

Stimulating energy sufficiency: barriers and opportunities

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Abstract

Energy efficiency policies and measures have so far mostly focused on technical optimisation, that is reducing the energy needed to provide a certain service, without so much questioning the service itself and its relevance in comparison to other ways of delivering societal progress and well-being. As it has been reported, there are limits to this approach, especially if in parallel to efficiency progress the amount of delivered or expected energy services continues to grow wildly and offsets the benefits of the former. There are undoubtedly potentials and benefits in broadening the scope and exploring ways of encouraging not only efficiency but also energy sufficiency.

However, this broadening of the scope suggests having a more holistic approach looking at behaviours and societal organisation. It raises specific challenges and barriers, whose nature can be political (challenging the dominant consumerism paradigm), sociological/organisational (adjusting values and the framework in which personal decisions and habits take place), and even technical (designing tools and practical nudges that could facilitate a more sober energy behaviour).

This paper provides an overview of this topic, building on recent projects and research on sufficiency in the French context in various fields (energy modelling, social sciences, etc.). It also looks at a number of new developments that could directly or indirectly stimulate energy sufficiency, such as the rise of the sharing economy, the diffusion of societal innovation practices, as well as new trends in lifestyles (e.g. vegetarianism). The

paper calls for increasing exchanges and networking between sufficiency researchers and experts in the EU, to reach a critical mass able to put sufficiency at the level it deserves on the EU political agenda.

Introduction and aim of the paper

In recent years, energy sufficiency has become an increasingly researched and discussed topic in Europe, notably in some Member States such as Germany. Yet, the initiatives and projects remain relatively scattered with infrequent exchanges and networking across countries and between interested stakeholders (grassroots movements, NGOs, institutions, academics, etc.). The visibility on the extent of the work and experiments carried out remains limited.

The aim of this paper is to go through the most salient issues related to energy sufficiency and how to stimulate it, primarily using French illustrations and authors, since these have not been largely shared outside the country yet. Thus, the paper is both a discussion on the topic and an introduction to French activities.

About sufficiency

The justifications for going further than just energy efficiency have been largely discussed in the international literature (Thomas et al. 2015; Brischke et al. 2015; Fischer 2015; Samadi et al. 2016; eceee 2010; etc.). The main argument being that despite sustained progress in technical efficiency, energy consumption is still increasing in developing countries and has at best stabilised in developed ones due to the growth in energy-

using activities. Whereas policy objectives – notably the 1.5 °C climate goal agreed in Paris – suggest deep and absolute cuts in energy use. This requires changes in the way we consume beyond technical adjustments.

There are varied definitions and interpretations of the concept of ‘energy sufficiency’ (Schneidewind et al. 2014; Thomas et al. 2015; Virage-Energie 2016; etc.). They all have in common the idea of *favouring behaviours and activities that are intrinsically low on energy use, at individual and collective level*. This encompasses for instance avoiding the use of cars, promoting natural thermal comfort and light, low-meat and fresh food diets, spending less time on electrical devices, avoiding oversized equipment, dismissing highly energy consuming leisure, etc.

Adopting such behaviours may be more or less conscious, and more or less driven by a primary concern for energy use. It is also possible to make distinctions in the level of personal involvement that is at the root of intentional sufficiency behaviours. In the circle of energy experts, sufficiency is sometimes interpreted as a simple broadening of the efficiency concept to behaviours¹, meaning that it is not necessarily something far-reaching (let’s call it the ‘soft interpretation’). But for others, sufficiency requires a thorough reassessment of individual and collective needs, even a profound rupture with the current social paradigm. For radical proponents, sufficiency goes well beyond saving energy and entails a complete (down)shift in values, attitudes, and lifestyles. It is often thought not only as a pure individual choice but also as a social adaptation to a new context of resource depletion (Semal 2015). In France, this ‘hard interpretation’ is supported by strong grassroots movements (involving philosophers, religious icons, activists), and is part of a wider criticism of the consumption society (see for instance André et al. 2015).

In this general paper, we do not restrict the analysis to a specific type of motivation or audience, but look at all kinds of options that may be used to stimulate behaviours that are considered part of energy sufficiency.

It is important to note that sufficiency still remains an insufficiently-constructed concept (Gorge et al. 2015), and is often used as a vague performative notion to suggest that more needs to be done to save energy, without really going down to what it means in details and how it can be operationalised (Semal et al. 2014). Another bias is the focus on individual behaviour and private households, while in reality sufficiency may be considered in all sectors and by various stakeholders (examples are using less artificial light in tertiary buildings, limiting over-packaging, reducing freight needs, avoiding terrace heaters, etc.).

Sufficiency behaviours: determinants and barriers

Observers usually acknowledge that, while environmental awareness increases in western societies, conscious and consistent sufficiency-based lifestyles are still niche (except maybe for populations suffering from energy poverty). French national surveys on environmental perception show a clear concern for climate change, but a strong belief that governments should act

first, as well as rather slow progress on a number of sufficiency behaviours (e.g. driving less, biking, switching off appliances, buying more local, ...) (CGDD 2016). Several explanations can be suggested, in relation to attitudes and social norms.

ATTITUDES TOWARDS ENERGY USE

According to sociological studies (Zélem 2013), energy is still a relatively virtual entity for many people, and not a strong motive for changing behaviour in itself. In a recent opinion poll in France, half the respondents state that their main potential motivation for saving energy would be financial, while a third mention a willingness to avoid energy waste, and a tenth refers to global warming (ADEME 2016). Thus, although an ‘anti-waste’ attitude does seem to exist in some of the population, cost benefits are ranked first. Yet, it doesn’t lead to significant behavioural change because energy – and notably electricity – remains largely affordable for middle and upper classes, and in the end doesn’t have a very visible impact on their finances (the average share of energy bills in French household expenses has remained stable for decades at around 7 %).

In addition, the idea of saving/restraining may be seen as regressive, stigmatising, and compromising on comfort. The notion and perception of comfort are central in western societies, notably in energy-related daily behaviours (La Branche 2015). Yet, comfort is not a given but a social construct that may evolve (Zélem 2013).

THE WEIGHT OF THE DOMINANT SOCIAL PARADIGM

The concept of sufficiency contrasts with the traditional forms of progress inculcated by the ideas of infinite growth, consumption, and production (Gorge et al. 2015; Moussaoui 2007). The ‘dominant social paradigm’ (as theorised by social scientists) is still very much based on material abundance and rhetoric of consumerism. *Bourgeois* values glorifying wealth, property, greed, power, size, and speed remain strong (Stengel 2011), even in a country like France where there is also a long tradition of challenging and criticising the negative impacts of the consumption culture (with well-known authors such as Baudrillard).

This dominant paradigm is daily spread by the influence of capitalism on our lives, through marketing, advertisement, etc. (Kilbourne et al. 1997). New desires and consumption-based personal identities are constantly forged, often building on energy-intensive activities (cars, far-away trips, fast food, etc.). On top of that, role models in the highest social positions (such as billionaires, TV stars, etc.) often display an ostentatious way of life based on extravagant consumption, hedonism, and no concern for energy use, as deplored by observers (e.g. Kempf 2007, in a harsh French book).

WHAT DO WE KNOW ABOUT PEOPLE WHO ENGAGE IN SUFFICIENCY BEHAVIOURS?

A French qualitative research based on twelve long interviews with people involved in conscious sufficiency behaviours highlights interesting semantic aspects of sufficiency (Gorge et al. 2015). For the interviewees, sufficiency takes its roots in a feeling of overwhelming by ‘too-muchness’ in the consumption society. Consuming less relates to a certain life ideal, yet it is not confused with frugality or asceticism, which are not seen positively. People engaging in sufficiency are not all radicals, and do not apply sufficiency in an instant systematic way. They

1. A significant part of the literature on energy does not even identify energy sufficiency *per se* but consider it included in the concept of ‘efficiency’. This is perfectly illustrated by report titles such as ‘Achieving energy efficiency through behaviour change: what does it take?’ (EEA 2013).

allow themselves internal negotiations and trade-offs. Thus, the importance of how the line is drawn and perceived between what is 'over-consumption' and what is not.

Energy sufficiency appears as well as a non-linear gradual path. For most interviewees, the process usually starts with initiatives related to 'better consumption' (e.g. dropping big shopping malls), and then continues with a reassessment of daily needs and the elimination of activities (e.g. the car). They are also often highly sensitive to the way their behaviour is perceived by others. This suggests a relevance for community-based approaches in the process of achieving sufficiency, not only in its definition as a collective goal but also in its implementation.

Other research on people engaging in energy saving activities have confirmed the distrust towards current consumption values, and highlighted motivations such as the willingness to better understand and control one's life and living environment (La Branche 2015). Knowledge about other types of stakeholders intentionally applying sufficiency principles (e.g. organisations or businesses) appears very limited.

BARRIERS TO THE WIDESPREAD ADOPTION OF SUFFICIENCY

Based on the above, there are indisputable barriers and challenges to developing energy sufficiency, even with already motivated people or organisations that express a level of energy-consciousness. Beyond financial aspects, which may be key (e.g. the perceived cost-benefits of changing a behaviour), three main types of barriers may be identified.

- The technical context and perception of comfort matter a lot and may constitute obstacles (Zélem 2013; Moussaoui 2007). For instance, some sufficiency behaviours require to spend more efforts and time on activities that are not necessarily considered as pleasant (e.g. longer transport times than by car, more frequent food shopping and preparation when dropping a freezer and favouring fresh food, etc.).
- Each time it goes against dominant social norms, sufficiency may not be widely adopted if these norms do not change, or if there is no strong push to value and prescribe sufficiency. As an example, it is difficult to imagine how in the current context frequent trips to far-away destinations could be discouraged. Undoubtedly, there are increasing calls for stronger climate action and deeper energy conservation in the media and civil society, yet sufficiency is rarely mentioned. Part of the reason is probably a reluctance to mingle into people's lifestyles and values. How else explaining that sufficiency was completely overlooked at the COP21 summit in Paris², while the 1.5 °C target certainly requires a behavioural change wedge?
- Some of the deepest sufficiency behaviours can trigger a fear of loss, marginalisation, and potentially painful familial or professional costs, especially if they are done on a personal basis without external support or understanding (Gorge et al. 2015). One example is getting rid of common material possessions that are considered part of a standard social life, such as the TV, home computers, etc.

2. Only one press release (from two French organisations) could be found on the topic: 'Energy sufficiency, hidden but essential cornerstone of an ambitious and fair climate deal' (negawatt.org/IMG/pdf/151209-cop21-presse-sobriete.pdf).

Quantifying sufficiency potentials

An important step is to quantify what energy sufficiency could reasonably achieve (in contrast to e.g. efficiency). It has received much less attention than efficiency in energy modelling. Prominent scenarios rarely consider it (Samadi et al. 2016), and institutions have commissioned little practical work on estimating potentials.

AT MICRO LEVEL

Potentials can be assessed at the level of a single entity applying sufficiency actions. Among the few available analysis, a recent German one on a household and focusing on appliances found a massive potential for sufficiency, representing half of the energy consumed and twice higher than the efficiency potential in the short term (Brischke et al. 2015). Although it is stated that it represents a maximum not easily generalizable.

A French study has also quantified the greenhouse gas impact by 2050 of lifestyle changes that could take place at the level of typical families, notably frugality-based scenarios (Emelianoff et al. 2013). The most engaged families (with significant cuts in car and plane use, dwelling sizes, meat consumption, number of appliances, etc.) manage to reduce their emissions by as much as 60 %.

To our knowledge, no similar theoretical potential estimates have been carried out for other typical entities (e.g. a district, a city, a company ...). However, there are examples of field projects in the tertiary sector applying eco-responsible strategies including sufficiency, that have been evaluated. One of them is the Darwin Project in Bordeaux³, an eco-renovated set of buildings with sufficiency principles (no air-conditioning, low-tech techniques ...) where users are empowered to apply sufficiency behaviours (Barlet et al. 2015).

AT MACRO LEVEL

Another angle is to assess the overall potential from sufficiency dissemination within a country, in a traditional energy scenario approach. A recent study in Germany has quantified the impact of a dozen sufficiency measures on the country's energy consumption in a detailed way (Fischer 2015; Umweltbundesamt 2016).

The French négaWatt scenario goes further in that it offers a systematic and comprehensive modelling of the implementation of energy sufficiency in all sectors in France⁴. It is not the only scenario in Europe covering sufficiency aspects, yet it does it in an explicit and meticulous way compared to other models (négaWatt 2016). The scenario assumes that sufficiency behaviours become more and more mainstream, and investigates the impact over the 2015–2050 period. Educated guesses have been made to suggest trends that look both technically feasible and socially reasonable on a large number of parameters (going down to product ownership rates, use patterns, etc.). An example is a reduction of the share of cars in total trips from 61 % to 49 % in 35 years. The scenario does not presume exactly how this would be achieved (but it would obviously take a combination of evolutions, from favouring alternative modes, develop-

3. <http://darwin.camp/>

4. negawatt.org/en

ing modal shifting tools, to increasing fuel taxes, or changing the cultural perception of cars).

The model output⁵ shows that such sufficiency evolutions could help reducing the country's final energy consumption by about 30 % by 2050, comparable to what energy efficiency could achieve over the same period. Table 1 provides the sufficiency potentials per sector (more details can be found in *NégaWatt 2014*).

A comparable (and even more thorough) study has been carried out at the level of the French Nord-Pas-de-Calais Region (*Virage-Energie 2016*). The potentials for a large number of sufficiency actions have been estimated, distinguishing between different levels of implementation, from 'soft' to 'radical'. The cumulative potential for the region is a cut in energy use ranging from 14 % to 39 % by 2050 (depending on the intensity and dissemination rate of sufficiency). The details by sector are presented in Table 2.

Ways to stimulate sufficiency

Implementing sufficiency means diffusing low-energy ways of living, moving, eating, etc. that eventually become new social norms. This evolution cannot be an instant revolution. It needs to deal with and accommodate other existing norms that won't change easily (e.g. hygiene representations) (*ADEME 2016*).

The long experience with past attempts at changing behaviour has taught us some lessons (*Zélem 2013*):

- Top-down instructions rarely work; change works better if people can make it their own.
- The socio-technical feasibility of a change matters and should be considered when stimulating it.
- Too much information kills information.
- To know, acknowledge, and say is not to do, there remains a gap.
- Cultural habits have a tendency to re-emerge.

SUFFICIENCY AS A SOCIAL INNOVATION?

An interesting approach is to consider energy sufficiency in the light of the social innovation theory (*Virage-Energie 2016*). In this view, sufficiency (in itself or related activities) would follow the usual steps of a social innovation to disseminate. First remaining a niche for some time, implemented by an 'active minority' of innovators who adopt a transgressive behaviour. Then eventually spreading in the way of an epidemic (through a S-shaped curve). The role of pioneers and cultural leaders is decisive here. They are usually highly educated and socially active people. The speed of diffusion depends on the social proximity between these innovators and the rest of the population. To be successful, a social innovation needs to tick some boxes:

- Be compatible with the mainstream self-capacities of the population.
- Have a reasonable level of complexity.

Table 1. NégaWatt sufficiency potentials in France compared to business-as-usual trends.

Sector	Energy use decrease by 2050
Passenger transport	-55 %
Freight transport	-41 %
Residential sector	-21 %
Tertiary sector	-28 %
Industry	-12 %

Table 2. Sufficiency potentials in the Nord-Pas-de-Calais Region compared to BAU (*Virage-Energie 2016*).

Sector	2025	2050
Passenger transport	-7 % to -34 %	-11 % to -55 %
Food production and transport	-3 % to -35 %	-12 % to -60 %
Residential and tertiary buildings	-5 % to -20 %	-13 % to -30 %
Manufacturing of goods	-17 % to -33 %	-18 % to -38 %

- Offer the possibility of trying before adopting.
- Ensure a certain degree of compatibility with the existing technical environment.
- Show easily measurable benefits.

As regards measurable benefits, most sufficiency actions are different from efficiency ones in the sense that they can potentially yield multiple benefits at the same time beyond saving energy, and can be driven by other reasons. Thus, a distinction may be made between strategies to stimulate energy sufficiency as such, and those using more indirect ways (the two are not exclusive though.)

THE STRAIGHT WAY: PROMOTING SUFFICIENCY VALUES

The idea is to promote sufficiency for what it is and as such, and expect a majority of people and organisations to embrace it as a strong value and change their behaviours accordingly (often in relation to ecological concern, and possibly financial gains). Achieving this requires change in the various fields mentioned before: social paradigm, attitudes, etc. This obviously takes time, but is a guarantee that sufficiency would be applied consistently, and to a level that would reduce the risks of rebound effects and regression.

There is international literature on the general requisites for doing so. Studies have investigated the extent of changes in social norms and institutional frameworks that would be required or desirable. For instance, a French advocacy study has offered the following six axis: from over to sufficient material consumption; from possessing to sharing; from centralisation to decentralisation; from traditional jobs to self-autonomy; from speed addiction to thrifty mobility; from artificiality to a reunited nature-culture conception (*Virage-Energie 2016*).

5. Based on the 2011 version of the scenario. A 2017 update is also available.

As to the ways to achieve these changes, recommendations typically include:

- Making sufficiency more enticing and positively rated, and promoting it in a way that arouses curiosity and provides a sense of security (i.e. by starting reasonable and giving room for reversible experiments) (Zélem 2013). Sufficiency needs to be seen as enjoyable and not just dull and self-induced.
- Avoiding being too prescriptive on moral norms, and too normative on sufficiency-based lifestyles. Some proponents view sufficiency not just as a value but as the very definition of 'the Good Life' or 'the whole life'. While it is a way of providing a positive enticement, it may be seen as philosophically and ethically too far-reaching. Whether sufficiency should become a strict moral issue is still debated.
- Interventions aimed at changing the socio-cultural perception of energy-intensive activities and products. History shows that the perception and appreciation of goods can change overtime (Stengel 2011).

When dissecting further and looking into particular sufficiency-related behaviours, literature may be abundant for some of them (e.g. drivers to reduce the 'addiction' to car use), while for others the ways to overcome their specific social, cultural, or psychological barriers have been far less researched. In Germany, Fischer (2015) and Umweltbundesamt (2016) have done a detailed analysis on a selection of sufficiency actions (mostly at household level). The aforementioned Virage-Energie (2016) also lists barriers and levers for a number of sufficiency practices related to collaborative and sharing activities.

Social marketing techniques

France has a long tradition of public communication campaigns on energy savings (since the oil crisis in the 70's). However, they are usually based on general messages, centred on indistinct individual responsibility but ignoring social differences and contexts (Comby et al. 2012).

Since then, social marketing has developed as a potentially more powerful tool to trigger behavioural change (ADEME

2016). The principle is to make a behaviour more desirable through well-targeted messages to specific audiences. A first step is population segmentation, identifying sub-groups to design strategies and promotion activities. It may be done based on standard social attributes (household types, revenues, etc.). Other approaches may be more interesting. In France, a segmentation based on environmental motivations is regularly carried out. The most recent issue identifies eight main individual types (see Table 3) (Greenflex 2016).

It reveals that some sub-groups could possibly embrace energy sufficiency practices, provided that their primary interests are taken into account in the way to approach and stimulate them. Other sub-groups would first require very basic awareness raising, insisting on some aspects (e.g. financial gains) more than others. It is likely that most European populations could be segmented in similar ways (although with varying percentages).

Another refreshing French analysis has looked at energy use perceptions by 'social age', in particular how far moderation values and green concerns expressed at childhood might be perpetuated in the adolescent and adult life (Garabuau-Moussaoui 2009).

Information and communication

A primary difficulty for the diffusion of energy sufficiency is the general lack of knowledge about the energy impact of daily activities. People also often believe they have limited leverage on their energy consumption, and underestimate potentials. This has been highlighted in a sociological study categorising participants to an awareness raising campaign in a French city (Cordella-Génin 2014), as well as in other studies.

Many ways have been investigated to make energy more noticeable and understood (through smart metering, labels, etc.), and there is ample literature around the globe on the topic (too large to cover here). There are also sociological theories about how communication messages related to energy savings are received by the public (e.g. in France Comby et al. 2012). Social scientists generally like to point out that while passive information may influence attitudes, it is not proven to have a huge direct impact on behaviour (Brisepierre et al. 2013).

Table 3. French population segmentation (Greenflex 2016).

Sub-group	Share	Characteristics
The 'No-changers'	15 %	Mostly young populations far from environmental interest and rejecting constraints
The 'Utilitarians'	12 %	Suburban people with average revenues, poorly interested in green issues but eager to do as much as possible by themselves to reduce costs
The 'Ecoessentials'	13 %	Rather ageing people with poor revenues taking great care of saving on everything
The 'Emotors'	8 %	Highly militant persons who are critics of the consumption society and looking for alternative societal behaviours
The 'Emodels'	10 %	Educated people looking for information, interested in living a healthy and conscious life, and eager to convince their relatives
The 'Sense-seekers'	15 %	Populations with high revenues, eager for consuming high quality products and services, and often considering sustainability as a quality criteria
The 'Locals'	15 %	Grounded people who are motivated by changing things locally and in their close circles
The 'Plugged'	13 %	Mostly young populations using networks and digital technologies to get informed, and first interested in innovation

Engaging in sufficiency requires some more active stimulation that could involve e.g. interaction, social media, gamification, etc. How far is it possible to go with such communication techniques? The French ‘Positive Energy Family Challenge’ program is an interesting case⁶. In various cities, household teams have been recruited, informed about energy, and challenged in a recreational way to save energy only based on behaviour change. A 12 % average energy consumption cut is achieved, mostly on appliances (ADEME 2016). Changes in heating and showering habits turn out to be more controversial within families, and not easily solved just through communicating information. A majority of participants state that they will keep most of their energy-saving behaviour. The program, quite popular, has also been used to communicate in a positive and entertaining way to the media and public. This shows that innovative communication and information has a potential to induce some behaviour change towards sufficiency, but with limits.

A few similar experiences in the non-residential sector have also been evaluated. Among them, the CUBE 2020 energy saving challenge in the French tertiary sector, which is seen as a potential ‘rite of passage’ for the organisations involved to turn them into disseminators of practices in their area (Brisepierre et al. 2016). Yet, applying energy sufficiency in the work environment is still something unfamiliar for many, according to a survey in a tertiary eco-building project involving its users through live information and gamification. Even eco-conscious people feel they lack certain types of information and reminders (Barlet et al. 2015).

Alongside communication, education can also be considered an essential cornerstone if social values and norms are to be changed. As far as we know, not much is said in French schools in relation to energy sufficiency. Outside, some activities and initiatives try to raise awareness, such as the Scout Movement⁷.

Community-based initiatives

As mentioned previously, the idea of community is important in sufficiency behaviour (Gorge et al. 2015). By being not just an individual undertaking but part of more collective movements, the sense of marginalisation among early-adopters is reduced. Besides, community-based initiatives tend to contribute more quickly to the diffusion of new social norms (Brisepierre et al. 2013). They are likely to be more successful if they involve role models and pioneers (EEA 2013; Thomas et al. 2015).

The French *Colibris* movement can be seen as a typical community of this kind⁸. Founded in 2007, initiated by a respected public figure, and now followed through social networks by 250,000 people, it defines itself as a movement of ‘individuals who invent, experiment, and cooperate concretely to build shared lifestyles that respect nature and people’. ‘Joyful sufficiency’ is part of the agenda, and sufficiency initiatives can be shared and supported through an on-line platform. It would be useful to evaluate how successfully sufficiency attitudes and initiatives have been disseminated to the community members.

Another example of a community-based approach is the *EcoWatt* program in the French Bretagne Region, where the electricity grid is fragile. Initiated in 2008 by the grid authority, it invites 45,000 users to voluntarily moderate their energy consumption at certain times of the year. A community of *EcoW'acteurs* can share ideas and experiences, at individual and business levels⁹. Some of them become ‘ambassadors’ to motivate others to save electricity. In 2012, the winter peak demand has been reduced by 3 % during seven days. This may be seen as light in terms of behaviour change, yet it can be a first stimulation in a gradual path towards sufficiency.

Communities are not necessarily only made of individuals. Groups of institutional stakeholders can also be mobilised to build sufficiency strategies. A valuable experience is the research project *Sobriétés* in France (Semal et al. 2014). Its aim was to look at how sufficiency initiatives can be institutionalised at the level of a local territory. Notably, a stakeholder network has been established to test the feasibility of turning institutional organisations into sufficiency facilitators. Activities have been organised to increase their ownership of the sufficiency concept, build capacity, and relate to other experiences (such as *Transition towns*).

ALTERNATIVE WAYS: INDIRECT STIMULATIONS

As it can take time for sufficiency to become a mainstream personal and social value (and success is not guaranteed), other approaches may be considered to trigger changes more indirectly. Some would consist in gradually ‘nudging’ people into sufficiency behaviours (without requiring a deep personal engagement), others to insist on certain co-benefits of such behaviours that may have greater chances of inducing rapid change.

Altering socio-technical contexts

Scientists have shown that many parts of our daily activities are routinized, and strongly influenced by the socio-technical context in which they take place. The way we consume energy depends on our free will, but also very much on the way the products, services, and infrastructures we use are designed and operated.

The Theory of practices suggests that altering this context may induce sufficiency without people craving for it or even realising it. They would move to new routines without stressful internal conflicts. Illustrations are:

- Other forms of urban organisation reducing the need for car travels.
- The diffusion of tools and practices that substitute mobility (teleconferencing, homeworking solutions ...).
- Innovative technologies that suppress or limit the need for energy-using services/products, e.g. auto-wash and no-iron clothes, cold wash detergents, autonomous devices based on ambient energy harvesting, etc.
- Products and services that become ‘smarter’ and adjustable to each user needs to auto-avoid energy waste.

6. www.familles-a-energie-positive.fr

7. Their 2015–2020 plan refers to sufficiency as an explicit value to promote (www.sgdf.fr).

8. www.colibris-lemouvement.org

9. www.ecowatt-bretagne.fr

As regards the latter, there is some debate as to whether ‘smartness’ really goes in the sense of sufficiency. It often entails more electronics and connectivity. It also leads to dispossessing people of the direct control on the determinants of their energy use. A consequence might be that users feel constrained by systems they do not necessarily understand, leading to a further lack of involvement (Zélem 2013).

Sufficiency nudges?

There is significant international literature on green nudges, these soft alterations in choice architectures that induce behaviour change without requiring deep modifications in attitudes and values. We won't enter into the details of the theory here. France is considered late compared to other countries, and not many examples of sufficiency nudges have been found and evaluated (CREDOC 2012), although the nudge approach probably diffuses in society. The communication campaign in Figure 1 can be seen as inspired by the nudge principles.

Among experts, there is some scepticism about nudges though. First, because they would not lead to thorough changes in attitudes. And also because they may create unwanted reactions and resistance (e.g. to mimicking), as revealed by a French qualitative research on consumer responses to green nudges (Robert et al. 2015).

Building on other non-energy motivations

Many sufficiency behaviours can be adopted for other reasons than energy aspects. Hence, the idea of building on the co-benefits, and pushing in priority for those meeting other societal expectations. The meat case is quite exemplary. Some French environmental organisations have advocated for long for low-meat diets using climate and ecological arguments. However, in a country where meat is deeply rooted in the national gastronomy, this seems to have had limited impact (the rate of vegetarians has remained stable at 3 % over the last years). Recently, hidden camera shootings by an animal welfare NGO revealing animal distress in industrial breeding units and slaughterhouses triggered a massive media and public interest and reaction. Some opinion leaders have now joined the cause, reinforcing the convergence of motivations to reduce meat consumption. All this increases the likelihood of behavioural change amongst various population sub-groups.

Obviously, there are other key sufficiency behaviours that may not have such easy co-benefits to promote (apart from financial savings). This is the case for e.g. flying less, agreeing on more reasonable indoor temperatures, using less electronic devices, etc. Thus, this indirect strategy has some limits.

Is the ‘new economy’ pro-sufficiency?

Some consider new economic trends, such as the collaborative economy, as genuinely supporting the sufficiency credo (Virage-Energie 2016). It is often presented as a powerful paradigmatic shift towards alternative, less individualistic and wasteful consumption (in e.g. EESC 2014).

The most well-known example is carsharing, a collective energy sufficiency activity. It requires carshared trips to actually substitute single car trips. A study in France concluded that most of the carsharing takes place for commuting to work and in 75 % of cases indeed replace single car trips (cited in Demailly et al. 2014).



Figure 1. Information campaign by an NGO based on the nudge theory – “62 % of French people are ready to eat less meat to fight global warming, and you?”

Table 4. Examples of values and motivations that may be mobilised for supporting sufficiency actions.

Activity	Non-energy motivations
Low-meat diet	Animal welfare, better health
Car-free mobility	Better health, noise reduction
Short circuit economy (reduced freight)	Socialisation, local jobs, rural landscape conservation
Reduced artificial lighting	Better sleep, biodiversity conservation
Reduced use of screens	Children health, socialisation

However, this perception of the sharing economy may also be judged a little too enthusiastic. A French research based on actor interviews has investigated how far collaborative activities could really be viewed as challenging current consumption paradigms (Herbert et al. 2016). In some cases, they may do the opposite to sufficiency and drive some consumers to consume (energy) even more, for instance by giving them easier access to more goods and services owned by peers. An illustration would be to start using a shared laundry drier. This suggests that the sharing economy may be an instrument of sufficiency strategies, but is not enough in itself.

What about sufficiency policies?

In addition to various types of bottom-up initiatives that could support the approaches described in the previous part, the potential role of top-down legislation and regulation in promoting energy sufficiency is still a relatively open topic (Thomas et al. 2015). Sufficiency policies have been researched mostly in Germany. A few initiatives have been organised in France, for instance policy discussion sessions during the activities in the Nord-Pas-de-Calais Region mentioned previously (Virage-Energie 2016).

Some authors and proponents do insist on the need and relevance for policies to be mobilised (Schneidewind et al. 2014; Bierwirth et al. 2015; négaWatt 2012). The end of cigarettes in public places may be an inspiring case, showing that it sometimes takes a combination of instruments from public commu-

nication to gradual laws and regulations to eventually implement a new shared and agreed-by-all norm.

There are signs that policies targeting behaviours are increasingly considered, as illustrated by the launch by the International Energy Agency of a work stream on this topic¹⁰. Yet, in practice, there has been so far little political appetite for energy sufficiency, notably at EU level. Several reasons might be found: lack of interest, lack of ideas, lack of courage, perceived contradiction with the growth motto, perceived intrusiveness, supposed lack of public support for lifestyle changes, etc. Some sufficiency behaviours would probably be best supported through local policies, yet local authorities are often reluctant to proceed if they don't feel the pressure from a strong and consistent higher-level political agenda (Semal et al. 2014).

RECOGNITION

Firstly, policies can provide an official acknowledgement of a new social value to be promoted. In France, a symbolic step has been taken in 2015 through explicitly stipulating in the national Energy Transition Bill that the State should 'favour energy efficiency and sufficiency'¹¹. (This has been the result of a push by a number of civil society organisations and experts during the national debate preceding the bill). However, little is then said about how to do it. Besides, other values traditionally associated with sufficiency, such as deceleration, material simplicity, decentralisation, etc. are not particularly high on the political agenda.

OVERARCHING POLICIES

Some high-level policy instruments may stimulate energy sufficiency even if not explicitly or primarily intended. This is the case for cross-cutting policies aimed at saving energy or greenhouse gas emissions in general, such as energy saving targets, tradable emission or energy quotas, energy taxes, progressive energy tariffs, caps on energy sales, and general information campaigns on energy savings. The advantage is that sufficiency does not need to be openly prescribed and is left to the appreciation of every agent. The pros and cons of these different policy instruments have been largely investigated, notably by economists who have sometimes modelled their impact on the overall level of consumption of energy services (Giraudet et al. 2008).

These overarching instruments need to be sufficiently ambitious if they are to promote sufficiency and not just efficiency. It has rarely been the case. In France, a recent trend is even to dismiss measures considered as so-called 'punitive ecology'. Plans for progressive energy tariffs and increase in energy/climate taxes have faced considerable obstructions. The implementation of innovative approaches such as 'personal carbon quotas', which could have facilitated the diffusion of sufficiency (Szuba 2015), has never been seriously considered. As regards information campaigns, they have never gone very far in terms of content. As an illustration, a once proposed 'No more 4x4 in cities' message for a public campaign has been judged too stigmatising and dismissed (as reported in Comby et al. 2012).

REGULATORY AND LEGAL CHANGES

National and local regulations, as well as legal rules, can sometimes support or hinder sufficiency behaviours. It is probably in the transport sector that the first consistent attempts at promoting such behaviours have been made in France, through e.g. stricter road and car traffic regulations in big city centres. However, they have not always had as much impact as expected, due notably to an underestimation of resistances and the strength of individual habits (Buhler 2012).

Other sufficiency practices that can be facilitated through institutional interventions have not yet or only recently been considered. For instance, French legal rules framing collaborative dwellings have been adopted in 2014. It shows the long time it can take from an innovative practice to be institutionalised (Virage-Energie 2016).

Another type of relevant regulation has been implemented in the country in 2013 to restrict tertiary building lighting at night (between 1 and 7 am). Although there is still non-compliance, this measure has been explicitly adopted for energy saving purposes.

In some cases, sufficiency can be pushed through simply tweaking existing policy or regulatory instruments, notably those on energy efficiency. Examples are progressive energy standards (eceee 2010), labels with absolute limits, etc. The advantage is to use familiar pieces of legislation that have been in place for years. A French example is the coverage of lighting in building regulations, to stimulate the use of natural light.

DIRECT SUPPORT TO SUFFICIENCY BEHAVIOURS AND SOCIAL INNOVATIONS

Incentives and other public tools can be designed to encourage or facilitate the diffusion of sufficiency behaviours.

Based on the importance of the 'trying before adopting' principle, a French region has carried out in 2012 an experiment in which 675 daily car users have received free public transport tickets for a month. 40 % carried on using the train after the month of trial, and they were still 30 % after a year (ADEME 2016).

Another example is large-scale public bike-sharing systems in big cities. It is not only a new service, but also a way of popularising a sufficiency practice and increasing its diffusion. The Parisian example of *Vélib'* has been replicated worldwide. And the use of bikes has doubled in Paris in the last decade (IAU 2014).

Other ideas are pushed in the French public debate, such as enforcing a weekly vegetarian day in schools.

SUFFICIENCY IN THE CONTEXT OF ENERGY CRISIS

There are past examples of brutal constraints on energy supply triggering sufficiency measures and behaviours, from the oil crisis in the 70's to the Fukushima accident. In such cases, the sense of urgency makes it easier to implement large-scale 'emergency sufficiency' actions, e.g. car traffic bans on certain days, industrial downshifts, information campaigns, and local regulations to restrict some energy uses (IEA 2011). Although these do not necessarily come with enthusiasm, and may not persist in the long term once the crisis is over.

These examples are interesting in the sense that they fuel our representations about limits to energy supply. The acknowledgement of such limits (be it potential disasters, peak oil, etc.) is a powerful driver to trigger discussions about sufficiency and

10. <http://www.ca-eed.eu/private-area/themes/consumer-information-ct6/key-results-from-the-iea-work-on-policies-for-behavioural-change-in-transport-buildings-industry-sam-thomas>

11. www.developpement-durable.gouv.fr/Les-enjeux,39744.html

how it may be socially negotiated, for instance in risk management administrations (Semal et al. 2014). They also reveal that sufficiency efforts are better accepted if there is a sense that everyone takes its fair share. Egalitarian considerations are important in sufficiency policy design (Szuba 2015).

Conclusion

This paper is another reminder that energy sufficiency, although looking simple at first glance, is a far-reaching concept. Its potential is large, and grasping it requires a wide range of strategies, possibly involving innovative communication, social marketing, community-based initiatives, as well as more indirect stimulations. A significant need for more investigation (at sociological, technical, and political level) is also apparent.

At present, research in EU Member States on sufficiency implementation and policies is rather scattered and insufficiently shared. Establishing more ties between European researchers and experts would be a relevant step towards reaching a 'critical mass', able to draw more attention on sufficiency and its energy saving potential.

Policy awareness and policy design in relation to sufficiency would also need strengthening. Policy-makers are insufficiently motivated. They might be more if they had a better sense of the ineluctable trend towards more energy and resource constraints in the future, and the fact that more sufficiency will probably become – willingly or not – indispensable (Semal et al. 2014). Considering that a full paradigmatic shift towards sufficiency may not be realised soon, indirect benefits of sufficiency behaviours may also be more emphasised to motivate policy intervention and increase public acceptance.

References

- ADEME (Agence de l'Environnement et de la Maîtrise de l'Energie), 2016, *Changer les Comportements, l'apport des sciences humaines et sociales pour comprendre et agir*.
- André Christophe, Kabat-Zinn Jon, Rabhi Pierre, Ricard Matthieu, 2015, *Se Changer, Changer le Monde*.
- Barlet Aline, Sémidor Catherine, Gancille Jean-Marc, Brassier Pascale, 2015, *Métrologie innovante et éco-comportements au service de la transition énergétique : le projet MIUSEEC au sein de Darwin. Proceedings of the 2^{èmes} Journées Internationales de Sociologie de l'Energie*.
- Bierwirth Anja, Thomas Stefan, 2015, *Almost best friends: sufficiency and efficiency. Can sufficiency maximise efficiency gains in buildings?.* Presented at the 2015 eceee Summer Study.
- Brischke Lars-Arvid, Lehmann Franziska, Leuser Leon, Thomas Stefan, Baedeker Carolin, 2015, *Energy sufficiency in private households enabled by adequate appliances.* Presented at the 2015 eceee Summer Study.
- Brisepierre Gaëtan, Belay Christophe, Vacher Thibault, Fouquet Jean Philippe, 2013, *L'efficacité comportementale du suivi des consommations en matière d'économie d'énergie dépend des innovations sociales qui l'accompagnent.* ADEME/GrDF.
- Brisepierre Gaëtan, Garabuau-Moussaoui Isabelle, Labbouz Delphine, 2016, *Le concours d'économies d'énergie CUBE 2020 : un rite de passage qui entraîne les organisations vers une gestion plus efficiente des bâtiments tertiaires.* Projet de recherche SOCIOCUBE.
- Buhler Thomas, 2012, *Eléments pour la prise en compte de l'habitude dans les pratiques de déplacements urbains – Le cas des résistances aux injonctions au changement de mode de déplacement sur l'agglomération lyonnaise.* CGDD (Commissariat Général au Développement Durable), 2016, *Opinions et pratiques environnementales des Français en 2015*.
- Comby Jean-Baptiste, Grossetête Matthieu, 2012, *"Se montrer prévoyant" : une norme sociale diversement appropriée.* Sociologie 2012/3 (Vol. 3).
- Cordella-Gémin Robin, 2014, *Freins et motivations à une plus grande efficacité et sobriété énergétiques – L'exemple d'une campagne de sensibilisation aux économies d'énergie basée sur le suivi des consommations.* IEP Grenoble.
- CREDOC, 2012, *Changer les comportements – L'incitation comportementale dans les politiques de maîtrise de la demande d'énergie en France.*
- Demailly Damien, Novel Anne-Sophie, 2014, *Économie du partage: enjeux et opportunités pour la transition écologique,* IDDRI.
- eccee (European Council for an Energy Efficient Economy), 2010, *Is efficient sufficient? The case for shifting our emphasis in energy specifications to progressive efficiency and sufficiency.*
- EEA (European Environment Agency), 2013, *Achieving energy efficiency through behaviour change: what does it take?.*
- EESC (European Economic and Social Committee), 2014, *Opinion on collaborative or participatory consumption, a sustainability model for the 21st century.*
- Emelianoff Cyria, Mor Elsa, Dobré Michelle, Cordellier Maxime, Barbier Carine, Blanc Nathalie, Sander Agnès, Castelain Christine, Joliton Damien, Leroy Nicolas, Pourouchottamin Prabodh, Radanne Pierre, 2013, *Lifestyles and Carbon Footprints – A Scenario Analysis of Lifestyles in France in 2050 and Carbon Footprints.* IDDRI.
- Fischer Corinna, 2015, *Absolute energy savings in the household sector – a case for public policy? Presented at the 2015 EEDAL Conference.*
- Garabuau-Moussaoui Isabelle, 2009, *Behaviours, transmissions, generations: why is energy efficiency not enough?.* Presented at the 2009 eceee Summer Study.
- Giraudet Louis-Gaëtan, Quirion Philippe, 2008, *Efficiency and distributional impacts of tradable white certificates compared to taxes, subsidies and regulations.* Revue d'économie politique 2008/6.
- Gorge Hélène, Herbert Maud, Özçaglar-Toulouse Nil, Robert Isabelle, 2015, *What Do We Really Need? Questioning Consumption Through Sufficiency.* Journal of Macromarketing 2015, Vol. 35 (1) 11–22.
- GreenFlex, 2016, *Typologie des Consommateurs 2016 : Action, Réaction, Reconstruction.*
- Herbert Maud, Collin-Lachaud Isabelle, 2016, *Collaborative practices and consumerist habitus: An analysis of the transformative mechanisms of collaborative consumption.* Recherche et Applications en Marketing 1–21.

- IEA (International Energy Agency), 2011, *Saving Electricity in a Hurry*.
- IAU (Institut d'Aménagement et d'Urbanisme), 2014, *Le vélo retrouve sa place parmi les mobilités du quotidien*.
- Kempf Hervé, 2007, *Comment les riches détruisent la planète*.
- Kilbourne William, McDonagh Pierre, Prothero Andrea, 1997, *Sustainable Consumption and the Quality of Life: A Macromarketing Challenge to the Dominant Social Paradigm*. *Journal of Macromarketing* 1997 17:4.
- La Branche Stéphane, 2015, *Réflexions sur l'engagement énergétique: vers des profils énergétiques ?*. Proceedings of the 2^{èmes} Journées Internationales de Sociologie de l'Energie.
- Moussaoui Isabelle, 2007, *De la société de consommation à la société de modération*. *les annales de la recherche urbaine* n°103.
- NégaWatt, 2012, *Les 10 mesures du Manifeste négaWatt*.
- NégaWatt, 2014, *Scénario négaWatt 2011–2050 – Hypothèses et méthode*.
- NégaWatt, 2016, *Projet Europe-Territoires – Transition(s) énergétique(s) en Europe : analyse comparative de scénarios, de leur application territoriale et de leurs impacts socio-économiques*.
- Robert Isabelle, Binner Anne-Sophie, Ourahmoune Naci-ma, 2015, *Nudges environnementaux et norme sociale*. Proceedings of the 2015 AFM Annual Congress.
- Samadi Sascha, Gröne Marie-Christine, Schneidewind Uwe, Luhmann Hans-Jochen, Venjakob Johannes, Best Benjamin, 2016, *Sufficiency in energy scenario studies: Taking the potential benefits of lifestyle changes into account*. *Technol. Forecast. Soc. Change*.
- Schneidewind Uwe, Zahrnt Angelika, 2014, *The institutional framework for a sufficiency driven economy*. *Ökologisches Wirtschaften* (29).
- Semal Luc, Szuba Mathilde, Villalba Bruno, 2014, *Sobriétés: une recherche interdisciplinaire sur l'institutionnalisation de politiques locales de sobriété énergétique*. *Natures Sciences Sociétés*, 22 (2014).
- Semal Luc, 2015, "Sobriété", in Bourg Dominique, Papaux Alain, *Dictionnaire de la pensée écologique*. PUF.
- Stengel Oliver, 2011, *Weniger ist schwer – Barrieren in der Umsetzung suffizienter Lebensstile und wie wir sie überwinden können*. GAIA 20/1.
- Szuba Mathilde, 2015, *Quotas individuels (carbone)*, in Bourg Dominique, Papaux Alain, *Dictionnaire de la pensée écologique*, PUF.
- Thomas Stefan, Brischke Lars-Arvid, Thema Johannes, Kopatz Michael, 2015, *Energy sufficiency policy: an evolution of energy efficiency policy or radically new approaches?*. Presented at the 2015 eceee Summer Study.
- Umweltbundesamt, 2016, *Konzept zur absoluten Verminderung des Energiebedarfs: Potenziale, Rahmenbedingungen und Instrumente zur Erreichung der Energieverbrauchsziele des Energiekonzepts*.
- Virage-Energie Nord-Pas-de-Calais, 2016, *Mieux Vivre en Région Nord-Pas-de-Calais – Pour un virage énergétique et des transformations sociétales*.
- Zélem Marie-Christine, 2013, *Comment aller vers la sobriété énergétique?*, Université négaWatt, Oct. 2013.