



Aalborg Universitet

AALBORG UNIVERSITY
DENMARK

Development of Nordic-Baltic competence and experience sharing of energy sufficiency

Kronby, Helena; Veber Rasmussen, Rikke; Jørgensen, Michael Søgaard; Olesen, Gunnar Boye; Brizga, Janis; Lekaviius, Vidas; Vikkelsø, Ann

Publication date:
2022

Document Version
Publisher's PDF, also known as Version of record

[Link to publication from Aalborg University](#)

Citation for published version (APA):

Kronby, H., Veber Rasmussen, R., Jørgensen, M. S., Olesen, G. B., Brizga, J., Lekaviius, V., & Vikkelsø, A. (2022). *Development of Nordic-Baltic competence and experience sharing of energy sufficiency*. Baltic Nordic Energy Research Programme.

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal -

Take down policy

If you believe that this document breaches copyright please contact us at vbn@aub.aau.dk providing details, and we will remove access to the work immediately and investigate your claim.

Development of Nordic-Baltic competence and experience sharing of energy sufficiency



Project partners:
Aalborg University
Lithuanian Energy Institute
INFORSE-Europe
Green Liberty Latvia



Integrating **Energy Sufficiency** into Modelling of Sustainable Energy Scenarios
- A project funded by the Baltic Nordic Energy Research Programme

Development of Nordic-Baltic competence and experience sharing of energy sufficiency

Project acronym	IESIMOSSES
Title	Integrating Energy Sufficiency into Modelling of Sustainable Energy Scenarios
Deliverable	Work package 6 “Development of Nordic-Baltic competence and experience sharing of energy sufficiency”
Project partners	Michael Sjøgaard Jørgensen (AAU) (project manager), Janis Brizga (Green Liberty), Vidas Lekavičius (Lithuanian Energy Institute) and Gunnar Boye Olesen (INFORSE-Europe)
Funded by	The Baltic-Nordic Energy Research Programme
Date of deliverable	31.03.2022
Authors	Helena Kronby (AAU), Rikke Veber Rasmussen (AAU), Michael Sjøgaard Jørgensen (AAU), Gunnar Boye Olesen (INFORSE-Europe), Janis Brizga (Green Liberty), Vidas Lekavičius (Lithuanian Energy Institute), & Ann Vikkelsø (INFORSE-Europe)

Citation (APA):

Kronby, H., Rasmussen, R. V., Jørgensen, M. S., Olesen, G. B., Brizga, J., Lekavičius, V., & Vikkelsø, A. (2022). Development of Nordic-Baltic competence and experience sharing of energy sufficiency. WP6 report from “Integrating Energy Sufficiency into Modelling of Sustainable Energy Scenarios”.

Project overview:

Integrating energy sufficiency into modelling of sustainable energy scenarios

The project was funded by the Baltic-Nordic Energy Research Program and took place 2020-2022. The project partners were Green Liberty (Latvia), INFORSE Europe (Denmark), Lithuanian Energy Institute (Lithuania) and Aalborg University (Denmark). The project was coordinated by Aalborg University. The project had an observer group with members from AirClim (Sweden), Finnish Nature Conservation Society (Finland), Naturvernforbundet (Norway), Association négawatt (France), and Stockholm Environmental Institute (Tallinn Office, Estonia).

The project objectives were:

1. Integrate sufficiency aspects into energy modelling tools applied for development of sustainable energy scenarios
2. Develop modified Danish, Latvian and Lithuanian national sustainable energy scenarios, which build upon the combination of sufficiency, efficiency and renewable energy
3. Create national policy dialogues among public and private actors in the Nordic and Baltic countries about energy scenarios that include energy demand changes from a sufficiency perspective and discuss the feasibility of these scenarios and the possibilities and limitations for socio-economic and regulatory changes enabling transition towards these scenarios
4. Disseminate the methodology for integration of sufficiency into energy modelling tools and development of scenarios, and disseminate the experiences with developing and applying these tools and scenarios to Nordic and Baltic stakeholders and to scientific journals

The following reports are available from the project:

Systematisation of experiences with energy sufficiency initiatives (Work package 2):

The report presents the applied understanding of energy sufficiency in the project and gives a literature-based overview of energy sufficiency actions within energy consumption in households and within mobility respectively. Furthermore, the report presents data, which enables integration of sufficiency actions into energy modelling.

Integration of sufficiency into energy modelling tools (Work package 3):

The report describes how sufficiency-based changes in energy demand within energy consumption in households and within mobility can be quantified at national level and can be included through exogenous and endogenous modelling approaches in EnergyPlan and MESSAGE modelling tools.

Development of adjusted national sustainable energy scenarios (Work package 4):

The report analyses how much energy sufficiency measures can contribute to the reduction of national greenhouse gas emissions. The report presents revised national sustainable energy scenarios for Denmark, Latvia and Lithuania based on the EnergyPlan and MESSAGE modelling tools with the integration of energy sufficiency.

National policy dialogues (Work package 5):

The report presents the developed concepts for national policy workshops aiming at exploring how policy measures can influence preferences for sufficiency-based reductions of energy consumption. Furthermore, the report presents the experiences from the national policy dialogues organised in Denmark, Latvia and Lithuania.

Dissemination to other Nordic and Baltic countries (Work package 6):

The report presents the experiences from a two-day workshop with dissemination of perspectives on and methods within energy sufficiency to Baltic and Nordic countries that were developed in the project. Furthermore, the report presents the joint cross-national discussions and experience sharing among the participants at the workshop. Finally, the report presents ideas for further research and knowledge development within energy sufficiency.

The reports can be requested by sending an email to the project coordinator Michael Søgaard Jørgensen, Department of Planning, Aalborg University, Denmark at msjo@plan.aau.dk

Table of contents

Table of contents	1
1.0 Introduction	2
1.1 Reading Guide	3
2.0 Approach and methodological considerations	4
3.0 Workshop summary	6
3.1 Introduction to Energy Sufficiency	8
3.2 Identification of Sufficiency Measures	9
3.2.1 Sufficiency measure discussions	11
3.3 Integrate sufficiency practices into modelling of energy scenarios	15
3.3.1 Energy modelling experience sharing	16
3.4 Using adapted energy scenarios for national policy development	21
3.4.1 National policy discussions	23
4.0 Workshop outcomes	27
4.1 Main points on energy sufficiency	27
4.2 Reflections on the proposed framework	28
References	30

1.0 Introduction

The report has been written as part of the project “Integrating energy sufficiency into modelling of sustainable energy scenarios”, which is funded by The Baltic Nordic Energy Research Programme. The project is coordinated by Aalborg University and conducted in collaboration between Aalborg University, INFORSE-Europe, Lithuanian Energy Institute and Green Liberty Latvia. The aim of the project is to contribute to the development of more advanced strategies for systemic, sustainable transition of energy production and use, based on new social practices that reduce energy consumption. This contribution is met through developing new, improved national 2030 energy and climate scenarios based on the feasibility of reaching a net-zero emission and 100% renewable energy system by 2050. Besides building upon existing national sustainable energy scenarios, the new scenarios developed in the project integrate experiences from recent national sustainable energy practice initiatives within the categories; household energy consumption and mobility.

This report is a deliverable of work package 6 “Development of Nordic-Baltic competence and experience sharing within energy sufficiency” and presents the experiences from a two-day workshop with dissemination of perspectives on and methods within energy sufficiency to Baltic and Nordic countries developed in the project. Furthermore, the report presents the joint cross-national discussions and experience sharing among the participants at the workshop. Finally, the report presents ideas for further research and knowledge development within energy sufficiency. It builds on experiences from previous workshops with national policy dialogues (reported in work package 5 “National policy dialogues in Denmark, Latvia and Lithuania”).

The purpose of this report is twofold; to present discussions and concerns in the field of energy sufficiency, showing different perspectives from heterogeneous groups of actors representing diverse national contexts as well as different professional areas of expertise. Hence the aim was to create awareness on the topic of energy sufficiency by defining sufficiency practices and integrating measures of such into modelling in order to develop scenarios with the intent to initiate policy discussions on the matter. Additionally, the report aims to provide suggestions on how workshops can be organised and facilitated in the pursuit of creating awareness and initiating energy sufficiency policy discussions in a cross-national setting. Evaluation and assessment of the workshop approach are thus intended to support others in planning and facilitating similar workshops.

1.1 Reading Guide

The report is structured as follows:

- Chapter 1.0 is an introduction to the report and establishes the project foundation and how this report serves as a contribution to the scope of the project.
- Chapter 2.0 establishes the approach and methodological considerations chosen for the purpose of disseminating knowledge and developing competencies with the aim of initiating policy dialogues.
- Chapter 3.0 begins with a presentation of the workshop programme and continues with four sections elaborating on each theme of the workshop including subsections with participants' contributions hereof.
- Chapter 4.0 is an evaluation and assessment of the workshop outcomes. It includes a summary of the main discussion points of the workshop and a reflection on the chosen methodological approach in terms of how it can be considered successful in the aim of disseminating knowledge and initiating policy dialogues, on energy sufficiency.

2.0 Approach and methodological considerations

The theoretical standpoint of this project stems from the practice theory literature, that provides an understanding of the dynamics of everyday practices, that is constituted by the three elements; materials, meanings and competences, as described by Shove et al. (2012). When approaching societal changes, it is essential to move away from conventional understandings of practices being observable activities and habits of individuals as outcomes of identifiable factors. Instead, “theories of practice draw attention to the historically and culturally specific trajectories of what people do, the details of which reflect distinctive accumulations of meaning, materiality and competence and the relative positioning of one practice with respect to others” (Shove et al., 2012, p. 145-146). Thus, practices become expressions of socially shared tastes and meanings, knowledge and skills, and materials and infrastructure, as they circulate, bundle together and build on historically trajectories of elements. When aiming to support changes of practices towards sustainable energy futures, the role of policies are thereby influencing the dynamics of practices. “In brief, policy makers and other actors, past and present, can and do influence: a) the range of elements in circulation; b) the ways in which practices relate to each other; c) the careers and trajectories of practices and those who carry them; and d) the circuits of reproduction” (Shove et al., 2012, p. 146). More in-depth descriptions of the theoretical considerations of the IESIMOSSES project has been reported in workpackage 2 “Systematisation of experiences with energy sufficiency initiatives”.

Based on the desire to convey and develop competencies around the integration of sufficiency in energy modelling, a workshop was chosen as a methodological approach to achieve this goal. The workshop was held in an online format, which enabled a larger share of participants to attend, and long-distance travel to be avoided. The online tool Zoom Video Communications, was used as the shared platform for discussions enabling participants to see the other attendees and follow the presentations held by members of the IESIMOSSES project. The platform supported verbal discussions as well as questions and comments raised in the chat function. In relation to the previously held policy workshop, this Nordic-Baltic workshop was intended to contribute to more comprehensive discussions on energy sufficiency, from the identification of such to the modelling of scenarios and discussions initiating policy dialogues. In the pursuit of this contribution, the Nordic-Baltic workshop was facilitated with more in-depth activities using participatory design methods as tools to inspire participants to engage in the discussions. Thus, sessions within the workshop took place in break-out rooms through Zoom Video Communications, where participants were distributed into smaller groups supporting active engagement. Discussions in the break-out rooms were furthermore supported by interactions in an online board tool called MURAL. The MURAL platform combined with the video communication tool Zoom provided a shared online space for interaction.

To support discussions among heterogeneous groups of actors, objects placed in the MURAL board were intended to function as boundary objects. Such objects must establish a shared context among

actors of different knowledge worlds and enable communication across knowledge boundaries. As described by Carlile (2002) an effective boundary object enables communication across both syntactic, semantic and pragmatic knowledge boundaries. A boundary object on the syntactic boundary “establishes a shared syntax or language for individuals to represent their knowledge” (Carlile, 2002, p. 451), whereas a boundary object at the semantic boundary can take form as a concrete method that “allows individuals to specify what they know—what they worry about—as concretely as possible to the problem at hand” (Carlile, 2002, p. 452). Finally, what is proposed by Carlile (2002) is that it is not enough to transfer knowledge, boundary objects must deal with the pragmatic boundary and “facilitates a process where individuals can jointly transform their knowledge” (Carlile, 2002, p. 452).

From a participatory design perspective, methods like design games can work as boundary objects, with the intention to transform knowledge through active engagement. Premade elements in the MURAL board were framed as a design game board inviting participants to engage in discussions through different tasks¹. Design games are described by Vaajakallio et al. (2014) as games that “provide a stage and tools for people to share current and past experiences in order to envision future ones” (Vaajakallio et al. 2014, p. 63-64). Design games are context-specific and created for certain interventions of attendees and topics under investigation. Hence, general templates can not be made and likewise, for the specific workshop, the MURAL board was designed to cover and steer discussions on different energy sufficiency aspects for the purpose of the workshop.

Design games can be created as both high fidelity or low fidelity, depending on the desired outcome of the intervention. Low fidelity design games are characterised by a loose framework that offers the participants great influence on the direction of the discussion. High fidelity design games, on the other hand, consist of more predefined elements to steer and structure the discussions in certain directions and influence the ‘rules of the game’. The design game developed for this Nordic-Baltic workshop included high fidelity elements in the posed questions structuring the discussions. However, low fidelity elements in the form of post-its enable participants to express their thoughts freely without having predetermined answers which they should choose from. Thus design games were used to empower participants and “provide hands-on tools for establishing a common language” (Vaajakallio et al. 2014, p. 64-65) and hence work as a boundary object aiming to support knowledge sharing across different knowledge domains (Carlile, 2002). Due to the variations in participants' areas of expertise and prior knowledge on energy sufficiency, it was deemed helpful to relatively high levels of participation in which the subject matter could be elucidated from different perspectives.

¹ Nordic-Baltic workshop MURAL board:
<https://app.mural.co/t/rikkescorpany0956/m/rikkescorpany0956/1641307337646/cc79ef90802cabe46039b43edd5dc3779ecc3216?sender=u1774f11ee0fc93bfdbbb2451>

3.0 Workshop summary

The cross-national workshop entitled; “Energy sufficiency in energy modelling and policy development”, was a two-day workshop held online on the 27th and the 28th of January 2022. Initially, the workshop was planned to be held at Aalborg University campus in Copenhagen but due to Covid-19 pandemic restrictions, an online workshop format was chosen instead.

Through the online format, a total of 31 participants attended representing both different nationalities and professional areas of expertise. This included researchers, consultants, NGOs and other policymakers from the following nine countries: Denmark, Lithuania, Latvia, Finland, Estonia, France, Sweden, Norway and Holland. A list of all participants attending the two-day workshop can be found in appendix 1.

The aim of the workshop was to initiate policy dialogues on sufficiency actions by disseminating work done in the IESMOSES project and support the development of Nordic-Baltic competencies for integrating energy sufficiency measures into the modelling of energy scenarios. Thus, the scenarios served as tools for initiating policy dialogues. In the pursuit of this contribution, the workshop programme was divided into sections covering the following four themes:

- 1. Introduction to energy sufficiency as part of sustainable energy transition together with increasing share of renewable energy and increasing energy efficiency.*
- 2. How to identify experiences and ideas for energy sufficiency?*
- 3. How to integrate sufficiency practices into modelling of energy scenarios?*
- 4. Using adapted energy scenarios, which include sufficiency measures, in the development of national public regulation of sustainable energy transition.*

The four themes of the workshop served as a suggestion on how to structure workshops when aiming to initiate energy sufficiency policy dialogues (Table 3.1 shows the workshop programme). Each theme provided participants with insights into the background and findings of the IESIMOSSES project and invited the participant to engage in discussions on the topics. Some background material was shared with the participants prior to the workshop in order to establish a foundation for discussions. This included four documents with brief introductions to each theme of the workshop²:

- Energy sufficiency definition(s): a brief overview of energy sufficiency definitions identified in the project (Theme one)
- Modelling energy sufficiency: exogenous and endogenous modelling. Overview of energy sufficiency measures (Theme two and three)
- Developing sufficiency data for energy scenario modelling: the approach and an illustrative example of how sufficiency-based data can be generated for modelling of energy scenarios (Theme three)

² Workshop presentations and background documents:
https://drive.google.com/drive/folders/1sfTnelgmX-hjb_jyWWad7q-5bJmx-ny-?usp=sharing

- **Policy approaches, theoretical considerations:** a short paper regarding policy approaches to support and promote energy sufficiency (Theme four)

Hence, the workshop built on knowledge from the IESIMOSSES project which has been further elaborated in the accompanying reports of this project. It is similarly relevant to note that the discussions of the workshop took their point of departure from presentations made by members of the IESIMOSSES project and the project observer group, and thus covers some of the same concerns and points of view. However, in contrast to the accompanying reports, the knowledge presented and discussed in this report is grounded in perspectives brought forward by participants from diverse professional backgrounds as well as nationalities.

Workshop programme

<p>THEME ONE <i>Introduction to energy sufficiency as part of sustainable energy transition</i></p>
<p>PRESENTATION - Introduction to workshop agenda and programme</p>
<p>PRESENTATION - Introduction to energy sufficiency as part of sustainable energy transition together with increasing share of renewable energy and increasing energy efficiency</p>
<p>THEME TWO <i>How to identify experiences and ideas for energy sufficiency?</i></p>
<p>PRESENTATION - How to identify experiences and ideas for energy sufficiency?</p>
<p>BREAK-OUT 1 - Questions and discussions in national/multinational break-out rooms</p>
<p>PLENARY DISCUSSION - Main points from break-out rooms presented in plenary</p>
<p>THEME THREE <i>How to integrate sufficiency practises into modelling of energy scenarios?</i></p>
<p>PRESENTATION & DEMONSTRATION - How to integrate sufficiency practices into modelling of energy scenarios? Demonstration of exogenous energy modelling in EnergyPlan</p>
<p>DEMONSTRATION - Experiences from négaWatt and demonstration of endogenous modelling in MESSAGE</p>
<p>EXPERIENCE SHARING - Participants with prior energy modelling experience share</p>
<p>THEME FOUR <i>Using adapted energy scenarios, which include sufficiency measures, in the development of national public regulation of sustainable energy transition.</i></p>
<p>PRESENTATION - Using adapted energy scenarios, which include sufficiency measures, in the development of national public regulation of sustainable energy transition.</p>
<p>BREAK-OUT 2 - National policy development, in break-out rooms</p>
<p>PLENARY DISCUSSION - National policy development and further work and cooperation possibilities</p>

Table 3.1 - Workshop programme of the Nordic-Baltic workshop entitled “Energy sufficiency in energy modelling and policy development”

3.1 Introduction to Energy Sufficiency

The first part of the workshop was concerned with the theme: *Introduction to energy sufficiency as part of sustainable energy transition together with increasing share of renewable energy and increasing energy efficiency*, and was based on presentations from project members and a presenter from the project observer group, Association négaWatt. The presentations were kicked off by Michael Sjøgaard Jørgensen, who introduced the workshop agenda and programme, followed by an introductory presentation on the scope of the project (as described in the previous sections of this report). Moreover, as part of the introduction, all participants were asked to introduce themselves by names and interests in the area of sufficiency, in order to create a common understanding of who is present in the workshop. This was particularly important as the workshop was held online and participants were only able to see one another through the camera if it was switched on. Moreover, it stressed the point that the workshop was aimed to initiate dialogue among a diverse group of actors.

Building on the background material³ shared with the participants prior to the workshop, Janis Brizga made a presentation on sufficiency definitions and the term's connection to efficiency and renewable energy. Several definitions of the concept of sufficiency exist, but essentially the term denotes a focus on consuming energy on a sufficient level, that is neither too high - exceeding planetary boundaries - nor too low - causing energy poverty and lack of meeting basic human needs. Further elaborations on sufficiency definitions can be found in work package 2 report “Systematisation of experiences with energy sufficiency initiatives”.

In addition, Yves Marignac, representing the project observer group, made a presentation on how sufficiency is approached by Association négaWatt (a non-profit french energy think tank). They look at sufficiency from a bottom-up perspective and stress that we must start thinking about the service with sufficiency before technical efficiency. Thus négaWatt have characterised and presented three leverages of energy sufficiency: servicial, dimensional and organisational. The servicial level is characterised by the intensity and duration of use of equipment and is close to what consumers can do on their own. Dimensional sufficiency is concerned with dimensional factors of energy consumption, which include size and the nominal capacity of equipment, dwellings, etc. The organisational level of sufficiency relates to organisations and is characterised by collective planning and sharing, for example co-working spaces, shared transport etc. (Marginac, 2019). For every sufficiency leverage, the négaWatt association suggests different policies that can be applied, which will be further discussed in section 3.4 *Using adapted energy scenarios, including sufficiency measures, for national policy development*.

³ Energy sufficiency definition(s): a brief overview of energy sufficiency definitions identified in the project.

3.2 Identification of Sufficiency Measures

With an established baseline of the concept of energy sufficiency, session two of the workshop was concerned with how sufficiency measures might be identified and themed; *How to identify experiences and ideas for energy sufficiency?*. Discussions on this topic (described in section 3.2.1) were initiated through two presentations: one by Gunnar Boye Olesen about identified sufficiency practices within the project, and one by Vidas Lekavičius elaborating on the findings from citizen surveys and energy statistics.

The first presentation by Gunnar Olesen focuses on data collection and presenting the sufficiency practices identified and quantified in the project. The objective is to identify realised practices that can be scaled up to a level, where it will affect national energy demands and climate impacts. Demands for energy services within household and personal transport have been analysed in the IESMOSES project in order to identify energy sufficiency practices. Thus the identification builds on various sources of information that have been described and analysed in work package 2 “Systematisation of experiences with energy sufficiency initiatives”. The following list is an overview of the actions that have been identified and focused on in this project:

- Reduce living space with more relocation and renting out rooms
- Reduce indoor temperature, based on results from Living lab
- Reduce laundry cycles, based on results from Living lab
- Electricity savings, based on different sources as Living lab, past experiences and potentials
- Reduce hot water use with EU labelling on water efficiency
- Reduce hot water use with shorter baths/showers, based on past experiences with water savings etc.
- Reduce (car) transport use with sustainable mobility plan

Vidas Lekavičius followed the presentation with findings from citizen surveys and energy statistics as another approach to data collection to be used in modelling. This is based on a positive approach to what could be achieved under usual conditions, whereas the normative approach (elaborated in section 3.3) is based on opinions of what needs to be achieved.

The data is based on a survey conducted with 1008 Lithuanian households, carried out by the Ministry of Energy and funded by Lithuanian Research Council, as part of an on-demand research project named “Households in the context of energy transition”⁴. The data collected showed that 63% were not willing to pay more for energy and 53% were also not interested in reducing their consumption. Interestingly, the survey also showed that the ones who agreed to reduce their consumption were also the ones who already used less than average (further descriptions can be found in work package 5 “National policy dialogues in Denmark, Latvia and Lithuania”). The survey

⁴ The Lithuanian “Households in the context of energy transition” project page: <https://www.lei.lt/projektas/households-in-the-context-of-energy-transition-nuene/?table=Yes?table=Yes>

reflects the positive approach of what actually is and can be achieved under usual conditions, however, the positive approach does not cover the full sufficiency potential as even small campaigns may change the survey responses resulting in greater willingness to accept sufficiency measures. A combination of both normative and positive approaches are therefore necessary as the targets have to be both ambitious and achievable.

Based on the two presentations, workshop participants were invited to engage in discussions on the topic. Participants were divided into groups based on nationalities, with some merged into one group, making a total of five discussion groups. In break-out rooms, discussions were supported by questions posed in the online MURAL board tool:

- What experiences do you have with energy sufficiency?
- What relevant additions could be made to our suggestions?
- How are the identified sufficiency practices relevant/not relevant to your national context?
- What preconditions are needed to allow them?
- How to evaluate the feasibility of sufficiency actions?

Members of the IESMOSES project team engaged as facilitators in the different discussion groups, where participants were prompted to generate discussion points on post-its while engaging in the verbal discussions in the group. Figure 3.1 provides insight into how the discussions were facilitated through questions, and how participants engaged and shared reflections using post-its in the online MURAL board tool. The figure shows the arrangement of the five groups consisting of participants from one or more countries. The group discussions were followed by a plenary discussion among all participants, where the main points from each group were presented, based on comments made in MURAL.



Figure 3.1 - An overview of the breakout room discussions on theme two, providing insights into how the discussions were structured and facilitated.

3.2.1 Sufficiency measure discussions

The discussions that took place in the break-out rooms and then in plenary, have been categorised based on the questions posed in the MURAL board and will be presented in the following.

Experiences with energy sufficiency

Sufficiency is a relatively new concept in discussions on energy consumption and reduction. It became clear from the break-out room discussions that participants had different experiences with energy sufficiency, whereas for some, the term itself was unknown prior to the workshop. Discussions around the concept were particularly a focal point in two of the groups, which consisted of representatives from Finland and Estonia in one group and Sweden, Norway, France and Holland in the other. A Swedish associate professor from Chalmers University of Technology shares that she has never used the term ‘sufficiency’ but has used many options for energy savings in her modelling setups. Thus she has experience with it for scenario narratives and finds it important but has never referred to it under the term sufficiency. Likewise, a representative from Estonia points out that compared to efficiency, which is widely known, discussions on sufficiency do not really exist and that the term is unfamiliar to people in Estonia. A group of representatives from Latvia have experienced increasing discourse on sufficiency as a response to an increase in energy consumption costs. For example, an increase in fuel costs make people rethink the need to drive. In general, participants have experience with sufficiency concerning transportation with the potential of reductions or changes in transport that can reduce personal vehicle use. Some have experience with integrating modal shifts in transport modelling and are familiar with sufficiency in this sense.

Hence, the concept of sufficiency is not commonly used in many countries. Instead, several participants pointed to the use of ‘energy savings’, which they find more interesting, clearer and potentially easier to promote. However, it might lack reflections on the double-sided aspects of sufficiency by only focusing on the efforts to reduce energy and not reflecting the lower limits to ensure basic needs and avoid energy poverty. A representative from D-Mat shares a Finnish term for sufficiency ‘kohtuus’ which might be more comparable, as it is quite broad and does not only cover environmental sustainability. In line with the previous presentation by Janis Brizga it becomes evident from the discussions that no single definition is established and it shows that the chosen term is not widely accepted but competes as well as complement other similar terms.

Discussions on sufficiency actions

Discussions on the reduction of dwelling size generally align with findings in the literature, showing a focus on certain groups at certain life stages such as elderly people living in larger dwellings than necessary, who finds it overwhelming to move, or parents who live in the same dwellings even though their kids have moved out. The discussions show that instead of providing ‘one size fits all’ solutions, there is a need for approaches that are sensitive to different life situations and capabilities.

On the other hand, discussions in the Danish group emerge on whether it even makes sense to reduce living space. A representative from the Danish Energy Agency mentions that reduced dwelling sizing may be less relevant since it does not have a very high potential impact as it will be too hard to regulate. An associate professor from Aalborg University with energy modelling experiences agrees and points to an issue about the statistics regarding dwelling sizes since she sees a tendency to measure dwelling size differently in Denmark compared to other countries, which makes dwellings appear bigger. These concerns, addressed by the representative from the Danish Energy Agency as well as the associate professor from Aalborg University, shows uncertainties on how to evaluate which actions are realistic and which are not, and thus whether these actions can be scaled to a national level. Instead, they argue that the focus should be more on mobility which shows a bigger potential from a long term perspective. Thus there is scepticism towards some of the sufficiency actions, where especially dwelling size and showering are discussed as an expression of people's basic priorities which can not be changed.

Contrastingly, it is emphasised among other participants that people have different incentives for changing practices. For example, health reasons can be incentives to adapt to sufficiency practices for shorter bath time and fewer baths. Furthermore, when people started working from home (referring to lockdowns during the global Covid-19 pandemic), they showered less. The practice of showering is thus determined by social aspects of being presentable to others. The practice of showering is also affected by and bundles with other practices, such as the practice of remote working. In the Lithuanian discussion group, distant working is suggested as an additional sufficiency measure to focus on in order to reduce energy consumption from transportation. Sufficiency practices within transport are moreover a question about better time planning and creating the opportunity for connecting several practices, such as grocery shopping combined with transport to and from work. This might for some eliminate an extra drive to the grocery store.

Additional suggestions were concerned with a greater focus on health impacts from air pollution and other environmental impacts, and how they can support energy sufficiency. It is generally emphasised that it is important to support an understanding of the scale of actions, e.g. how turning off lights creates an impact compared to moving to smaller houses. Finally, participants emphasise that society and people always change and therefore the aim must be to grasp this potential positively. Whether changes are induced by policies or otherwise, the question is how to stimulate and include both in order to grasp the full potential for making changes. At last, it is essential to acknowledge and provide social and collective support for sufficient practices in order to keep new practices going.

Sufficiency practices in a national context

The relevance of sufficiency practices depends on the national context and differs from country to country. Associate professor from Chalmers University of Technology finds sufficiency practices to be

highly relevant in Sweden as a necessary tool for building sustainable societies. She works with global energy systems modelling and stresses that all types of energy savings are relevant and must be considered as an important part of both bio-economy and circular economy.

In a Danish context, discussions continue on whether sufficient housing practices or sufficient transport practices are relevant in the national context. On one hand, it is argued that both sectors present potential energy reductions with shifts from car to bicycle and reduced dwelling size, reduced laundry cycles, reduced hot showers etc. On the other hand, it is argued that focus must be placed on the transport sector only because attendees suppose only minor reductions to be achievable in the housing sector of heating demands when considering a long term system perspective. Hence, from a modeller and policymaker perspective, there is more to gain when focusing on the transport sector. Discussions on the relevance of sufficiency practices in a Danish context is mainly focused on the upper ecological limits, whereas less focus is on the lower social limits which must ensure everyone has access to a sufficient amount of energy to satisfy basic needs. This is due to the fact that energy poverty is not currently a widespread issue in Denmark, however, with rising energy prices, attendees address that this might increasingly be the case.

Latvia and Lithuania are already experiencing energy poverty among citizens, and approaching energy sufficiency on the lower limits is therefore highly relevant in these countries. In both groups, it is emphasised that energy underconsumption exists and that has to be taken into account when addressing the issue of energy consumption. Thus it is suggested that more progressive approaches to amelioration of energy poverty are needed. Further discussions on the relevance of sufficiency practices in the Latvian context is concerned with the practices of sharing and cooperation. Representatives point to issues regarding low public trust, which influences the possibilities for sufficiency practices such as car sharing, room sharing etc. Thus it might be problematic for some areas of the Latvian society to adapt to these kinds of sufficiency practices.

A representative from Finland suggests changing focus away from the national context as he finds it more relevant to address sufficiency in an urban/rural context. He argues that moving to smaller homes is easier in cities compared to rural areas. Hence, discussions point not only to differences in national contexts but in diverse areas within the national context as well.

Preconditions of sufficiency actions

To allow sufficiency practices to develop, preconditions must be taken into account when addressing the change. A fundamental aspect of such is the acceptance amongst the population, which is necessary for politicians to start addressing it. To obtain acceptance, social norms must be considered e.g. with the previously mentioned situation in Latvia experiencing low public trust, social norms are currently restricting sharing practices of both transport and room renting. Social norms are similarly reflected in the way people live and the willingness to move to smaller apartments. This

raises further questions on social status and how people perceive and attach meaning to the practices of e.g. living in small spaces, using public transport etc.

Thus, social acceptance must be in place for changes to happen. Some participants argue that relevant arguments when informing the public is always important in order to widen the horizons and influence the established social meanings. Some suggest it should be integrated already in the primary school, whereas others point to campaigns on e.g. the need for vegetarian food, how healthy it is to bike etc.

The acceptance and meanings of practices are closely connected to the material elements, which must be in place in order to support sufficiency practices. In terms of the transport sector, it is argued that there must be sufficient public transport possibilities and bicycle paths in order to support social practice changes. Currently, cycling infrastructures in Estonia are poor and do not favour bicycle practices over cars. The situation in Finland is similar, though improvements in this area have recently been achieved. However, a lack of maintenance and effort was experienced in this regard. Hence it is important to establish these infrastructures to allow changes to happen. Several participants stressed the development of business models to enable a sharing economy with the development of a rental market, to be essential preconditions for sufficiency actions. Others point to more concrete preconditions that must be in place to support greater opportunities for individual adaptation. For example, to reduce indoor room temperature, sufficiently accurate temperature regulation equipment must be provided to give citizens the ability to monitor temperatures themselves. It is therefore agreed and argued that preconditions must be taken into account in order to support changes towards sufficiency practices.

Evaluating the feasibility of sufficiency actions

Final discussions are concerned with the question of how the feasibility of sufficiency actions can be evaluated, in order to understand the potential for change. Some participants point to surveys (similar to the Lithuanian survey presented by Vidas Lekavičius) and others point to living lab experiments (similar to the ones presented by Gunnar Boye Olesen). A participant stresses that it is a difficult task since society and people always change and she argues that it is about positively grasping the potential. In this regard, lines are drawn to the pervasive changes that occurred during the global Covid-19 pandemic. Thus, conclusions can be drawn from how people have adapted to Covid-19 restrictions. However, although comparisons are made, it is emphasised that the two crises (Covid-19 and Climate crisis) are very different in the timescale perspective. Whereas the Covid-19 pandemic was only a temporary crisis, climate adaptation is a process crisis. Another participant adds to the discussion by emphasising that the temporary aspects of changes must be acknowledged and taken into account when evaluating the potential for sufficiency actions. He argues that larger test populations and longer test periods must be performed in order to cover the risks of people returning to old habits after shorter test periods.

A representative from D-mat demonstrated and proposed a Finnish board game called Climate Puzzle (Climate Puzzle, n.d.) as a tool for evaluating the feasibility of sufficiency actions. The game is developed by D-mat with the intention to illustrate the significance of everyday actions and support planning of personalised 2030 low-carbon lifestyles. Hence he argues that Climate Puzzle in workshops could provide statistics on the most popular options to plan and implement when approaching sufficiency actions. Thus it can serve as a tool for initiating dialogue and provides insights into people’s willingness to change practices.

3.3 Integrate sufficiency practices into modelling of energy scenarios

Second day of the workshop (the 28th of January 2022) was a full day workshop building upon the discussions from the day before. This section will elaborate on the third theme; *How to integrate sufficiency practices into modelling of energy scenarios?* and builds on background material shared with participants prior to the workshop⁵.

One of the main workshop objectives was competence development, thus a practical approach to energy modelling was also an important focus. However, due to the workshop going online, hands-on experimentation was not possible, wherefore live demonstrations by Gunnar Olesen and Vidas Lekavičius were prioritised. Prior to the modelling demonstrations, the data processing for inputs into modelling is presented based on findings from the IESIMOSSES project (further in-depth descriptions hereof are reported in work package 3 “Integration of sufficiency into energy modelling tools”). It is presented how sufficiency practices are developed into assumptions on possible demand reductions.

Energy sufficiency can be included in energy models as either exogenous parameters or endogenous parameters. In an exogenous modelling approach, sufficiency is integrated by simply reducing the energy demands or energy service demands in the input data. This modelling approach is demonstrated by Gunnar Boye Olesen, using EnergyPLAN (Lund et al, 2021) as an energy modelling tool. The exogenous model only includes sufficiency as change (a reduction) in the inputs for energy demands in the scenario, the model cannot change the level of sufficiency. Endogenous modelling, on the other hand, can include energy sufficiency measures in the model’s optimization. Hence, sufficiency is considered a possible part of the future scenario but it is not guaranteed that it actually will be included in the scenario and to which extent. This depends on how the model evaluates sufficiency compared to other scenario elements. The role of sufficiency will thus be a result of the

⁵ Background material: “Modelling energy sufficiency: exogenous and endogenous modelling. Overview of energy sufficiency measures” and “Developing sufficiency data for energy scenario modelling: the approach and an illustrative example of how sufficiency-based data can be generated for modelling of energy scenarios”

endogenous modelling, which Vidas Lekavičius demonstrates using the modelling tool MESSAGE (Model for Energy Supply Strategy Alternatives and their General Environmental impacts).

In addition to the demonstrations, Yves Marignac from the négaWatt’s association presents experiences with sufficiency modelling and thus initiates the following plenary discussion of knowledge sharing. The négaWatt association has developed a modelling methodology for the implementation of both energy sufficiency and energy efficiency actions, for the development of 2050 energy scenarios on energy consumption. It is a cost-optimization modelling approach that takes both physical and environmental limits into account. The models are based on hypotheses that reflect the implementation of an energy transition agenda within the building, transport and industry sectors. The approach is similar to the one presented by Gunnar Boye Olesen, however, négaWatt has a greater focus on the more indirect impacts of consumption. For example, an increased share of cars is not only reducing GHG emissions, it also leaves space for other activities in the city, for instance, social interactions, which can be identified as indirect impacts. Elaborated descriptions of sufficiency modelling experiences within the IESIMOSSES project, can be found in work package 3 “Integration of sufficiency into energy modelling tools”.

The demonstrations and presentations are followed by a plenary discussion where workshop participants are invited to share experiences. This was primarily aimed at participants with modelling experience, who prior to the workshop were asked to reflect on their own experiences in relation to energy sufficiency, on the basis of four questions:

- What programme(s) have you used for energy modelling?
- What (types of) scenarios have you modelled?
- How to improve data availability?
- What are the most crucial research directions to allow the improved creation of scenarios?

3.3.1 Energy modelling experience sharing

This section elaborates on the presentations from attending actors with modelling experience as well as the plenary discussions that came with it.

System Dynamics modelling

A participating professor from Riga Technical University, presents a System Dynamic (SD) modelling approach (developed by Jay Forrester of MIT) to study complex dynamic systems. This system approach is based on a triangle figure constituted of events at the top, behaviour in the middle and structure at the bottom (see figure 3.2). Using the global covid-19 pandemic as an example, events refer to the lines from news e.g. when news write “the extension of covid-19 is continuing”. At this level, we have no information about whether it is going fast, slow or in which direction the covid-19 pandemic is developing. If we look deeper we sometimes can see the behaviour, usually in graphs

with time on the x-axis and some parameters that change over time and cause the problems on the y-axis. However, it is still not clear what is happening and why this problem is occurring, e.g. we clearly see that the covid-19 is increasing but we can not understand why it is increasing. Therefore, a structure must be created as a representation of reality through mathematical methods. For this purpose, the professor of Riga Technical University, makes national energy modelling and she points to two papers recently published as her references for the presentation (Blomberga et al., 2021, 2022).

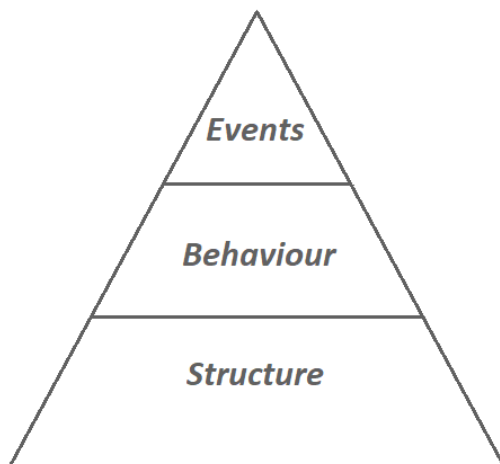


Figure 3.2 - *The levels at which the System Dynamic approach builds on the 'structure'*

At the core of the system structure within SD, they start by looking for casual loops which are the ones that drive and balance the system structure and create behaviour. When loops are found where behaviour is changing, the next step is to build a mathematical stock and flow structure. The estimation of the different factors going into the model is based on interviews with actors within different sectors, e.g. household, industry and commercial sectors, and these identified factors are then built into the model. This is how they deal with the drivers for energy efficiency and in terms of sufficiency, she uses the same structure of probability of e.g. temperature reduction or shifts from car to bicycle. Hence, the probability to have an action depends on these structures.

Additionally, an online internet interface⁶ has been developed for policymakers of Latvia, with the intent to make a tangible tool for non-modellers to model energy policies until 2030. The tool is developed for the different sectors, where parameters can be changed to see the different effects on the presented output. The tool is tested with representatives from the different sectors who have been asked to try out the tool and give feedback on whether they agree or not, in order to ensure accurate data presentations.

⁶ Internet interface presented by Andra Blomberga:
<https://exchange.iseesystems.com/public/andra/national-energy-model/index.html#page1>

Cost-minimising energy modelling

Attending associate professor at Chalmers University of Technology presents a linearly programmed cost-minimising global energy systems model that is developed at the Chalmers University of Technology. The model is named Global Energy Transition (GET) and is similar to MESSAGE (the model demonstrated by Vidas). She was not familiar with the term sufficiency but dealt with energy savings in models in different ways, and looked at the trends we can expect regarding sufficiency, modal shift, GDP per capita etc. The model is typically used for assessing long-term global scenarios (until year 2100) where CO₂ emissions are restricted to meet different climate targets, at the lowest cost. The study is focused on the transport sector with future fuel mix for shipping, which is done for cars, buses and trucks, and more seldom for aviation. In this regard, “scenarios” are used for both the choice of input data and as a result of the modelling of cost-effective future fuel mix. For the input data, they build on existing scenarios done by other researchers e.g., the IIASA C1-scenario towards an energy- and resource-efficient energy system in a world where GDP over the coming 100 years is becoming more and more equal between developing and developed countries. More recently they have started using the Shared Socioeconomic Pathways (SSP) scenarios to make energy demand assumptions on e.g. different transport modes. For example, she refers to SSP1 as the post-Gretha world where there is a high understanding of what is needed in terms of climate mitigation etc. On the contrary, SSP3 (called the post-Trump world) is a world in conflict where people can not depend on their neighbours and have limited access to resources and solutions. In such scenarios, there is lower knowledge and the focus is on exploring your own country and going for the least complex solutions. Thus the SSPs help to understand the difference that is put into the modelling and to make assumptions that represent the SSP scenarios, e.g., assumptions on energy demand, resources availability, and import-export-limitations.

For each study, the model is developed and input data is double-checked in order to understand the results. She stresses the importance of running sensitivity analyses e.g. Monte Carlo algorithms to understand how robust the results are and find under what conditions the results remain and under which they change. Furthermore, it is relevant to look at other solutions that might appear when changing e.g. costs for the batteries, fuel cells, hydrogen storage and other technology uncertainties. Model adjustments are thus emphasised especially for this modelling approach where measures on cost and CO₂ reductions are included but are more limited in dealing with complex policies, such as parking fees or environmental zones.

Energy scenario development

A senior researcher of IVL Swedish Environmental Research Institute presented his experiences with energy scenario development. He is not a modeller himself but has led several projects with energy scenario development as well as scenario development narratives. Unlike the other presenters, he has not worked with cost-optimisation models but rather looked at transformative changes and

studied the actions required to achieve certain societal aims and goals. In 2010 he was involved in energy scenarios that were developed by a range of different organisations in Sweden, as a response to the IPPC reports that came in 2007. With one of the milestones being 2020, it is now possible to look at how it has evolved. For example, in 2010 they tried to talk to actors in the steam sector and include drastic innovative ideas, however, nobody wanted to look at solutions but rather based on what was present. Today everyone in the sector is talking about hydrogen solutions as new technology. The example stresses the challenges for modellers and scenario makers, to be able to look at the transformative solutions that now come in, and whether they are not always driven by economic short term cost-effectiveness but rather by the strategic change they see in the future. Thus, the challenge here is also about how scenario makers can be inclusive enough of new opportunities and grasp the willingness of people to change. To have people change e.g. their diets or go by bicycle instead of cars, due to support structures from the government, is really complicated to do. On the other hand, when big changes occur very quickly people suddenly change independently of any support structure. However, these unexpected changes are difficult to bring into the model in a proper way. Thus from our current perspective in time we do not know what solutions will come and thus it is difficult to pick the right winner. Instead, models are reflections of our time.

Discussions on the use of scenarios

An associate professor in energy modelling at Aalborg University, responds to the challenges presented by the attendee from IVL Swedish Environmental Research Institute. Based on her experience with modelling she stresses that it is a question of whether the model has the possibility of adapting to changes, which some models do and some models do not. Models are made for different purposes and all have strengths and weaknesses, which is why no model is perfect. However, from her perspective, the good models are the ones that can be adjusted to the changes that we might experience with new technologies and have full transparency to adapt to these changes. It is moreover important to do different scenarios and thereby show different ways to go where you want to end.

The representative from IVL Swedish Environmental Research Institute, stresses the concern that sometimes scenarios are understood as forecasts or predictions of the future. Whereas scenarios are actually more like a study of a potential opportunity or something that we can learn from in itself. Thus from this perspective, a scenario will always be correct because it is a scenario and not a forecast of the future. On the other hand, if scenarios should be reflections of the future, there would be plenty of gaps due to the complexity, since only rather simple forms are studied. Referring back to the study from 2010 he expressed that there were certain aspects of the scenarios, which they were not able to understand the full magnitude of at the time, e.g. in terms of innovations and behavioural changes in households as well as the industry of different sectors. This is why he

emphasises scenarios as reflections of our time, where adaptability is needed.

Further discussions are concerned with reflections on what type of information is needed from the perspective of policymakers. As previously expressed, one of the attending experts was involved in the development of 100% renewable energy scenarios in 2010 and from his perspective, NGOs at that time had a desire to show that renewables were possible. Thus it was a question about using scenarios to show that energy systems based on 100% renewable energy is possible and as an argument of ‘why’ it is important. Today that type of message is no longer the focal point since politicians (at least in Sweden he argues) have a common understanding and ambition to go carbon net-zero in 2045. Instead, it has become a question about ‘how’ to move in the directions put forward by the scenarios. The facilitator and INFORSE-Europe representative agrees that it is important to see scenarios as if certain policies and conditions are in place, then it shows potential ways to go. In relation, looking back on old scenarios, we can see what options were chosen based on policy actions. On the contrary, he disagrees that scenarios are no longer aimed as arguments of ‘why’ transitions of the energy system are important. Although it is well proven by scientific literature, it is still important to push the point.

There has been a gradual change in the demand for modelling scenarios, which have moved from renewable energy to efficiency, and now a sufficiency approach is needed to reach the goals. However, this change in demand might not be reflected yet, because a strong belief in technological solutions still exists, and less focus is placed on how to actually live sufficiently in an energy-efficient apartment for example. This points to questions on rebound effects when talking about efficiency approaches and how to account for these aspects in the models.

When addressing rebound effects, it is relevant to distinguish between direct and indirect effects. When we talk about efficiency approaches it is important to address the direct rebound effects. For example, if dwellings are better insulated, people tend to raise the indoor temperature, which results in a lower percentage of savings compared to the estimations of expected savings. Sufficiency approaches, on the other hand, do not have these direct rebound effects where reduced consumption is less than expected because of related changes, for instance with the change of behaviour. However, sufficiency approaches might in some cases cause indirect rebound effects where saved energy costs can be used for other consumptions, causing energy use and climate effects in other sectors. A representative from D-mat shares experiences from a study in Finland exemplifying this type of indirect rebound effect. The study showed that when comparing the total carbon footprint of a group of people, they noticed that car owners who did not use the car much, actually had a lower carbon footprint in total compared to people without a car. The reason was that the people without a car had more money to spend on other energy-consuming activities. Hence, the study showed that investing in a car actually fixed a lot of money that could not be used for anything else. However, it is not recommendable to buy a car and not use it since energy goes into the production as well. Instead, to avoid the challenge of indirect rebound effects caused by sufficiency

practices, measures such as consumer advice on how to improve buildings or guidance for consumers to use their savings to invest in energy renovations, can be included.

From an NGO perspective (shared by a representative from Green Liberty), scenarios are valuable tools for composing arguments when participating in the processes concerning energy and climate policymaking. Therefore more scenarios are needed, especially renewable energy scenarios and sufficiency scenarios in order to bring forward proposals and to have a more progressive view of what is possible. However, she points to the descriptive (previously referred to as positive) and normative parts that scenarios usually consist of and finds energy sufficiency to be rather complex due to the double-sided aspect of the concept, which implies that energy must be consumed on a sufficient level, no more and no less. She stresses that focus must be put on the descriptive approaches about how things are, instead of normative approaches about how things should be. Hence, scenarios should describe how things are going if the existing policies are actually implemented. Because if we, on the other hand, have scenarios that are more focused on the question ‘if decisions are taken, then things are expected to go in a certain direction’ then discussions come to depend on the policy makers’ own political preferences. INFORSE-Europe representative responds to the arguments from a modeller's perspective, agreeing that ‘business as usual’ scenarios are important, however, stresses that they must be complemented with a number of action scenarios with proposals. This is further emphasised by a representative from Aalborg University, with reflections to build on studies of everyday social practices, in order to include both what is possible as well as to address differences in the uptake of certain practices. Thus, the aim is to understand the thoughts behind social practices and to include it in the model through assumptions on how reductions are obtained and why some reductions are not obtained. This relates to policies aiming to support people living in energy-efficient dwellings, on how to actually live in a sufficient way in these dwellings.

From the sharing of modelling experiences, it is clear that a range of different tools have been developed where sufficiency measures are included as either exogenous or endogenous parameters. It is also addressed how this entails some difficulties in the quantification for integrating sufficiency into modelling, and how this is navigated for. Furthermore, the discussions show how scenarios are developed and used as well as interpreted in different ways. Thus emphasis should be placed on the role of scenarios depending on the desired purpose.

3.4 Using adapted energy scenarios for national policy development

The final session of the workshop programme focused on how energy scenarios might contribute to the development of national public regulation for sustainable energy transition, hence this session was themed; *Using adapted energy scenarios, which include sufficiency measures, in the*

development of national public regulation, of sustainable energy transition. With policies, we move from potential to realisation with the aim that scenarios can initiate political developments. Janis Brizga started the conversation with a presentation on sufficiency policy approaches identified in the IESMOSES project, which are as follows:

- Regulation and standards
- Economic energy pricing instruments
- Policy + information - sufficiency oriented product policy
- Information of energy sufficiency advice
- Systems of provision - promotion of energy-sufficiency services
- Integrated instruments
- Practice-oriented policies

The literature in which policy instruments have been identified throughout the project research phases put great emphasis on the integration of several instruments in order change practices (Thomas et al., 2019; Jensen et al. 2019). Using an example of laundry practices, there is a need for locally available public facilities to go to public laundromats instead of washing at home. This implies different policy instruments e.g. financial incentive programmes, public investment, including laundry costs in social benefit, information, public publicity etc. Of these, it is further stressed that the applied policies must take into account the specific social groups and local context where the policy is implemented. Descriptions of policy instruments can be found discussed in work package 5: “National policy dialogues in Denmark, Latvia and Lithuania” and work package 2: “Systematisation of experiences with energy sufficiency initiatives”.

The presentation by Janis Brizga is followed by discussions in break-out rooms about relevant policy approaches, including the possibilities and limitations. Again, the MURAL board included discussion prompts and participants were asked to discuss;

- how sufficiency energy scenarios can be used in the development of national public regulation of sustainable energy transition
- how national experiences with regulation of energy consumption can influence future regulation policies related to energy sufficiency

Due to a decrease in the number of attending participants, the discussions took place in two groups (a Baltic and a Nordic group) of approximately eight participants in each (see figure 3.3). The group discussions were followed by a plenary discussion with each group sharing their main points with regards to the questions posed.

At last, the workshop ends with a joint discussion of the main points presented and discussed throughout the entire two-day workshop. Furthermore, the project leader explains the next steps in the IESMOSES project, which leads to a discussion on potential further collaboration.

3.4.1 National policy discussions

Main points from the group discussions as well as the plenary discussions, have been categorised and will be presented in the following.

Acceptance of sufficiency practices

It is, among participants, agreed that energy scenarios including sufficiency measures are needed in order to open up for discussions on a more complete set of options for policymakers. However, the public acceptance in society for changing such practices vary among citizens, being more or less willing to change. It is important not to ignore the actors who share concerns about these transitions, but instead approach them and take their concerns into account. Shifting towards more plant-based food has, for example, raised concerns about the farmers and the great tradition that goes with the agricultural sector. Thus, it is important to understand the historical trace that constitutes this unwillingness to change. Associate professor of Aalborg University shares an example where workers in the meat industry have been approached directly to understand the concerns, which in the case resulted in a greater acceptance of the development within plant-based food when the meat workers actually saw opportunities for workplaces in such scenarios. Hence, it is a question about understanding the lock-ins of the established system and acknowledging it as a transition process changing these structures by providing alternatives and building positive future narratives, in order to achieve acceptance and willingness to change.

Furthermore, the acceptance of policy regulations varies from country to country as well as from national to local contexts. Associate professor of the Chalmers University of Technology highlights that recently, in Sweden, there has been a great acceptance of sufficiency practices e.g. carpooling, reductions in living space and eating vegetarian. For example, today people accept that vegetarian food is served regularly in e.g. schools and for the elderly in nursing homes, which just 10-15 years ago would have been arranged only for people explicitly asking for it and definitely not for everyone. On the contrary, the same practices of modal shifts and plant-based diets have not been accepted in the Danish context. Associate professor of Aalborg University, brings up the example of vegetarian food and argues that this is due to policy traditions, where people are not accepting that the government is deciding what should be eaten at specific workplaces. He stresses that people are not necessarily against eating vegetarian in these cases but against the top-down approach that contradicts the national policy traditions. Hence, it is viewed as top-down interference with local workplace policies, where management and employees should be able to decide for themselves what to eat. Thus, it results in clashes between different types of policies and raises a question of what should be decided top-down and what should be decided in local contexts.

The discussion of acceptance is a question of acknowledging that on one hand it is a transition process and on the other hand also acknowledging that there can be clashes between different policies and policy areas.

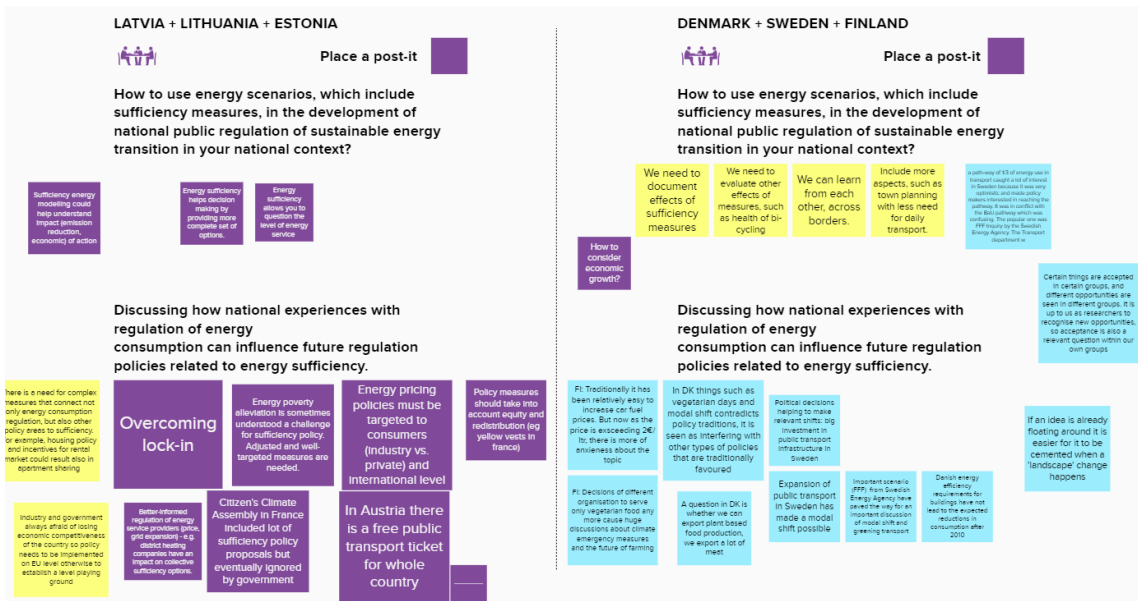


Figure 3.3 - An overview of the breakout room discussions on theme four, providing insights into how the discussions were structured and facilitated.

Lock-in

On the topic of how national contexts can influence future policies, one of the essential aspects is that of lock-ins. There are regulations and practices in place that can not be easily changed. An example from France shows how comprehensive citizen assemblies came up with radical sufficiency proposals, however, ended up being somewhat ignored by the government due to fundamental difficulties in changing existing relations, significantly limiting the impact of the proposals.

When building new scenarios, existing lock-ins are important to consider, as well as the question of supporting lock-ins of new systems. Thus, scenarios are tools aimed at showing different paths. However, no single path can be determined beforehand but it is a question of showing different possible opportunities. Some concerns from scenario developers might be to promote lock-in of e.g. batteries in electric vehicles and thereby eliminating the possibilities for other great solutions. Senior researcher of IVL Swedish Environmental Research Institute, stresses how scenarios are used for showing some aspects but one should also be aware that the dynamic of real life is quite difficult to get into these scenarios.

Economic instruments and competitiveness

Elaborating on the policy measures presented by Janis Brizga, discussions emerge around the economic energy pricing instruments, as one of the measures. It is argued that taxes can be incentives for people to change practices. A representative from the négaWatt association shares an example from the freight sector in Switzerland. They are located in the middle of Europe but have introduced a kilometre tax for trucks and freight, which has resulted in a complete shift to a train infrastructure of freight. However, when applying taxes, it is important to reflect on the slow and fast

price increases. In many cases when talking about energy taxes, governments introduce slowly progressing increases in energy prices e.g. taxes for fuels that increase 5% per year. This slow increase actually makes people adapt to the increasing prices instead of changing their practices. If the prices, on the contrary, increase drastically (like with the current energy prices) people do not have time to slowly adapt but must make changes right away. It is argued that currently, in Estonia, with the rising energy prices, the people who are changing their practices are actually people who are suffering from energy poverty and have no other alternatives. So it is also a question of who the incentives are aimed at which points to the question of distribution.

In this regard, it is argued that different policies should be aimed at different target groups. In the Baltic group, it is emphasised that private households or consumers should not be affected more than large industries that are consuming and wasting more energy. This discussion points to a broader question of whether it is the industry or individual actors who should bear the burden and take action. A representative from Aalborg University shares a concern that he thinks one of the problems with sufficiency aimed practices and sufficiency aimed policies is that the whole burden is on the consumer to change, whereas the heavy industry can continue business as usual. Thus, he points to the question of what energy sufficiency is from the perspective of industries. In relation to this point, the interconnectedness of the industry and households is highlighted - a recurrent but complex theme of the research field of energy sufficiency.

Further discussions about industry point inevitably to the conventional inherent aim for economic growth. The question of how to consider economic growth proves essential when discussing policy actions aimed to support sufficiency practices. The whole aim of the business sector is growth and industries and government are afraid of losing economic competitiveness or worsening the business environment. The issue spotlights the global scale of change that is required.

Economic growth is a fundamental aspect, and is included in many of the scenarios developed, as a significant variable. This exemplifies how scenarios are a reflection of our current society where economic growth is expected and built-in into scenarios. However, zero growth or even negative growth scenarios are also introduced but perceived as more pessimistic scenarios. The challenge here is to show that it is possible to have development or higher prosperity that is not linked to economic growth. Senior researcher of IVL Swedish Environmental Research Institute points to the core issue in policy dialogue concerned with the types of instruments that should be used to facilitate support. He experiences an issue with how to introduce these sufficiency measures. Since it is easier to put taxes on spent energy, whereas energy sufficiency can not be paid for, it is something you save, and thus the question is how the sufficiency measures should be financed.

Accounting for the complexity

From the discussions it is stressed that currently, the economic measures are, in many cases, the primary measures that are incorporated into the modelling. However, in order to understand the

impact of economic instruments, it is important to recognise the complexity of the whole. If economic incentives are introduced in order to move away from certain technologies, then it is important to provide alternatives that can support the transition toward more sustainable and sufficient practices. It is furthermore argued by the facilitator and Green Liberty representative, that economic instruments must not be seen isolated but in synergy with other sets of instruments in order to support the complexity of the elements influencing practices. Policies need to take into account a lot of factors, and acknowledge that energy policies are always tied to social policies and that we can not do one without the other. An attendee points to an example, that energy taxes and prices can not be raised without introducing some sort of social policy instrument along with it. It is furthermore argued that besides subsidies for energy use, it is also important to support knowledge infrastructures in local contexts, about how to actually live in a sufficient way.

The first step in approaching the complexity is to start with the demands and move from there e.g. fewer buildings, less demand for cement or less demand for steel etc., which would result in fewer emissions in these sectors. Furthermore, identifying good examples of sufficiency practices to build on is important. It is argued by a representative for the négaWatt association, who has investigated a lot in the field of sufficiency, that there are many good examples but it is difficult to determine potential effects and scalability outside the local context. Hence, sufficiency might seem more difficult because of the lack of good examples and evidence for changes in practices, which is needed in order to have more policies targeting sufficiency.

4.0 Workshop outcomes

This chapter evaluates and assesses the workshop outcomes in relation to the two-fold purposes of addressing concerns in the field of energy sufficiency and serves as a suggestion on how such dialogues can be structured. It includes descriptions of the main discussions and arguments achieved throughout the workshop. Furthermore, it includes reflections on how the workshop was organised through four themes in an online workshop format and how it may be considered successful in the aim of initiating sufficiency policy discussions in a cross-national setting.

4.1 Main points on energy sufficiency

From the discussions it became evident that the concept of sufficiency is still in a process of being established generally among both researchers, policymakers etc. It is often referred to as and compared to the concept of energy savings, in which there is an emphasis on energy reductions, but a lack of recognition of the social aspects in terms of ensuring basic needs are met. Although the term and concept of energy sufficiency were not familiar to all participants prior to the workshop, a common understanding was established through the discussions. Thus the workshop proved successful in terms of initiating discussions on energy sufficiency among a diverse group of actors who were able to transform their original perception of the concept.

The input data for energy sufficiency modelling was from the experience sharing based on different sources e.g. interviews, ideas and actual experiences. The challenge of quantifying sufficiency practices into measures that can be used in the modelling called for further identification of such practices. The need for a database or library with experiences of sufficiency actions, based on actual experiences and not ideas, was urged by several participants. The reason is that current policies do not target energy sufficiency because they find it to be more weak and uncertain. Therefore more evidence is needed which, as proposed, should be gathered in a database similar to what exists for energy efficiency. It is argued that the two concepts (sufficiency and efficiency) are not different in the nature of how it is modelled but different in the evidence that is used. Thus, it requires more awareness of such actions to broaden the understanding, including local examples that reflect opportunities for scaling to other countries. Furthermore, it might be beneficial to include other examples outside the energy sector, in order to support the possibilities for change that the concept entails. A representative from the négaWatt association points to a (soon to be published) policy database developed by the German Enzu group, which might meet the demand for an energy sufficiency actions database.

Modelling of scenarios aiming to initiate political developments led to great discussions on the use of scenarios in policy dialogues. It was commonly stressed that scenarios are currently misperceived as forecasts or predictions of the future based on assumptions. However, this is not the case as no one can predict the future and the greater societal effects that we might experience. Models must

therefore be transparent and adaptable to such changes. Instead, scenarios should be addressed as tools that reflect our current knowledge of society and provide several different directions that society can move in depending on the political incentives that are put in place. Hence, scenarios are aimed to work as boundary objects that enable knowledge transformation across heterogeneous groups of actors and steer the conversation towards possibilities to act.

In all the workshop was considered successful in terms of disseminating knowledge achieved in the IESIMOSSES project and as an exchange of national competence experience of energy sufficiency.

4.2 Reflections on the proposed framework

The workshop and descriptions hereof, serve as a suggestion on how energy sufficiency dialogues may be organised and facilitated. Hence this section will elaborate on reflections and learnings achieved regarding the performed framework of the workshop.

The online setting provided opportunities as well as limitations in relation to physical workshop settings. The Covid-19 pandemic has resulted in fast-changing practices, where new infrastructures have been established supporting online communication. This includes expansion and introduction of online material elements, as well as online competency development and a change in the social meaning constituting the practice of online interactions. Those three elements (Material, meanings and competencies) are described by Shove et al. (2012) as elements that constitute a practice and that “practices emerge, persist, shift and disappear when connections between elements of these three types are made, sustained or broken” (Shove et al., 2012, p. 14-15). Initially, the workshop was planned to be held and facilitated with attendees' physical presence. However, due to Covid-19 pandemic restrictions, the format was rescheduled to be held in an online context instead, which meant that a larger number of actors were able to attend. The online space enabled participants to communicate despite long geographical distances and required less time out of the calendar for the participant since time spent on transport was avoided. On the other hand, it also resulted in the participants jumping in and out of the meeting, and hence being less dedicated and present throughout the workshop. This was the case for several participants who were occupied with other obligations, which meant that they did not follow all of the discussions and their perspectives were likewise not reflected in every discussion. However, the alternative might have been that those participants would not have attended the workshop at all if it was held in a physical setting only. Thus, in online workshops with several participants invited, facilitators must be able to adapt to changes in the number of participants. This was for example the case in the second breakout-room discussion, where participants were organised into two discussion groups instead of the five initially prepared groups.

Furthermore, knowledge, as well as natural dynamics in discussions, may be challenged in online settings where current technologies do not provide good opportunities for reading body language

and only allow one participant to speak at a time. Thus, when a large number of people are gathered it is difficult to keep conversations going and knowledge might be lost or even misinterpreted.

To accommodate the challenges of online interactions, the workshop programme was stretched over two days, in order to allow more in-depth discussions and diversity to support engagement. The Zoom Video Communication and Mural board tools used to facilitate the discussion, serve as a suggestion on how such dialogues might be facilitated in an online workshop constellation. In break-out room discussions, people were able to reflect and bring their thoughts forward in smaller groups. This was further supported by questions and post-its in the MURAL board where participants could share their immediate reflection points. The MURAL board that was setup as a design game to spark interest and engagement, provided structures to the discussions and gave participants the opportunity to engage on their own terms. In each break-out room, participants approached the setup differently. Some started by individually reflecting on the questions posed, added comments to the boards and afterwards discussed in the group. Other groups had more dynamic discussions where some shared their reflections on post-its while others were more drawn to verbally and collectively share reflections. Thus the low fidelity aspects of the design game were able to support both different ways for actors to express their opinions. Hence, it is highly recommended to use design games as boundary objects to support communication between actors of diverse nationalities and professional backgrounds.

The workshop programme based on four themes serves as a suggestion on how energy sufficiency dialogues may be organised. How the workshop was structured into these themes provided a natural flow and ensured a good overview of the workshop programme. However, in relation to the workshop being online, some participants were only attending the sessions covering their own area of interest (e.g. modellers attending sessions concerned with integrating sufficiency into modelling or policymakers attending the session on using energy scenarios for policy dialogues). Having actors with expertise in the different areas was highly valuable and important for the discussion and outcomes. Hence, the aim of the workshop was to develop competencies and experience sharing across heterogeneous groups of actors, why it is important that actors from different professional backgrounds are present at the same time. This is worth considering in future workshops since a lack of presence from mixed groups of actors might challenge the overall purpose of the workshop.

Thus, the evaluation and assessment of the proposed workshop framework reflect how development of competence and experience sharing of sufficiency might be organised in an online workshop format, that builds on participatory design approaches. Moreover reflections on the performed workshop shows aspects that must be considered when preparing and facilitating future workshops on the topic of energy sufficiency.

References

Blumberga, A.; Bazbauers, G.; Vancane, S.; Ijabs, I.; Nikisins, J.; Blumberga, D. Unintended Effects of Energy Efficiency Policy: Lessons Learned in the Residential Sector. *Energies* 2021, 14, 7792.

<https://doi.org/10.3390/en14227792>

Blumberga, A.; Gravelins, A.; Blumberga, D. Deliberation Platform for Energy Transition Policies: How to Make Complex Things Simple. *Energies* 2022, 15, 90. <https://doi.org/10.3390/en15010090>

Carlile, P. R. (2002). A pragmatic view of knowledge and boundaries: Boundary objects in new product development. *Organization science*, 13(4), 442-455.

Climate Puzzle. (n.d.). D-Mat. Retrieved January 28, 2022, from <https://d-mat.fi/en/what-we-do/climatepuzzle/>

Jensen, C. L., Goggins, G., Røpke, I., & Fahy, F. (2019). Achieving sustainability transitions in residential energy use across Europe: The importance of problem framings. *Energy Policy*, 133, 110927.

Lund, H., Thellufsen, J. Z., Østergaard, P. A., Sorknæs, P., Skov, I. R., & Mathiesen, B. V. (2021). EnergyPLAN—Advanced analysis of smart energy systems. *Smart Energy*, 1, 100007.

Marignac, Y. 2019. Energy sufficiency as part of climate action. *négaWatt*.

Shove, E., Pantzar, M., & Watson, M. (2012). *The dynamics of social practice: Everyday life and how it changes*. SAGE Publications Ltd, <https://www.doi.org/10.4135/9781446250655>

Thomas, S., Thema, J., Brischke, L. A., Leuser, L., Kopatz, M., & Spitzner, M. (2019). Energy sufficiency policy for residential electricity use and per-capita dwelling size. *Energy Efficiency*, 12(5), 1123-1149.

Vaajakallio, K. and Mattelmäki, T. (2014): Design games in codesign: as a tool, a mindset and a structure. *CoDesign: International Journal of CoCreation in Design and the Arts*.

Appendix 1

Energy sufficiency in energy modelling and policy development

List of registered workshop participants

Name	Affiliation	Nationality
Reinhold Pape	Air Pollution and Climate Secretariat, Sweden	Sweden
Maria Grahn	Chalmers University of Technology	Sweden
Mathias Gustavsson	IVL Swedish Environmental Research Institute	Sweden
Krista Petersone	Green Liberty	Latvia
Selīna Vancāne	Riga city council	Latvia
Einars Cilinskis	Ministry of Economics, Latvia	Latvia
Andra Blumberga	Riga Technical University	Latvia
Mathilde Djelali	The négaWatt association	France
Stephane Bourgeois	The négaWatt association	France
Yves Marignac	The négaWatt association	France
Kenneth Karlsson	Energy Modelling Lab	Denmark
Karsten Hedegaard	Danish Energy Agency	Denmark
Iva Skov Ridjan	Aalborg University	Denmark
Tomi J. Lindroos	VTT Technical Research Centre of Finland	Finland
Senja Laakso	University of Helsinki	Finland
Michael Lettenmeier	D-mat	Finland
Jari Kolehmainen	D-mat	Finland
Arvydas Galinis	Lithuanian Energy Institute	Lithuania
Vytautas Džiuvė	Lithuanian Energy Institute	Lithuania
Aurimas Kontautas	Lithuanian Energy Agency	Lithuania

Adil Aslam	Stockholm Environment Institute	Estonia
Silver Sillak	Aalborg University	Estonia
Laurens de Vries	Delft University of Technology	Holland
Dag Arne Høystad	Norwegian Society for the Conservation of Nature	Norway
Helena Kronby	Aalborg University	Denmark
Ann Vikkelsø	INFORSE-Europe	Denmark
Rikke Veber Rasmussen	Aalborg University (facilitator)	Denmark
Gunnar Boye Olesen	INFORSE-Europe (facilitator)	Denmark
Vidas Lekavičius	Lithuanian Energy Institute (facilitator)	Lithuania
Janis Brizga	Green Liberty (facilitator)	Latvia
Michael Søgaard Jørgensen	Aalborg University (facilitator)	Denmark