Energy sufficiency: are we ready for it? An analysis of sustainable energy initiatives and citizen visions

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Abstract

The aim of this paper is to bring together knowledge and experience about energy sufficiency from two European projects. On the one hand, relying on a database of sustainable energy initiatives we investigate whether the concept of energy sufficiency is present in projects designed to make energy consumption more sustainable. On the other hand, based on an analysis of visions created by citizens, we explore whether energy sufficiency, or sufficiency in general, appears in citizen visions of a sustainable future.

The paper starts by defining energy sufficiency, or more accurately, 'energy sufficiency within limits' that the authors describe as consumption that ensures that everyone has access to a sufficient amount of energy to satisfy their basic needs in a way that respects the ecological limits of the planet. Thus, energy sufficiency is understood as connecting the need to limit energy consumption with the need to make consumption and distribution more just, hence also introducing the concept of energy justice into the analysis.

Then, an analysis of the ENERGISE database of more than 1,000 sustainable energy consumption initiatives (SECIs) from 30 European countries is introduced, using an energy sufficiency framework.

This is followed by a study of citizen visions from the CIMULACT project. CIMULACT developed a participatory methodology that involved more than 1,000 citizens from 30 European countries in a consultation process during which visions of a desirable future were created. These citizen visions are analyzed from the point of view of sufficiency: namely, does the latter term (or similar terms) appear? If yes, in which contexts, and in relation to which objectives? What, if any, are the aspects that are currently missing?

The paper closes with reflections on what the findings from the analysis mean for putting energy sufficiency more firmly on the research, action and policy agenda.

Introduction

The related policy and practice community have recognized the urgency of action created by climate change, as emphasized most recently by the dire warnings of the latest IPCC report (IPCC 2018). Climate change is caused by the global human community being in a state of carbon overshoot (Lin *et al.* 2018, Rockström *et al.* 2009, Steffen *et al.* 2015); accordingly, there is a pressing need to identify an approach for reducing and eventually abolishing this overshoot. The approach that is required must be such that it does not only focus on the reduction of the carbon footprint, but is more inclusive and holistic in terms of allowing for the satisfaction of the basic needs of those in energy poverty, thus recognising the potential to increase the carbon footprint of some. The concept of (energy) sufficiency appears to be one such approach, although it should be recognized that similar concepts or approaches have also been previously put forward and used; for example, the contraction and convergence concept proposed by Meyer (2000) as one way to manage and reduce anthropogenic carbon dioxide through a burden-sharing approach (taken forward as 'convergence'; Vadovics and Milton, 2018), shrink and share (Kitzes *et al.* 2008), environmental space (Bührs 2008, Potocnik *et al.*

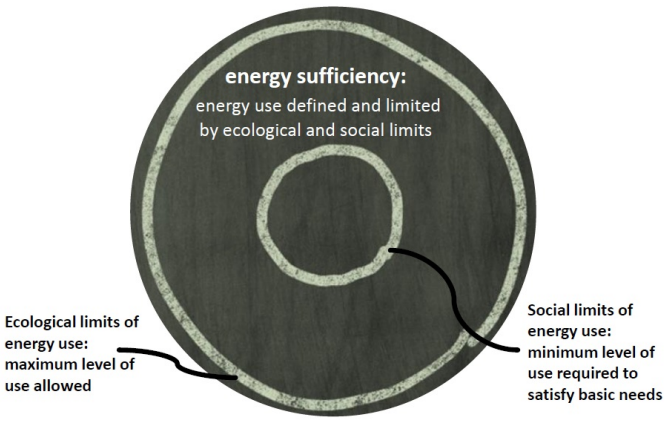

Figure 1. Conceptualizing and illustrating energy sufficiency (Source: authors' own creation inspired by Raworth 2017).

2018), and 'doughnut economics' that proposes both upper- (an ecological ceiling) and lower limits (a social foundation) for a "safe and just space for humanity" (Raworth 2017). In Figure 1, which borrows the doughnut figure from Raworth (2017), we provide a first illustration of energy sufficiency as conceptualized in this paper.

Building on data and information from two European projects, in this paper we investigate whether and to what extent the concept and practice of (energy) sufficiency is already present and understood in society. On the one hand, relying on the database of sustainable energy initiatives created in the ENERGISE project[1] we explore the presence of the concept of energy sufficiency in projects designed to make energy consumption more sustainable with the active involvement of households. On the other hand, based on an analysis of visions created by citizens in the CIMULACT project,[2] we explore whether the concept of (energy) sufficiency is present in citizen visions of a desirable and sustainable future.

Defining energy sufficiency

THE NEED FOR ENERGY SUFFICIENCY

There are several key reasons why the need for discussion about energy sufficiency is becoming increasingly pressing. First of all, current levels of energy production and use are causing serious problems that are creating multiple crises. Current energy production and consumption levels and practices are increasing the pressure on the environment (e.g. air and water pollution, land degradation, and biodiversity loss), and exhausting non-renewable natural resources to an unsustainable level. Moreover, they are also the key cause of climate change, which adversely impacts the most vulnerable sectors of society (e.g. those living in degraded areas, those forcefully resettled due to energy projects, or impacted by climate change) (IPCC 2018, WWF 2018).

Another reason for increasing the perceived importance of energy sufficiency is that there is no 'innocent energy'; i.e., no form of energy that is accessible to humanity that has no adverse impacts on the environment or society. This is why it is important to minimise the adverse impacts of energy production and consumption, and pursuing energy sufficiency is one potential way to do this, as it represents a way to connect environmental perspectives with social- and justice-related perspectives. As Stoddart (2018) also argues, there is a need for systemic energy justice and energy sufficiency perspectives in energy-related discussions.

Furthermore, while energy efficiency is notably increasing, it is not leading to a similarly notable decrease in energy consumption – even when such decreases can be identified, they are smaller (and are occurring more slowly) than the energy efficiency potential would suggest (Thomas *et al*. 2015, Lorek and Spangenberg 2017). Thus, research, policy and practice should investigate and engage in fostering the paradigm and practice of energy sufficiency.

While on the one hand energy production and use are increasing pressure on society, the environment and natural resources, on the other hand the impact of energy use is detrimental to human wellbeing. To avoid climate chaos, avoid the exhaustion of non-renewable energy sources, and preserve the natural environment, humanity needs to reduce its energy use radically. However, in a world where about three billion people live in energy poverty (Thomson *et al.* 2017), fostering the message about the need for a radical reduction in energy use could represent a challenge. It should be acknowledged that, while a great deal of attention is being paid to the part of the population that lives in energy poverty and understanding how to help them escape this situation, little or no attention is paid to those living in 'energy excess' or 'energy decadence' (De Decker 2018). There is significant inequality in terms of energy use: while the average North American uses 6,881 kg of oil equivalent per year, the average Bangladeshi uses only 222 kg (De Decker 2018). Furthermore, inequality is not only manifested in terms of the quantity of energy that is used, but also in the quality: while populations in industrialised countries are fuelled by electricity and gas, many of the above-mentioned three billion people living in energy poverty use wood, charcoal or animal waste to cook their food and stay warm (De Decker 2018).

Accordingly, closer attention needs to be paid to inequity, which would be possible through adopting energy sufficiency as an objective; energy sufficiency defined as a level of energy use that is both fair and sustainable (De Decker 2018). Whereas raising the energy use of the people who live in energy poverty to the level maintained in well-off parts of the world would be a way to address the gap in energy use, this option is simply not possible in a limited world with an already seriously destabilised climate. While it is an open question whether our bounded world can ever satisfy even the basic energy needs of the entirety of humanity (De Decker 2018), it is clear that a discussion about the over-consumption of energy must be started. As Sovacool *et al.* (2017) observed, energy production and use are closely linked to ideas about fairness and justice, but we generally fail to take this relationship into consideration when planning and implementing energy production and use. For this reason, it has been proposed that there is a need to incorporate justice-related considerations into thinking about all aspects of energy production and use (see also Meyer 2000,

1. To learn more, please visit http://energise-project.eu/.
2. To learn more, please visit http://www.cimulact.eu/.

Vadovics *et al.* 2013, Potocnik *et al.* 2018). Accordingly, we believe that energy sufficiency, as defined in this paper, can make a contribution to this goal.

DEFINING ENERGY SUFFICIENCY

There is currently no universally accepted definition of sufficiency or energy sufficiency. Fischer *et al.* (2013:5) define sufficiency as "a change in consumption patterns that help to stay within the carrying capacity of the planet. This change implies a modification of the utility aspects of consumption". Thomas et al. (2015:60) take this further and show that "energy sufficiency at the household level differs from efficiency in one central aspect: energy efficiency reduces energy input while keeping the utility/services from energy constant. With energy sufficiency, energy consumption is reduced while the utility/technical service changes in quantity or quality". In the framework of this definition, sufficiency-related action can take different forms; for example, it can be implemented through making quantitative reductions, by satisfying a need by using a less energy-demanding service than previously (e.g. avoiding clothes washing by airing clothes) or by making technical adjustments to the services required to meet actual needs (e.g. by adjusting room temperature, or avoiding the use of standby functions) (Thomas *et al.* 2015).

Lorek and Spangenberg (2017) offer a different approach to defining sufficiency. Following others, they argue that sufficiency is about "living well on less" (2017:8), and contrast this approach with the efficiency approach, saying that "where eco-efficiency is concerned with production based on using fewer resources, eco-sufficiency follows the premise that we should limit what is produced or consumed in absolute terms" (2017:9). This also implies that adopting a sufficiency perspective or sufficiency objectives does not mean replacing the efficiency perspective, but rather taking it further. For example, it is important that our homes be energy efficient, but even if they are, in order to remain within ecological limits their size in square meters needs to be limited, while there is also a need to limit even our efficient energy use by adopting appropriate practices. Thus, the efficiency principle must be complemented with the principle of sufficiency (Lorek and Spangenberg 2017).

Another important notion related to the concept of energy sufficiency is energy justice. Sovacool *et al.* (2017) define energy justice as a global energy system that fairly distributes both the benefits and burdens of energy services, and one that contributes to more representative and inclusive energy decision-making.

Considering and building on these existing definitions of energy sufficiency and justice, the authors of this paper provide their own definition of energy sufficiency which combines these two concepts. We define energy sufficiency as *consumption that ensures that everyone has access to a sufficient amount of energy to satisfy their basic needs in a way that respects the ecological limits of the planet*. Thus, energy sufficiency is understood as connecting the need to limit global energy consumption with the need to make consumption and distribution more just (see Table 1). As indicated in Table 1, energy sufficiency in our understanding can take the concept of efficiency further through the introduction of a concrete and quantified reduction target that would be equal to, for example, the fair and ecologically sustainable per capita carbon footprint that is also sufficient to cover basic needs. This concept of energy sufficiency creates an explicit link between environmental and social sustainability, and could thus lead to the creation of policies and programmes that contribute to both objectives. Furthermore, it is important to emphasize that even though energy sufficiency requires an overall reduction in the global human carbon footprint, it also provides opportunities for those in energy poverty to increase their carbon footprint to a level that would allow them to meet their basic needs, as indicated in Table 1 (see the right-hand column of the table). Along with other authors (e.g. De Decker 2018, Lorek and Spangenberg 2017), we recognize the challenge inherent to quantifying the sufficient level of energy consumption and the challenge of managing non-basic needs; however, detailed discussion of this issue is beyond the scope of the present paper.

Overall approach and methodology

In this paper, we bring together data and information from two European projects in order to obtain some insight into where current thinking and practice stand in relation to energy suf-

Table 1. The concept of energy sufficiency as understood in the current paper, and its comparison to efficiency (Source: authors' own creation).

	MORE SUSTAINABLE ENERGY USE AT THE HOUSEHOLD LEVEL				
	EFFICIENCY		SUFFICIENCY		
Description of change	Increase in efficiency, which may or may not result in reduced overall energy use	Increase in efficiency, which results in reduction in energy use but there is no reference to any reduction target or ecological limits	Reduction in energy use to sufficiency level, which is defined in relation to meeting basic needs but there is no reference to sustainable footprint or justice (this is how sufficiency is defined in the ENERGISE project)	**Reduction in energy use to sufficiency level that is defined as equal to the sustainable *(within ecological limits)* and just carbon footprint** (this is what we base our own analysis of ENERGISE cases and CIMULACT visions on)	**Increase in energy use to sufficiency level that is equal to the sustainable (within ecological limits) and just carbon footprint for those whose basic needs are not met**
Is there a reduction in energy consumption?	Yes or No	Yes	Yes	Yes	No
Are ecological limits considered?	Not explicitly	Not explicitly	Not Explicitly	Yes	Yes
Is justice considered?	**May or may not include a JUSTICE element**			**Yes, explicitly includes a JUSTICE element** (~ explicit link between environmental and social sustainability)	

ficiency. To do this, we first examine a database of sustainable energy projects that focuses on households. We then complement the examination of projects with an analysis of citizen visions of a sustainable and desirable future. To accomplish both these goals, we place specific focus on two countries: Hungary and Slovenia.

There are several reasons why we have decided to focus on Hungary and Slovenia, the key one being that within the ENERGISE project justice-related considerations were not a part of the assessment of initiatives, hence information is too scarce in the related database for further detailed study. However, in Hungary and Slovenia the authors are sufficiently familiar with the initiatives and have invested extra resources in studying and identifying their justice-related elements. For the same reasons, however, an overall analysis of all of the initiatives included in the database from the 30 countries would have been beyond the scope of this paper. Accordingly, Hungary and Slovenia were chosen as pilot cases on which to test the methodology, the findings of which can be compared to other countries in both projects.

SUSTAINABLE ENERGY CONSUMPTION INITIATIVES AND SUFFICIENCY

The database of sustainable energy initiatives was compiled in the ENERGISE project in 2018. ENERGISE is an innovative pan-European research initiative aimed at increasing scientific understanding of social and cultural influences on energy consumption. Funded under the EU Horizon 2020 programme for three years (2016–2019), ENERGISE develops, tests and assesses options for the bottom-up transformation of energy use in households and communities across Europe. As part of this effort, the international ENERGISE research team systematically classified more than 1,000 sustainable energy consumption initiatives (SECIs) from 30 European countries.[3] The initiatives were collected and classified by the ENERGISE consortium using a shared methodology (Jensen *et al.* 2017a, Jensen *et al.* 2018).

SECIs are defined as activities that deal with reducing energy-related CO_2 emissions from households. This can either be in terms of reducing actual energy consumption or substituting fossil fuels with renewable energy sources. In agreement with the objectives of the ENERGISE project, the SECIs that were mapped generally include some active involvement from households. The definition of a SECI is intentionally kept broad in order to make room for empirical enquiry, such as is occurring with the large variety of empirical examples that seek to achieve the same goals (Jensen *et al.* 2018).

The initiative collection process was mainly desk-based and built upon the knowledge of the project consortium, an internet and document search, a press release to invite submissions, and some interviews. In order to systemically identify and catalogue diverse examples of SECIs across 30 European countries, a theoretically inspired criteria-guided grid was developed to assess aspects of SECIs related to size, scale, scope, objectives, outputs, medium- and type of interventions, as well as types of energy consumption targeted, the role of households and potential types of changes – categories that are all pertinent to the scope and objectives of ENERGISE (Jensen 2017).

Once the database was compiled, the ENERGISE research team developed two typologies: a problem-framing typology and a resource-consumption typology (for details on typologies and reasons for constructing them, please see Jensen *et al.* 2017b). Here we introduce and build on the resource-consumption typology because of its greater relevance to this paper.

The ENERGISE resource-consumption typology classifies SECIs into the following categories:

- Sufficiency: Limiting what is produced and consumed in absolute terms; examples from the database include eco-communities and initiatives that limit energy use to a defined level;
- Efficiency: Changing the ratio between value created and resources used or impact created; examples: using greener products and changing behaviour;
  - Efficiency – Reduction: Reducing energy use or emissions; examples: turning down thermostats at home a bit, but not to the pre-defined level determined to be necessary for ecological and social sustainability (e.g. from 24 °C to 23 °C, which is still considered high); unplugging dormant appliances; insulating buildings;
  - Efficiency – Substitution: Substitution of more harmful products with less harmful products; examples: replace inefficient lighting with LEDs; purchase energy efficient appliances; switch to electric vehicles; use a bicycle instead of a car;
- Sharing/Repairing: Initiatives that have the characteristics of both sufficiency and efficiency – context dependent; examples include car-sharing; sharing appliances; repairing products (Jensen *et al.* 2017b).

Although in this paper we build on the analysis and classification developed and conducted in the ENERGISE project, we also take it a step further and test our methodology using the two countries in focus, Hungary and Slovenia, by adding a justice component to the analysis (see Table 1). At this point in our analysis, we understand 'justice' in the widest possible sense. Thus, we sought to identify an implicit or explicit manifestation of justice or equity in the objectives, design and implementation of sustainable energy initiatives. For example, we considered whether:

- the initiative aimed at increasing the equity of the distribution of resources, and/or
- included those in energy poverty among its target groups with the aim of improving their situation, and/or
- integrated justice-and-equity-focused decision-making in design and implementation, and/or
- included a reference to the fair carbon footprint, etc.

Thus, in our analysis of Hungarian and Slovenian SECIs we examined both their categorization according to the ENERGISE resource consumption typology, and we supplemented this with an assessment of whether they included a justice element.

3. The database is available at http://energise-project.eu/projects and is further detailed in Jensen *et al.* 2017a.

CITIZEN VISIONS AND SUFFICIENCY

The CIMULACT (Citizen and Multi-Actor Consultation on Horizon2020) project was conceived to contribute to the process of creating the H2020 research agenda through engaging citizens and stakeholders in the co-creation of European research agendas based on real, validated and shared visions, needs and demands. The visions of citizens represent a great resource for investigating whether the concept of sufficiency exists in some form in the non-academic world. Here, it should be noted that the visions were created using exactly the same methodology in all 30 countries (Bechtold *et al.* 2015). The citizens who participated in the vision-creating exercise were also recruited following the same guidelines, albeit using methodologies that best fit local circumstances. The guidelines included reference to diversity and achieving quasi-representativity of participants from each country regarding gender, nationality, age, education, place of living, etc. as much as possible within groups of 35–40 people. In each country, the selected participants were required to be non-experts; i.e., not leading an expert organization, not working as experts, not being active or leading an NGO or a political party, etc.

The citizens were helped to brainstorm various ideas about the future. These ideas were then turned into draft visions. The whole group of participants then discussed and debated these draft visions through a process which resulted in six visions as an output in each country (Riisgaard *et al.* 2015).

To identify elements of sufficiency and justice in the visions created in the CIMULACT process we subjected them to simple text analysis. Although we paid particular attention to Hungary and Slovenia in our work, we still provide here an overview of the analysis of visions from all the countries. When performing the analysis, we examined the occurrence of the term 'sufficiency', and its synonyms and generative forms. Furthermore, as we found very few occurrences of these we also included occurrences of its component concepts based on our definition related to living within ecological limits in a more equitable and just way. Table 2 includes the terms that we searched for in our analysis.

Once the searches were conducted, each occurrence, including its context within the vision, was considered, and those not relevant to our topic of study were rejected.

Results and discussion

SUFFICIENCY IN SUSTAINABLE ENERGY CONSUMPTION INITIATIVES (SECIS)

Strikingly, but perhaps not surprisingly, as shown in Table 3 the number of SECIs categorised as 'sufficiency' initiatives are few, whereas the majority of SECIs can be classified as 'efficiency' focused (primarily a mix of reduction and substitution). This finding is in line with current research that indicates the dominant focus on efficiency schemes.

In the 'sufficiency' category are included initiatives such as the '2000-Watt Society' campaign in which implementers encouraged participating households to reduce their energy consumption to 2000 watts through making changes in multiple lifestyle-related areas, with the overall objective of creating a 2000 watts society by 2050. Another example is the 'On débranche' research project that organized community 'disconnect' events in order to facilitate inter-generational discussion about what it means to live without electricity, and what the minimum amount of energy is that we need (Jensen et al. 2017b).

In the 'sufficiency/efficiency' category we find initiatives that include both efficiency and sufficiency objectives. For example, this is where the 'Aha!Car' web platform for carpooling was located. This platform makes it possible for households to share cars through the creation of a social network. Another initiative is the 'R.U.SZ' initiative which operates a repair centre for

Table 2. Occurrence of terms investigated in the text analysis of citizen visions.

Main term searched for	Related terms and expressions searched for	Additional searches
sufficiency	sufficient	Enough
ecological limits	environmental limits, limits, to limit, planetary boundaries, reduction, consumption reduction, resource use reduction	ecological footprint, eco footprint, harmony with nature/environment, balance with nature/environment
equity and justice	equal, equality, fair, fairness, just, (social) justice	basic income, sharing of resources

Table 3. Resource Consumption Typology and frequency of occurrence in database (N.B. some initiatives may appear in more than one category) (Source: Jensen et al. 2017b and authors' own calculations).

Sustainable consumption category	% of total initiatives, all countries	% of total initiatives, Hungary	% of total initiatives, Slovenia
Sustainable resource consumption (All)	100.00		
Sufficiency	9.09	11.1	6.1
Sufficiency/Efficiency (Sharing/Repairing)	3.28	13.3	0.0
Efficiency	90.06	75.6	93.9
Efficiency (reduction and substitution)	58.29	55.6	67.3
Efficiency (reduction only)	14.62	6.7	12.2
Efficiency (substitution only)	17.15	13.3	14.3

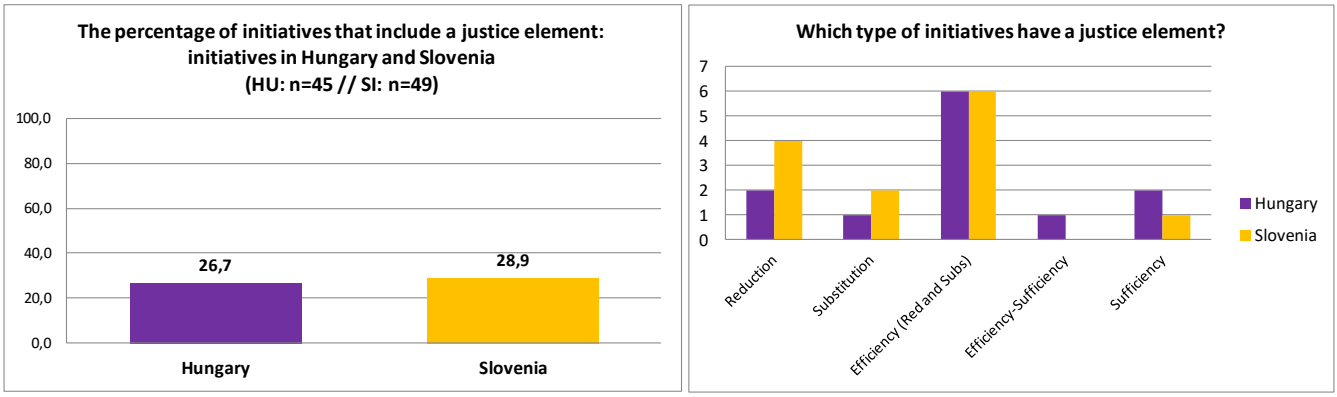

Figure 2. Initiatives with a justice element in Hungary and Slovenia (based on authors' own calculations informed by Jensen et al. 2017b).

repairing broken electronic appliances, as well as making them more efficient, when possible (Jensen et al. 2017b).

Finally, in the 'efficiency' category there are initiatives that help make buildings or electronic equipment more efficient (e.g. washing machine or refrigerator-exchange programmes, and building insulation projects), or assist households or communities to switch to more efficient fuels or change their behaviour and practices to become more energy efficient (Jensen et al. 2017b).

Sufficiency in Hungarian and Slovenian SECIs

As can be seen from the table, the distribution of SECIs in the different categories of the resource consumption typology is similar in Hungary and Slovenia. Accordingly, the majority of both the Hungarian and the Slovenian initiatives are built around energy efficiency (a combination of reduction and substitution). A relatively limited number – five in Hungary (11.1 %), or 11 if we also consider the 'Efficiency-Sufficiency' category (24.4 %), and three in Slovenia (6.1 %) – feature sufficiency characteristics (see Table 3).

At this point, a reminder is needed that the understanding of sufficiency in the ENERGISE resource-consumption typology is different from the one we propose in this paper (see Table 1). The difference lies in the fact that in our understanding (as presented above) sufficiency includes a justice element in addition to limiting energy use in absolute terms. If we incorporate the presence of a justice element into the analysis, we find that close to a third of all the SECIs include this in some form in both Hungary and Slovenia, but in slightly more initiatives in the latter country (see Figure 2). It is important to note that it is not only initiatives that focus on sufficiency that include a justice element. In Figure 2 it can be seen that in both countries the justice element is, in fact, most often found in initiatives classified into the 'efficiency' category. However, there are some differences as to which other initiatives have a justice element: for example, in Slovenia 'reduction-' and 'substitution-' focused initiatives more often have a justice element than in Hungary, while initiatives in the sufficiency-related categories more often have a justice element in Hungary.

Based on the definition of what we understand to be a 'justice element' provided above in the *Overall approach and methodology* section, in Table 4 we illustrate and exemplify the justice element in initiatives with the inclusion of a couple of SECIs from both countries.

THE CONCEPT OF SUFFICIENCY IN CITIZEN VISIONS

As revealed by the text analysis of citizen visions, the word 'sufficiency' does not appear in any of the 179 visions that were created. 'Sufficient' appears once in one of the six Maltese visions entitled 'Sustainable and Equitable Society' in the following context: "Overpopulation is addressed, ensuring available resources are sufficient for everyone's needs" (Riisgaard *et al.* 2015, pp. 205.). In addition to this one occurrence, even though the words 'sufficiency' and 'sufficient' do not appear in any of the other visions, similar ideas to these are expressed in one of the visions from Luxembourg ("Life is generated in an ethical way: ethical in the sense of human life for everybody by respecting the planet's limitations", pp. 194), and another one from the UK ("… where we live in balance with available resources. The highest levels of available health care/education/resources are available to all", pp. 304). The Hungarian and Slovenian visions do not mention sufficiency as it is defined in this paper.

Thus, in the next step it was found interesting to explore how often and in which countries the terms related to the components of sufficiency (namely, ecological limits and justice or equity, and terms analogous to them as shown above in Table 2), appear. Our analysis, summarized in Table 5, indicates that overall the desire of citizens to have a more just and equal society in the future is stronger than the desire to live within ecological limits.

The expression 'ecological limits' and related terms and expressions are mentioned in citizen visions in a total of 17 countries on 38 occasions. The terms that appear most often are 'consumption reduction' and 'balance or harmony with nature/the environment'. In fact, the need is expressed to be in harmony with nature in the future in 10 countries, and among these both in Hungary and Slovenia. In both countries this need is related in the respective visions to the appropriate amount of natural and cultivated land.

While citizen visions generally express a fairly moderate desire for a society that lives within its ecological means in the future, a much stronger societal need is expressed for a more equal and just society. The terms we searched for in relation to 'equity' and 'justice' appear in almost all countries (a total of 27), including both Hungary and Slovenia, where one of the visions is built on equality and is entitled *"Equality and Human Rights – A Driver of Social Development"* (Riisgaard *et al.* 2015, pp. 270).

Finally, when considering the outcomes of the text analysis conducted here, its limitations need to be considered as well;

Table 4. Examples of initiatives from Hungary and Slovenia that illustrate how a justice element can be incorporated into projects (all examples are taken from the ENERGISE SECI database).

	Initiative example from Hungary	Initiative example from Slovenia
Efficiency focus with justice element	**Energy Check for Low-Income Households:** Social workers trained to work with low-income households to increase their energy efficiency (and reduce energy bills) mainly through behaviour change. Low-Income families were involved and provided with energy advice and household equipment for free in order to decrease energy poverty and increase sustainability.	**REACH:** European project for reducing energy consumption in households affected by energy poverty. Energy advising in households was implemented but policy work was also done to promote structural change.
Sufficiency focus with justice element	**Gödöllő Climate Club:** The Club is a small, voluntary, grassroots group initiated with the primary goal of reducing the carbon footprint of its members, with the 'sustainable and just' footprint clearly communicated, and information shared, etc. with the wider local community. Decisions in the Club are made in a participatory way, taking into account everyone's opinions and ideas.	**SUŽV:** The project aims to inform, train and empower local communities in the sustainable management of natural resources in their environment and therefore to accelerate the transition to a low-carbon, material-efficient and sustainable society and facilitate a more just distribution of resources.

Table 5. The occurrence of sufficiency and related terms in citizen visions in the CIMULACT project.

Terms searched for	Number of occurrences	Countries in which the terms occurred
Sufficiency	1 (+ 2)	*3 countries:* Malta, (Luxembourg, the UK)
Ecological limits *and related terms**	20	*12 countries:* Belgium, Bulgaria, Czech Republic, Denmark, Estonia, Finland, France, Latvia, Lithuania, Luxembourg, Norway, **Slovenia**, Sweden,
Additional: ecological footprint, harmony with nature, balance with nature	18 **Total: 38**	*9 countries:* Bulgaria, Finland, **Hungary (in 3 out of the 6 visions),** Lithuania, Romania, **Slovenia**, Spain, Switzerland, the UK
Equity, justice *and related terms**	88	*All countries* except for the Czech Republic, Lithuania and Poland Occurs both in **Hungary (in 3 visions)** and in **Slovenia (2 visions)**.
Additional: basic income, sharing resources	15 **Total: 103**	

** See full list of terms in Table 2.*

in particular, the fact that there may indeed appear more instances of the same or similar concepts in the visions which are expressed in different ways using different words and expressions. In addition, due to translation into English the original wording may have been lost or slightly altered. Nonetheless, even bearing such shortcomings in mind our analysis can still provide an indication of, and useful insight into, where to focus when planning sustainable (energy) initiatives and communication activities, as well as policies.

SO, ARE WE READY FOR ENERGY SUFFICIENCY? CONNECTING THE ANALYSIS OF SUSTAINABLE ENERGY CONSUMPTION INITIATIVES AND CITIZEN VISIONS

To respond to the question articulated in the title of this paper, the simple answer is 'no, we are not yet ready'. Energy sufficiency as conceptualized in this paper is not yet widely known about and applied in society, and nor is it widely applied or implemented in sustainable energy initiatives that focus on households in Europe. Furthermore, as supported by the analysis presented in this paper, although they do exist and thus constitute a basis for further work, there are very few sustainable energy initiatives or citizen visions that explicitly connect the need for more justice and a more equal society with the need to stay within ecological limits.

On the one hand, there are many sustainable energy consumption and use initiatives, and, indeed, many of them have a 'reduction' element. However, most of them do not specify to what extent we should reduce: how much energy may we 'sustainably' (i.e. while remaining within planetary boundaries) use? Furthermore, is the amount that we should be reducing to sufficient to meet basic needs? Also, only approximately one-third of the initiatives covered in the ENERGISE project database include some kind of a justice element.

On the other hand, based on the analysis of citizen visions we can see the very clear need for increasing social justice and promoting a more equal society. Compared with the level of awareness in citizen visions of the need to stay within ecological limits and respect planetary boundaries, awareness about and the need for a more just society is much more strongly expressed. Although there appears to be recognition of the need to be in harmony or balance with nature, it is not yet widespread. It is also important to note that although this need exists, it is not yet explicitly connected with the need for more justice.

In relation to the vision creation and the analysis and development process of the former, it is also interesting to reflect on how they were taken further in the CIMULACT project during the subsequent consultation steps. In the categories of social needs that were created based on the citizen visions by the expert consortium with the involvement of external 'challenger' experts (Warnke *et al.* 2017), sufficiency does not obviously appear as a concept or an expressed social need, as it is only present in a very limited number of citizen visions. However, during the next step, when social needs were discussed further and turned into research programme scenarios (Warnke *et al.* 2017), the concept of energy sufficiency emerged in one of the scenarios under 'sustainable energy'. The research programme scenario in question is entitled 'Beyond energy efficiency: less consumption by structural design and behaviour change' and aims at increasing energy sufficiency through research that goes beyond energy efficiency (Warnke *et al.* 2017, pp. 214). The participants – citizens, experts and CIMULACT consortium members – of this workshop related this research programme scenario to three specific citizen visions, one each from Cyprus, the Netherlands and Hungary. From the wording of the scenario it is not clear whether justice features as a component of sufficiency. Furthermore, this scenario is only one of the 48 that were created (Warnke *et al.* 2017).

To summarize, we are not ready yet for a sufficiency and justice approach, neither in general, nor in the field of energy. By 'not ready' we mean that neither 'sufficiency' nor 'just sufficiency' are yet explicitly articulated as needs in citizen visions, nor as objectives in sustainable energy projects. What is particularly notable is the lack of awareness of the link between staying within ecological limits and satisfying the basic needs of all (which also includes an awareness of the necessity of investigating what exactly basic energy needs are, and whether they can be satisfied for all while remaining within planetary boundaries). However, there appears to be limited yet relevant grounds for working towards the stronger presence of sufficiency and justice in the future.

Conclusions

As it has become evident that energy efficiency is not delivering on its potential, sufficiency needs to play a more prominent role in sustainable energy policy and action, especially because it offers a way to connect the satisfaction of basic needs with not consuming excessive and unsustainable amounts of resources. However, efficiency is currently the most important objective of both policies and initiatives. Thus, there is an urgent need to explicitly connect absolute reduction objectives with justice elements in the conception and design phase of both energy policies and sustainable energy initiatives. Clearly understanding the need for this, researchers have an important responsibility and role to play in helping policy-makers, practitioners and wider society to recognize the need for sufficiency and justice to be connected and implemented in tandem. In addition, while this is being done, the important discussion about what basic needs are in terms of energy, and whether these can be satisfied while staying within ecological limits needs to commence in the policymaking and academic community, as well as in society more generally. Methods that build on inclusivity and multi-stakeholder dialogue, such as those developed and tested in the CIMULACT project, can be useful in facilitating such processes and realizing these objectives.

As there is great urgency for this to happen, there is also a need to develop a multi-layered approach. First of all, an important component of working towards sufficiency and justice is making changes in policy- and decision-making processes. To promote justice, the representation of all stakeholders, especially the most marginalised ones, in decision- and policy-making processes is of crucial relevance. In this work it is possible to build on the few but still important examples of citizen attempts to express the necessity of such a future. Moreover, since there is a widely expressed need to increase the level of social justice in visions created by European citizens, it may be best to start the discussion from there, and then make the connection with the need to respect ecological limits, as well as the often expressed need to be more in harmony or balance with nature.

Next, while it is necessary to introduce policies that lay the ground for and also explicitly express requirements for sufficiency initiatives, inspiration for action at the personal and community levels is also needed. Researchers have a key role to play here in helping to create visions of a *desirable 'just sufficiency'* future that inspires action. We, researchers, need to become more vocal about the importance of promoting the principle of just sufficiency, as it is already being expressed by others who have made concrete suggestions about how this can be achieved (see e.g. Agyeman 2005, Calwell 2010, Melamed *et al.* 2012, Sovacool *et al.* 2017, Potocnik *et al.* 2018).

Furthermore, to provide examples of how this can be done in practice, as well as to inspire more widespread action, there is a need for the more detailed study as well as recognition and dissemination of existing initiatives that include both justice and sufficiency elements. These could be taken from the ENERGISE database discussed herein and supplemented with other examples from outside Europe, as well as from other fields. This work could also build on very similar work conducted elsewhere; for example, in Westley *et al.* 2011, Potocnik *et al.* 2018, and Vadovics and Milton 2018.

Finally, although there is some research-based evidence available from Germany that modern living standards may be achievable with a much lower energy demand, there is not yet concrete evidence that such reductions would maintain humanity's needs within the carrying capacity or ecological limits of the planet (De Decker 2018). Thus, open discussion as well as quantitative research are needed about both the lower (i.e. sufficient to satisfy basic needs) and upper limits (i.e. within ecological limits of the planet) of resource consumption at the household, regional and global level to guide both policy and action.

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