Energy sufficiency: how to win the argument on potentials?

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Abstract

In terms of energy demand, technical efficiency improvements alone may not be enough to tackle climate change and meet the 1.5 °C target if we continue using a growing amount of energybased services. Actions on behavioural and societal organisation changes – encompassed in the 'sufficiency' concept – are also required.

Energy sufficiency means efforts to rethink and redesign collective and individual practices in order to favour intrinsically low-energy activities and services, to keep us in line with the ecological limits of the planet. It requires reflecting on human needs, social equity, economic development, urban structures, social norms, consumption habits, as well as the role of policies to foster sufficiency.

There is an increasing number of contributions discussing how to take sufficiency into account in energy transition scenarios. Some energy models include quantifications of sufficiency potentials, and studies provide recommendations on how best to do it. Theoretical assessments of potentials are a key step; but making a convincing case as to the credibility and plausibility of these potentials appears to be another important matter.

The reason is that sufficiency potentials are provoking specific doubts and sometimes reluctance, that may be due to their nature, limitations, and other (more or less subjective) reasons. In this paper, we propose an exploratory investigation and typology of these objections, and factors that are likely to aggravate them. The analysis is notably based on the experience of the French négaWatt Association on the way its sufficiencybased energy scenario published 17 years ago has been received by various audiences since then.

We then suggest and discuss ways to increase the trust in and acceptance of sufficiency potentials, through recommendations on how to improve their robustness and how best to communicate them (supporting explanations, effective arguments, importance of co-benefits, use of narratives, etc.).

Introduction and context

There is a growing understanding that energy efficiency improvements alone may not be enough to curb energy demand in line with the 1.5 °C or even 2 °C global climate goal. As energy efficiency measures tend to focus on technical optimisation and seldom question the need for energy services in the first place, approaches touching on behavioural and societal organisation changes – encompassed in the 'sufficiency' concept – are also called for by an increasing number of experts (Druckman et al 2010). Although there are varied conceptions of what energy sufficiency entails depending on the conceptual lens and scope considered (Toulouse et al 2019), most definitions in the literature have in common the idea of rethinking and redesigning individual and collective practices to favour activities and services that are intrinsically low on energy use (Toulouse et al 2017).

The need for sufficiency is not only shared by experts, but also by a seemingly significant part of the public. In a French opinion poll, to the question 'How can we solve climate change?', only 9 % believed that technical progress will provide the solution whilst 51 % answered that substantial changes in our way of life will be necessary (ADEME 2018). Other more in-depth studies have found that when asked what they can do to save energy, people tend to mention curtailment/sufficiency aspects (such as using their car less) before the shift to more efficient technologies (Attari et al 2010).

Some researchers are investigating the barriers hampering the diffusion and implementation of sufficiency, be they psychological, organisational, linked to energy governance issues, etc. Behavioural and practice theories are notably contributing to finding solutions to foster sufficiency (Toulouse et al 2019). Some studies and scenarios (both academic and non-academic) have also assessed the potentials of energy sufficiency in various sectors and regions. They usually conclude on energy saving opportunities commensurate to that achievable through energy efficiency. Various co-benefits of sufficiency (such as on health) are also mentioned (Toulouse et al 2017; Virage Energie 2016). Nevertheless, sufficiency does not receive a similar amount of attention and credit as efficiency and renewables in the mainstream literature (Samadi et al 2016), and in policymaking. This is illustrated by the lack of scenarios that explicitly consider sufficiency, and even less that develop the concept systematically (Zell-Ziegler et al 2018). It is also reflected in the limited number of policies addressing sufficiency. We assume that the latter can be explained (at least partly) by a lack of trust in the feasibility and applicability of sufficiency approaches, and we investigate in this paper some of the reasons that contribute to it.

After a reminder on the fundamentals of potential assessment and the specificities and limitations of sufficiency potentials, we propose an exploration of the types of reactions that they trigger (notably based on the experience of a French sufficiency-based scenario and its public reception). We then suggest ways that we believe may help reinforce confidence in the potentials of energy sufficiency.

Foundations of sufficiency potentials

A FEW BASICS ABOUT POTENTIAL ASSESSMENTS

In this paper, we use the term '*potential*' in the usual sense of the quantification of the amount of a beneficial output that can be delivered by the implementation of something that is not yet in place. With respect to energy sufficiency approaches, the potentials may be expressed in terms of energy saved, carbon emissions avoided, costs saved or other units. Two main approaches to quantify a potential may be distinguished:

- A direct way, through making a static calculation to answer a (theoretical) question such as 'if 50 % of the population were commuting by bike, how much energy would be saved?'. The calculation is usually based on current static data.
- The output of a modelling exercise, in which assumptions are made on rates of adoption (e.g. of cycling in the population) and a (more or less sophisticated) model that calculates saving potentials over time. It can answer questions such as 'how much potential is there by 2030, 2050, etc.?'. The potential may be assessed against the starting year or a business-as-usual scenario.

While the first approach can help to prioritize between different options, the second comes closer to assessing the potential that can be mobilised through action, in particular if the assumptions are made on the enabling conditions rather than on the activity itself, e.g. 'What is the potential if fuel prices increase to a certain level?' Policy potential assessments are of this nature, looking at enabling factors such as 'What is the potential if authorities put in place cycling lanes in all cities?'. For these approaches, robust assumptions to relate the enabling condition to the realisation of the behaviour are required.

Do sufficiency aspects pose a specific difficulty to modelling? Although many energy models have not been used so far with sufficiency-oriented input, they should be able to do so one way or another by adjusting modelling parameters. There is, however, a concern that complex behavioural aspects may not be easy to illustrate, thus requiring the development of more sophisticated tools (Zell-Ziegler et al 2018). Another approach is to translate sufficiency assumptions into simplified proxies, such as e.g. a reduction or stabilisation in the demand of specific energy services.

The robustness of the assessment of a sufficiency potential depends not only on the quality of the modelling, but also on the robustness of the underlying assumptions about the sufficiency aspect and its rate of implementation in the society.

SPECIFICITIES OF SUFFICIENCY BOUNDARIES AND BARRIERS

Potentials for efficiency and renewables are constrained by physical boundaries (available resources, technical limits ...), and strongly influenced by economic factors (present and future technology costs) – making those understandably key building blocks in most energy models. An important particularity of sufficiency potentials is that they are often less constrained by those factors. A main reason is that in principle there would be no technical or (micro)economic limits for sufficiency to go as far as saving close to 100 % of the energy we use. This would correspond to e.g. everyone switching to extremely frugal lifestyles and living and working in self-sufficient eco-villages. There may of course be arguments to rule out such a scenario, but not because it would violate physical laws or require unbearable investments.

Even without going this far, microstudies exploring maximum theoretical sufficiency levels conclude on the possibility of very substantial cuts by 50 to 60 % on energy or carbon emissions for an average family (cited e.g. in Toulouse et al 2017). Yet, none of the existing macro-level energy scenarios that include or promote sufficiency reach or consider such levels of implementation. The most ambitious result we could find in the literature is a 39 % cut on overall energy use by 2050 (most radical 'societal change' scenario in Virage Energie 2016).

This shows that barriers and constrains other than technical and microeconomic ones are considered and included in the analysis. They often pertain to:

• Expected conflicts and trade-offs between sufficiency and other attitudes, preferences, and considerations (such as comfort, convenience, safety ...), leading to limits on the level of implementation. An example would be: 'It is conceivable to imagine a reduction of over-heating habits, but it is unlikely that people will ever agree to live in buildings below 19 °C in winter.'

- Assumed limits to the pace at which sufficiency changes may diffuse, in relation to the pace of change of the underlying sociocultural norms. An example would be: 'It is unrealistic to expect the paradigm of the individual car to completely disappear before many decades (even with multiple efforts and policy interventions).'
- Boundaries to the practical adoption of certain activities, even in the most ideal state (e.g. necessary infrastructures and appealing conditions in place). An example would be: 'Even if all conditions are met for people to commute by bike, a fraction of the population will still not do so (e.g. disabled people)'.
- Other more or less explicit hypotheses and preconceptions on the acceptability, desirability, or legitimacy of sufficiency options to consider in an energy scenario. For instance, ruling out any reduction in the growth of long-distance air travel (because of a preconceived idea that it would be totally impossible to put into question the freedom of travelling anywhere on the globe).

All of these factors may be reflected in several ways in the development of an energy scenario, and not only in the mechanics of the modelling. They can influence:

- The initial choice of sufficiency aspects considered and covered.
- 2. The predefinition of sufficiency evolutions or policies that are investigated in the analysis, i.e. how they are framed in terms of scope, magnitude, etc.
- 3. And ultimately the adjustment of modelling and calculation parameters (rates of adoption, behavioural response, share of the impacted population, etc.).

ASSESSMENT LIMITATIONS

An interesting question is how far the level of the constraints and barriers mentioned previously, and the way they are incorporated into the scenario development, are grounded on solid science or are subjectively set by the scenario developers.

All models and scenario developments rely to a certain extent on 'disciplined expert intuitions' (Druckman et al 2010), but it seems to us, based on our experience with existing scenarios and available scenario overviews (Zell-Ziegler et al 2018; Samadi et al 2016 & 2018; etc.), that the subjective dimension plays a particularly important role for sufficiency potentials. Science on sufficiency and its implementation (especially quantitative research) is rather in its infancy, so there is often little ground to firmly establish impact chains and assess the plausibility of certain hypothesis.

The way sufficiency potentials are approached in energy studies is sometimes rather normative, and as such notably influenced by preconceptions, cognitive bias, self-censorship, and other inclinations of the authors, as much as by the availability of relevant data. It does not mean that the resulting potential calculations are not valuable, but this aspect needs to be acknowledged.

Another difficulty with some of the individual and collective practices that sufficiency challenges is that they have been shaped and influenced by sometimes complex layers of sociocultural norms and past choices of infrastructures. Changing the former requires altering the latter in some more or less in-depth way. It can be arduous to reflect properly and comprehensively these ramifications in a scenario or modelling exercise.

At the extreme, some sufficiency advocates believe that not much will happen if there is not a strong emergence of sufficiency as an overarching societal value or moral norm in itself, substituting or moderating existing ones (consumerism, materialism, individualism, etc.). Some authors argue that sufficiency cannot be narrowly regarded as a goal of environmental policy-making as is efficiency, but needs to become a core value of liberal societies at the same level as freedom or social justice (Muller et al 2016). This perspective questions the relevance of making assumptions and trying to assess the potentials of individual sufficiency options in isolation, if this broader picture and prerequisite are not reflected.

These methodological and theoretical limitations contribute to some extent to another important specificity of sufficiency potentials: the way they are doubted, in degrees that seem different than for efficiency or renewables (at least at present).

Objections to sufficiency potentials: an investigation

Many authors expect sufficiency to face acceptance issues (Zell-Ziegler et al 2018; Fischer et al 2016; Schäpke et al 2014; etc.). We find it important to distinguish between two aspects: the consent in the population to adopt more sufficient activities, and the acceptance of sufficiency as a plausible and feasible approach in energy transition scenarios. On the former, some studies and surveys have investigated views and societal preferences for sufficiency measures (Leuser et al 2016, Moser et al 2015). On the latter to our knowledge, no academic research has been carried out yet.

A TYPOLOGY OF REACTIONS TO SUFFICIENCY POTENTIALS

In this section, we propose an exploratory discussion of the types of doubts expressed about sufficiency potentials, and factors likely to fuel them. This analysis is based on empirical evidence notably stemming from the experience of the French négaWatt Association with the way its sufficiency-based energy transition scenario (and successive updates published since 2001) have been perceived and commented¹.

To gather this experience, we have asked the négaWatt Association to provide us with as many examples of reactions on the sufficiency side of their scenario they were aware of (critical reviews, media articles, comments on social networks, etc.), and we have prepared a questionnaire that 12 'ambassadors' of the négaWatt Association filled in for us in December 2018. They are volunteers from various backgrounds and French regions who are trained to present the négaWatt scenario during local public events. The questionnaire asked them to report the most frequent examples of objections they have heard from the audience when presenting sufficiency and the sufficiency potentials of the scenario.

We have used this material to propose an exploratory typology of the reactions to sufficiency potentials (presented below in an order that does not reflect any prioritisation).

^{1.} More information about négaWatt and the scenario: http://negawatt.org/.

Table 1. List of most contentious sufficiency options (according to négaWatt ambassadors).

Торіс	Examples of objections expressed to the related potentials
Reducing air travel	Contradictory to globalism and cultural wealth (especially among younger people); too coercive to be realistic
Reducing speed limits on roads (especially outside urban areas)	Socially unfair; doubts that it saves any energy
Heating buildings at maximum 19 °C	Reluctance and disbelief towards comfort-related constraints; unfeasible in collective flats where the temperature is driven by cold-sensitive tenants
Moderating living space areas per capita, notably through re-increasing the size of households	Doubts on the feasibility and means to foster such a societal trend that relates to personal life
Strong reduction in meat demand	Lack of understanding of the relation to energy use; fear of cultural loss
Reducing levels of consumption of goods	Unthinkable as long as publicity and marketing are not constrained
Capping the production of certain goods	Appears utopian if the fundamentals of economics do not change
Increasing energy prices/taxes	Socially unfair; risks for poorest populations

Ideological preconception

Strong negative reactions to the very scope and aim of sufficiency are sometimes witnessed, even before any potential has been discussed and understood. The idea of challenging how people and organisations prioritise their activities is simply rejected *per se*, in sometimes harshly and denigrating words. Reactions of this sort may have an ideological or political background, and seem often associated with other positions such as anti-green, anti-state intervention, anti-degrowth, etc.

It is difficult to assess how much of the general public is subject to such an adverse feeling, but it appears to be a relatively common reaction among decision-makers and advocates around them (especially when they have a reason to denigrate sufficiency due to a pro-dirty energy or pro-business agenda). The general lack of consideration for sufficiency is clear among policy-makers (Villalba et al 2018). It is exemplified by the well-known quote by US president George Bush Senior in 1992: 'The American way of life is not up for negotiations. Period.' Things do not seem to have very much changed since then. During the French national debate on the energy transition in 2013, observers remarked that energy sufficiency triggered heated debates, splitting participants in two strongly-minded sides using sometimes hasty arguments². More recently in 2018, even the seemingly pro-environment French President Emmanuel Macron gave a very negative interpretation of the idea of travelling less: 'We need to consume less energy (...) [However] our strategy cannot, and should not, be to travel less (...) We shouldn't let people think that we are talking about being stuck at home.'

This type of instant dismissal of the concept can also be felt in the way some energy scenarios explicitly rule out sufficiency from the beginning (e.g. the Klimapfade für Deutschland scenario from the German industry federation³).

It is possible that the term 'sufficiency' itself contributes to exacerbating such preconceptions and instinctive objections, sometimes to the point of hindering any objective discussion

2. https://www.lagazettedescommunes.com/167102/efficacite-et-sobriete-energetique-un-bon-sens-a-geometrie-variable/

3. https://bdi.eu/publikation/news/klimapfade-fuer-deutschland/

about potentials. The term is symbolically strong, and interpretable as subversive (Villalba et al 2018), morally normative, or carrying negative ideas of curtailment. It can be felt as a threat on comfort and quality of life (Schäpke et al 2014). It remains to be studied if reactions would be different should a softer term be coined.

Emotional reactions on specific items

It appears that among sufficiency potentials, some trigger stronger feelings than others. Table 1 lists for instance the items that often generate the most emotional (negative) reactions, based on the experience of the négaWatt Association ambassadors. This list is culturally biased (as it only covers the French context) and relates to the négaWatt scenario; it is therefore an indicative rather than representative collection.

The readiness to trust a certain type and level of sufficiency potential is likely influenced by several psychological factors, some pertaining to rational thinking and others more to feelings, personal preferences, own habits, age, social category, and life experience. As sufficiency touches on human factors and lifestyle aspects, emotions and subjectivity play a role in the way sufficiency and its likelihood of generalisation are perceived, which is largely less the case for efficiency and renewable potentials.

It is interesting to compare the previous list to studies about personal preferences for sufficiency behaviours. Moser et al (2015) found for instance in the Swiss population a clear average reluctance for the options of vegetarian diet and reduced living space per person, two topics that also appear in Table 1.

Perceived abstractness

When sufficiency potentials are presented, it is not rare to see some of the audience finding them too theoretical and lacking substance. This relates to the already mentioned difficulty to ground them on hard evidence. Clarification questions often revolve around the practicability of the potentials ('how do we make these savings happen in real life?') and their concrete consequences ('What changes does this entail?').

The abstractness can also be felt in a difficulty to visualise how alternative lifestyles resulting from these potentials will actually look like, and uncertainties about how flexible and enjoyable they will remain.

Reluctance towards normativity

When a scenario is presented without variants, the unique set of sufficiency assumptions it contains (often described by the way of mean values) may be perceived as promoting a predetermined version of sufficiency. This is a source of possible distrust or doubt in the objectivity, and therefore reliability, of the work. For instance, sufficiency options considered in the négaWatt scenario are often referred to by media and observers as 'the négaWatt vision', or 'sufficiency according to négaWatt', meaning that they are seen more as the subjective and normative views or wishes of the scenario proponents than rationale constructs. Critics sometimes even use expressions such as 'the sufficiency *they want to impose on us*'.

These doubts may be alleviated by presenting several scenario variants, with differentiated levels of resulting potentials. The scenarios from Virage Energie are a good example, where three levels of sufficiency intensity (entitled 'fragmented society', 'moderate transition', and 'societal shift') have been modelled with varied assumptions on the degree and rate of diffusion of sufficiency (Virage Energie 2016).

AGGRAVATING FACTORS

The reactions described previously, and the lack of confidence in sufficiency potentials, are likely exacerbated by some current issues in the way sufficiency is approached in energy scenarios.

Insufficient coverage

Sufficiency, and more generally behavioural aspects, have been so far rarely included in mainstream energy scenarios. Some of them sometimes highlight the need for lifestyle changes in their introduction, but then do not significantly include any of this in the modelling (Samadi et al 2016). The reasons might be perceived methodological difficulties, but also a lack of confidence to give them the same treatment as efficiency and renewables.

This increases the difficulty to make a convincing argument about the credibility and plausibility of sufficiency potentials. If sufficiency was systematically and explicitly considered in sustainable energy and energy transition scenarios, especially from established institutions, it would give them a more authoritative quality.

Discrepancies between scenarios

Among scenarios and studies that consider sufficiency, there are sometimes substantial differences in the level of potentials from one to the other. This may be due to modelling aspects, but also to the way the underlying assumptions have been set. While this is scientifically understandable, it contributes to a general idea that there is no consensus and agreement on sufficiency and what it can truly deliver. This may fuel doubts. A few illustrations:

- On the issue of containing the growth of constructed areas, Fischer et al (2016) and négaWatt (2018) do not count on more than a mere stabilisation of the average living space per person, whereas Bierwirth et al (2018) conclude that an 'adequate' level would be 25 % below the current level. Resulting levels of energy savings are obviously quite different.
- Where Fischer et al (2016) foresee a possibility to reduce hot water use by 10 %, négaWatt (2018) considers twice more.

NégaWatt (2018) assumes that a 15 % decrease in TV watching time would be reasonable by 2050, whereas Fischer et al (2016) calculates a potential based on a 50 % reduction by 2030.

Lack of backing

A significant weakness in current publications on sufficiency is that the potentials are rarely put in perspective with the related impact chains and policies that are required to achieve them (Zell-Ziegler et al 2018). It is as if sufficiency was assumed to emerge by itself, but explicit justifications are missing or not quantified (Samadi et al 2016). This contributes to the feeling of abstractness mentioned earlier, and may leave an audience unconvinced.

There has been an increasing amount of research recently to investigate energy sufficiency policies more in-depth⁴. However, the connection between this and quantified potential calculations in sufficiency scenarios has not been sufficiently made yet.

One specific difficulty in designing sufficiency policies and assessing their potential impact is that they often need to be overarching or cross-sectoral and are not well adapted to the current way governmental intervention works. This adds a barrier to their implementation, and constitutes a factor to consider when trying to convince about the feasibility of sufficiency potentials (especially towards decision-makers). This is also mirrored in the structuration of models to develop energy scenarios, that are often not designed to take into account cross-sectoral interactions (for example all the consequences of alternative urban planning policies).

Recommendations to increase trust in sufficiency potentials

In this last part, we present and discuss ways to face and lessen the doubts and objections to sufficiency potentials that have been identified.

SHOPPING LIST OR SYSTEMIC APPROACH?

Sufficiency is often considered rather downstream in scenario building, as a supplement to efficiency and renewables if those do not achieve the predefined goals (e.g. climate targets). It is a sort of last stage 'patch' to fill a remaining gap. It results in a narrow and partial approach (covering only selected sectors and activities), whereas efficiency and renewables are usually treated more systematically. Samadi et al (2018) and Zell-Ziegler et al (2018) have for instance spotted biases: shifts in passenger mobility are currently much more frequently considered than sufficiency changes in other sectors. This raises questions, and it would be useful to further investigate to which extent it is due to perceived modelling difficulties, or preconceptions, are other subjective reasons that we mentioned in the first section.

Anyway, we think such 'shopping list' approaches fail to capture the real potential and essence of sufficiency, and may undermine a better understanding and acknowledgement of its rationale. As sufficiency addresses needs for energy services,

^{4.} See e.g. the publications presented on www.energysufficiency.org.

it seems more relevant to see it the other way round, as the first step and entry point to discuss the transition of energy systems. This approach is illustrated by négaWatt (2018), which considers sufficiency first and foremost in the chain going from human needs to energy services, equipment, and last energy supply. The principle of sufficiency in this view is to capture and challenge what makes us and our societies consume energy services in the first place, whatever the need and sector, before discussing the potentials of other solutions and technologies. The crucial importance of considering and questioning all the root causes that shape energy demand is highlighted by other authors (e.g. Shove 2018; Villalba et al 2018).

Introducing sufficiency as a systemic entry point of a scenario, and as an 'intelligence' in (re)conceiving energy services in all societal aspects and at individual and collective level makes it a more powerful notion. The resulting potentials appear less artificially introduced, and certainly not as an afterthought. Such an approach is also beneficial to take into account the issue of rebound effects, which remain more likely when sufficiency is not considered systematically (Sorrel et al 2018).

IMPROVING THE ROBUSTNESS OF ASSESSMENTS

How to approach sufficiency assumptions?

It appears reasonable to consider sufficiency assumptions or policies that are not totally unrealistic, and that are compatible with a decent life for everyone. It is not easy to define what an acceptable level of sufficiency would be, but research is investigating and usefully contributing to the debate (e.g. Druckman et al 2010). There is some room before reaching 'extreme' sufficiency levels though, so there is no reason to be exaggeratedly inhibited or cautious when it comes to considering sufficiency assumptions.

Concretely, Zell-Ziegler et al (2018) encourage authors not to determine the initial choice of sufficiency measures in their scenario by preconceived hypothesis about their acceptance or political feasibility. Sufficiency can be considered in any sector and type of energy service need.

The magnitude and pace of the assumptions should then be determined taking into account as much as possible existing studies and evidence, be they behavioural and practice studies, analysis of sociocultural barriers and social imaginaries (e.g. Cherrier et al 2012), surveys on individual preferences (e.g. Moser et al 2015), ex-post evaluations, as well as consideration of existing trends. As an illustration of the latter, négaWatt (2018) assumes a halving of meat consumption by 2050. This may sound ambitious; however, it appears that meat consumption has already decreased by 12 % in a decade in France, and the recommendations from official nutrition agencies increasingly consider that overconsumption of meat is unhealthy. This is a strong support to the previous hypothesis. Case studies are also useful. Citing examples of car-free city centers reinforces the plausibility of implementing such approaches elsewhere.

When evidence is strongly lacking, another option is to investigate a range of more or less far-reaching variants, thus getting a better picture of the sensibility of the resulting potentials, and lessening the feeling of excessive normativity or subjectivity.

Mitigating the risks of emotional reactions

We have seen previously that some of the sufficiency options were triggering particularly strong reactions. It may be advisable to take this somehow into account, in order to avoid irrational debates or instinctive rejection of the whole concept. It does not need to go as far as self-censorship. There are other ways:

- Adjusting assumptions on rate of adoption, starting relatively low in the first decades and accelerating afterwards. This accounts for the fact that time will be needed to change the perception and willingness to shift, and the influential factors (social norms, education, infrastructures ...). Virage Energie (2016) does this in its sufficiency scenarios by defining three paces ('short term', 'mid term', 'long term'). It may relieve some of the emotional feelings. An example would be to start curbing the demand for air travel only after e.g. 2030.
- Sub-categorising the assumptions, and allowing varying degrees of change. For instance, curbing air travel more strongly for short distance trips than for long distance ones, as there are more alternatives.
- Conditioning negatively-felt trends to positive alternatives. An example is to couple a reduction in short distance air travel to substantial progress on the speed and quality of train travel and present both hand in hand.

Increased collaboration between experts

To avoid too huge discrepancies between appreciation and consideration of sufficiency by scenario developers, it would be relevant to increase exchanges and discussions between such experts. We can only encourage steps in this direction. The establishment of the ENOUGH network in 2018 (International Network for Sufficiency Research & Policy)⁵ is one of such steps.

An open-source database of sufficiency options and evidence could also be envisaged, where experts and modellers would share expertise and approaches to take sufficiency into consideration in a well-documented and standardised manner (Zell-Ziegler et al 2018).

KEY PRINCIPLES IN PRESENTING SUFFICIENCY POTENTIALS

The way sufficiency potentials are introduced to an audience seems at least as important as their content. Communication in this context is not an end in itself, but may serve to improve understanding, and lessen reservations (Zell-Ziegler et al 2018). As an illustration, the négaWatt Association has felt the need to issue a specific publication clarifying sufficiency in its energy transition scenario (négaWatt 2018). It has been prepared in reaction to objections and criticisms received on the topic. It illustrates the need for specific efforts to reassure on the extent and credibility of these potentials.

^{5.} https://www.researchgate.net/project/ENOUGH-International-network-for-sufficiency-research-policy

The importance of supporting explanations

Whereas figures on efficiency and renewables are often self-explanatory, it is more rarely the case for sufficiency ones. They are more likely to be inaccurately understood and rejected. Changes in lifestyles and societal organisation need to be not only quantitatively but also qualitatively explained and described.

There are several types of explanations/clarifications that can help reinforcing the adherence:

- Clarifying the overarching societal changes in which these sufficiency assumptions take place is useful. For example, changes in ownership rates and usage time of certain IT equipment cannot be easily interpreted if there is not an understanding on how far current trends in digitalisation and social interactions are supposed to be hampered or not in the scenario.
- Averages are a particular enemy to the confidence in sufficiency potentials. Average numbers are felt uniformly, whereas they may just be the result of a variety of changes. As an illustration, when considering an average 50 % cut in meat consumption, it is not the same to picture everyone constrained to halve its own consumption, or to imagine that half of the population would (potentially willingly) become vegetarian while the other half would still be able to eat the same amount.
- In relation to the previous point, it is also important to show how diverse lifestyles can still be in a more sufficient society. This aspect is particularly highlighted by néga-Watt (2018), which insists that the sufficiency it considers 'do not push at all for some sort of uniform monastic life; personal choices and experiences remain largely open.' An option to convincingly illustrate this is to show ranges of sufficiency-based lifestyles (according to e.g. household types), or to refer to publications doing so (such as the SPREAD project⁶).
- It may be excessively abrupt to only present the end date of a potential, e.g. the 2050 level. It is important to show not only the ultimate result, but also depict the pathway. Reducing something by 30 % by 2050 may sound hugely difficult, but it only means a reduction of about 1% per year. It can also be sometimes useful to put the changes between now and 2050 in perspective to how important some changes have been between the 1980's and now.
- Another useful and important explanation to provide is an overview of the impact chains that may concretise sufficiency potentials (Zell-Ziegler et al 2018), so that they are not felt as too theoretical. If it is not feasible, presenting at least successful case studies or anecdotal evidence showing how implementation could be promoted can be helpful.

Prioritisation of effective arguments

It is without doubt more difficult to convince a large audience of the potential of sufficiency when it is perceived as equivalent to constrained curtailment, privation, or regression. Choice of words and arguments is critical in this matter. A strategy may be to insist on the arguments that are easiest to relate to or agree with.

- First, as sufficiency potentials are often related to curbing or decreasing existing trends, there is a risk of semantic saturation with the notion of 'reduction', which may induce a negative overall feeling. Hence, the benefit of using alternative and more positively rated terms, such as e.g. 'optimisation', 'intelligence', 'reasonable', 'rationale', etc. The idea is not to hide the reality behind the potentials, but to better describe the underlying concepts, and not just the trends.
- A key argument is to discuss the 'what if' of not implementing sufficiency. The importance and extent of the changes behind sufficiency potentials may be more positively understood and acknowledged when the current situation they intend to replace cease to be embellished. It can be done by evoking of course ecological unsustainability and the consequences of business-as-usual scenarios, but also the dissatisfactions and social injustice brought by the current excesses of materialism, consumerism, and individualism (evidenced by many authors).
- Some research results can help identify the arguments that are most likely to work to support sufficiency. As an example, the notion of avoiding wastefulness has been shown to have positive connotations for most audiences, and resonates even strongly with conservative people (Corner et al 2018). A (large) part of the saving potentials of sufficiency can indeed be introduced as avoiding some forms of waste.
- Last, it seems reasonable to remain relatively humble and acknowledge the uncertainties and difficulties behind sufficiency potentials. Being too peremptory, and avoiding the objections that are frequently heard can only reinforce them. But it is also fair to point out that the other options for a sustainable energy future (efficiency, renewables, carbon storage, etc.) are also not without their own implementation issues (Samadi et al 2016).

The relevance of bringing co-benefits to the front

Alongside saving energy, the other benefits of sufficiency decisions may be felt as particularly desirable. As an example, the most frequently perceived benefits of low-meat diets include the ability to 'prevent disease', 'eat a greater variety of food' and 'eat more fibre', while benefits to 'the environment' (20 %) are much less considered (Corepal et al 2014).

Health benefits are particularly useful to highlight. A US research showed that emphasising health benefits from less road traffic meets with a positive response across a broad cross-section of the public (Corner et al 2018). Other benefits on life quality (more fulfilling social interactions, happier life, etc.) can also be powerful, provided they are not presented in a too morally normative or excessively optimistic way.

Collective benefits can also resonate with some audiences. For instance, the potential role of sufficiency in reducing inequalities, and contributing to social justice (at the level of a country and worldwide), may be used. This is particularly highlighted by négaWatt (2018).

Last, a recurrent question asked when sufficiency potentials are presented is the assessment of the impact on the economy.

^{6.} https://www.sustainable-lifestyles.eu/

Studies showing how sufficiency can promote new forms of economic wealth and create jobs (e.g. in local tourism, alternative transports, repairing activities, etc.) can be helpful to answer. Their conclusions are worth to be reminded when communicating.

Using narratives

There is a growing interest for finding new ways of promoting sustainable lifestyles, one of which is the use of narratives and story-telling. They can help decreasing the sense of abstractness, and also make sufficiency-based lifestyles more familiar and attractive. Narratives as a complement to quantified potentials can help to illustrate the plausibility and concreteness of the envisaged changes. Narratives can help understand how fulfilling the new lifestyles may be, and what kind of barriers needs to be overcome.

A participative development of such narratives can enhance their acceptance and strength (Samadi et al 2016). In general, involving citizens and external stakeholders in the development of sufficiency assumptions and scenarios can be a way to increase the trustfulness of the resulting potentials (Virage Energie 2016).

Conclusion

Sufficiency potentials included in energy scenarios are facing specific objections and trustworthiness issues that have been discussed in this paper, and are important to consider. Otherwise, sufficiency risks remaining a nice theoretical playground for modelling experts, without convincing those who have a role to play to foster it in real life.

We have proposed in this paper some recommendations in that sense, and we would like to conclude by highlighting in particular the following important needs:

- More evidence, case studies, and evaluations to provide robust foundations for sufficiency assumptions
- Increased connection between the work on energy transition modelling and research on sufficiency policies
- Further efforts to develop convincing and varied arguments for sufficiency options and potentials in all sectors, with a more systemic approach
- A better understanding of those sufficiency potentials that provoke the strongest objections, and ways that can mitigate these reactions and avoid that they eventually trigger a reluctance towards the whole concept.

A stronger collaboration between sufficiency model developers would probably help. It is also necessary that they have access to useful research from various fields (social sciences, psychology, economics, communication, etc.), hence the importance of supporting multidisciplinary approaches and networking between sufficiency experts in general.

References

ADEME (2018). Représentations sociales du changement climatique : 19^{ème} vague.

- Attari S. Z., DeKay M. L., Davidson C., Bruine de Bruin W. (2010). Public perceptions of energy consumption and savings. *PNAS*.
- Bierwirth A., Thomas S. (2018). Energy sufficiency in buildings – Concept paper. eceee.
- Cherrier H., Szuba M., Özçaglar-Toulouse N. (2012). Barriers to downward carbon emission: Exploring sustainable consumption in the face of the glass floor. *Journal of Marketing Management.*
- Corner, A., Shaw, C. and Clarke, J. (2018). Principles for effective communication and public engagement on climate change: A Handbook for IPCC authors. *Oxford: Climate Outreach*.
- Corepal R. K., Copeman J. (2014). The Perceived Barriers and Benefits of Consuming A Plant-Based Diet. *European Journal of Nutrition & Food Safety.*
- Druckman A., Jackson T. (2010). The bare necessities: How much household carbon do we really need?. *Ecological Economics*.
- Fischer C., Grießhammer R. (2013). Working Paper: When less is more – Sufficiency: terminology, rationale and potentials. *Öko-Institut*.
- Fischer C., Blanck R., Brohmann B., Cludius J., Förster H., Heyen D. A., Hünecke K., Keimeyer F., Kenkmann T., Schleicher T., Schumacher K., Wolff F., Beznoska M., Steiner V., Gruber E., Holländer E., Roser A., Schakib-Ekbatan K. (2016), Konzept zur absoluten Verminderung des Energiebedarfs: Potenziale, Rahmenbedingungen und Instrumente zur Erreichung der Energieverbrauchsziele des Energiekonzepts. German Umweltbundesamtes.
- Leuser L., Lehmann F., Duscha M., Thema J., Spitzner M. (2016). Akzeptanz von Energiesuffizienzpraktiken im Haushalt. *Wuppertal Institut and IFEU*.
- Moser C., Rösch A., Stauffacher M. (2015). Exploring societal preferences for energy sufficiency measures in Switzerland. *Frontiers in Energy Research*.
- Muller, A., Huppenbauer M. (2016). Sufficiency, Liberal Societies and Environmental Policy in the Face of Planetary Boundaries. GAIA – Ecological Perspectives for Science and Society.
- négaWatt (2018). Energy sufficiency: towards a more sustainable and fair society.
- Samadi S., Gröne M., Schneidewind U., Luhmann H., Venjakob J., Best B. (2016). Sufficiency in energy scenario studies: Taking the potential benefits of lifestyle changes into account. *Technological Forecasting & Social Change*.
- Samadi S., Terrapon-Pfaff J., Lechtenböhmer S., Knoop K. (2018). Long-term low greenhouse gas emission development strategies for achieving the 1.5 °C target – insights from a comparison of German bottom-up energy scenarios. *Carbon Management*.
- Schäpke N., Rauschmayer F. (2014). Going beyond efficiency: including altruistic motives in behavioral models for sustainability transitions to address sufficiency. Sustainability: Science, Practice and Policy.
- Shove E. (2018). What is wrong with energy efficiency?. Building Research & Information.

- Sorrell S., Gatersleben B., Druckman A. (2018). Energy sufficiency and rebound effects – Concept paper. *eceee*.
- Toulouse E., Le Dû M., Gorge H., Semal L. (2017). Stimulating energy sufficiency: barriers and opportunities. *eceee Summer Study proceedings*.
- Toulouse E., Sahakian M., Bohnenberger K., Bierwirth A., Lorek S., Leuser L. (2019). Energy sufficiency: how can research better help and inform policy-making?. *eceee Summer Study proceedings*.
- Villalba B., Semal L. (2018). Sobriété énergétique Contraintes matérielles, équité sociale et perspectives institutionnelles.
- Virage Energie (2016). Mieux vivre en Région Nord-Pas-De-Calais – Pour un virage énergétique et des transformations sociétales.
- Zell-Ziegler C., Förster H. (2018). Mit Suffizienz mehr Klimaschutz modellieren. *German Umweltbundesamtes*.

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