate scenario builders, it has been essential to engage in **dialogues in each country to deepen the understanding of sufficiency throughout the network**.

It is the first time that such a bottom-up approach is used in a European energy transition pathway. By integrating national specificities into a global pathway, it ensures a suitable definition of sufficiency assumptions, to maximise deployment and acceptability (see the Example 4 below).

Translation of equity principles into national convergence corridors

A challenge and key outcome of the CLEVER scenario has been the **harmonisation and reinforcement of national assumptions following a social equity and environmental approach**. To consider the **disparity of national contexts**, the network based its work on the notion of **"convergence corridors"** for key indicators, particularly those relating to energy consumption.

These corridors are defined following the doughnut economy approach of setting a social lower bound and an environmental upper bound. In this approach, **the CLEVER network sets, for each indicator, a lower and upper limit of consumption for 2050 (see Example 4).** Each corridor then becomes a target to be achieved by each national trajectory. This setting was based on an iterative technical dialogue, both bottom-up (considering specificities from each partner's national scenario) and top-down (considering technical knowledge and literature review from the project lead).

Example 4: Floor area per capita evolution in CLEVER

One of the CLEVER parameters is the **space of dwelling occupied per capita**.

The CLEVER convergence corridor for 2050 for this indicator is bounded between:

- **32 m²** per capita, which correspond to the minimum decent living standard (defined in Rao et Min., 2018).
- **40 m²** per capita, which is above global trends defined in Grubler et al., 2018 or IEA, 2021 to reach 1.5° but has been adopted to be realistic and adapt to every national context (the adaptation was made thanks to exchanges within the network and a study of the ambitions of EUCalc and Climact trajectories).

This corridor means that countries such as Germany (currently using 43 m^2 per capita) will have to reduce their dwelling space per capita in their CLEVER trajectory while countries such as Romania (currently 19m^2 per capita) will be able to increase it. CLEVER partners are then defining a set of policy recommendations and best practices to make this possible.

The ambition of these corridors has been supported by preliminary policy research and recommendations. Through the integration of national trajectories into the corridors, and then their aggregation into a European trajectory, sufficiency and efficiency potentials were able to be harnessed. The CLEVER vision thus matches the necessity of climate ambition with the technical and political feasibility of transformation.

Next steps for the CLEVER scenario

Partners are currently finalising energy consumption trajectories and their integration into a European pathway, harnessing the mutualisation potential of energy, particularly renewable electricity production and exchanges. The CLEVER scenario is soon to be published.

The first series of **publications, starting in October 2022** focuses on explaining the construction of energy consumption corridors for 3 key sectors: **industry, mobility and residential**. It is available on this webpage.

A **webinar with first results** should be organised at the end of 2022, with a **final report publication planned for Spring 2023.**

Best practice recommendations for scenario builders

Requirements to integrate sufficiency in a model

To integrate sufficiency, **a model allowing to describe energy demand and services consumption is required**. Classical econometric models[16] seem to show strong limitations in this regard. It is thus recommended to use a **physical modelling** and a **bottom-up approach** to be able to understand and model the needs for energy services.

A fine **description of energy consumption at the national or regional level** is recommended in order to describe accurately energy consumption patterns. This allows to better take into account local specificities affecting a feasible pace of transformation.

Definition of sufficiency assumptions

In order to back and support sufficiency assumptions, **policy work and research** is recommended. It will allow to support the ambitions and increase the feasibility of assumptions.

The **definition of environmental and social bounds framing sufficiency assumptions** could be based on several research works:

- To define the **minimum consumption level** for every human, the Millward-Hopkins et al. scenario and decent living standards could be used.
- To define the **maximum consumption level**, scenarios computing maximum standards to reach 1.5°C such as the Grubler et al., 2018 scenario could be used.

These bounds should be adapted to the pace of transformation and to the local contexts. A good source of inspiration for this adaptation is the comparison with other existing modelling scenarios[17]

An illustration of the concrete definition of these bounds for one modelling parameter in Europe is given in Example 4.

Finally, to define sufficiency assumptions, an extensive **knowledge of social practices and social patterns of consumption** would be beneficial. A research project, **FULFILL**, financed by the European Union's Horizon 2020 programme is currently ongoing to analyse these practices and patterns. More information is available on this webpage.

[16] As highlighted as a result of the CACTUS project, which explored the integration of sufficiency assumptions into Central and Eastern European scenario models TIMES and MESSAGE

[17] The 2022 negaWatt scenario for France is particularly accurate on sufficiency hypothesis.