FULFILL

Fundamental decarbonisation
through sufficiency by lifestyle changes

Policy brief on findings from WP4

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Project Partners

No	Participant name	Short Name	Country code	Partners' logos
1	**Fraunhofer Institute for Systems and Innovation Research ISI**	FH ISI	DE	
2	**Wuppertal Institut für Klima, Umwelt, Energie GGMBH**	WI	DE	
3	**Accademia Europea di Bolzano**	EURAC	IT	
4	**Notre Europe - Institut Jacques Delors**	JDI	FR	
5	**Association négaWatt**	NW	FR	
6	**Politecnico di Milano**	POLIMI	IT	
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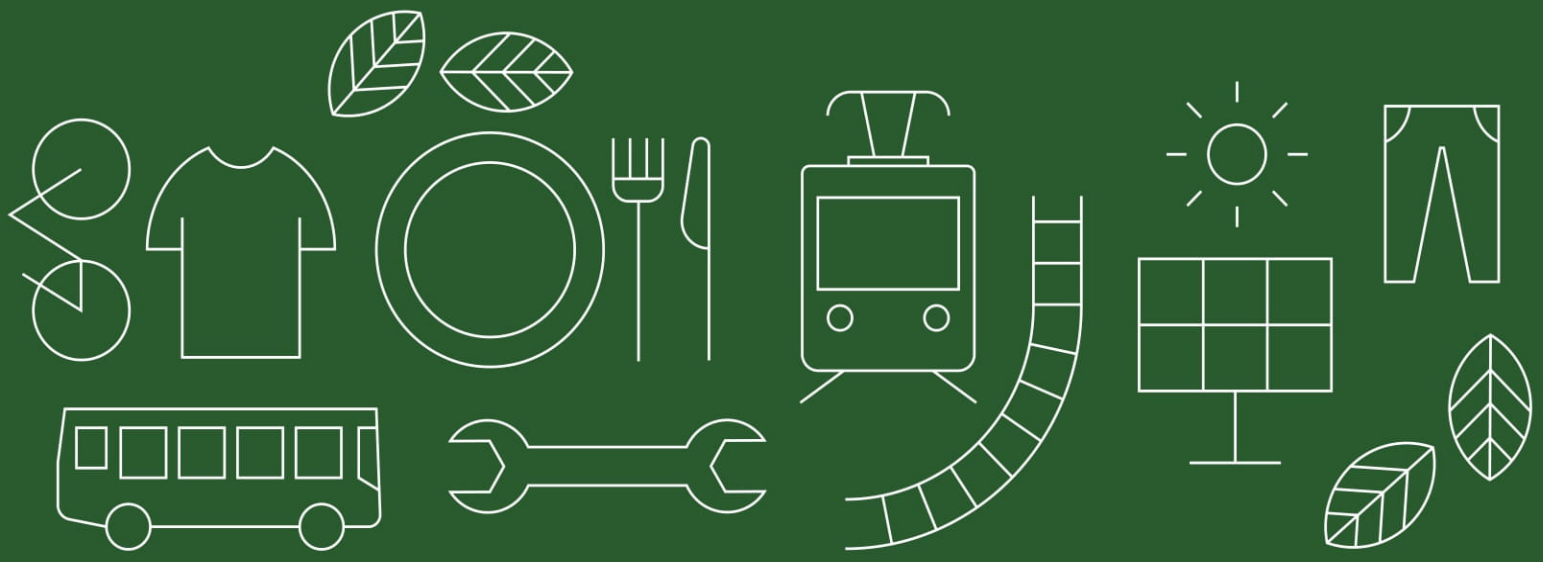

Content

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List of Abbreviations

EU	European Union
FULFILL	Fundamental Decarbonisation Through Sufficiency By Lifestyle Changes
IPAT	Impact = Population x Affluence x Technology
SSH	Social Sciences and Humanities
WP	work package

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Abstract / Summary

This policy brief summarizes policy relevant conclusions from work package 4 (WP4) of the FULFILL project, which analysed local sufficiency initiatives, their relation to the multi-level governance of the European Union and their multiple effects.

The first chapter presents what WP4 found out about local sufficiency initiatives. It describes main characteristics of the initiatives the WP4 team has mapped in five EU Member States. It outlines their potential and their relationship in industrial urban systems.

The second chapter aims at explaining the limited popularity of the sufficiency concept, summarizing the state of the art in definitions and metrics. The operational shortcomings are general, but they might also explain their limited acceptance in an urban context. The operational deficits also reduce the usefulness of the sufficiency concept for policymaking including at the municipal level. In that context we discuss strengths and shortcomings as well as opportunities and risks of the contemporary academic sufficiency discourse as background of chapter 4 which outlines short-term, medium-term and long-term policy recommendations:

1. In a short-term perspective **strategic niche management (SNM)** could offer niches, in which sufficiency initiatives would be temporarily protected from the full force of prevailing selection pressures within unsustainable urban systems.
2. In a medium-term perspective **metrics and indicators** for the climate-neutral satisfaction of human needs could inform an evidence-based development of sufficiency governance.
3. In a long-term perspective only a **change of framework conditions** would eventually allow the emergence and stabilization sustainable urban structures and practice.

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Introduction and Overview

Purpose of this Document

This policy brief summarizes main conclusions from work package 4 of the FULFILL project, which aimed at analysing local sufficiency initiatives, their relation to governance and their multiple effects. Our conclusions are preliminary and are not meant to express final conclusions of the project. As a policy brief, this document is concise and describes complex issues as simple as possible. The referencing to literature is reduced. More detail can be found in the deliverables of work package 4:

- D4.1: Mapping of local sufficiency initiatives
- D4.2: Report on municipal sufficiency strategies and policies
- D4.3: Report on multiple effects of sufficiency lifestyles
- D4.4: Vertical and horizontal multi-level-governance: five case studies

For analyzing the state of the art of the academic sufficiency discourse we have used the literature reviews of workpackages 2 (D2.1) and 4 (M4.3) as well as the cited literature reviews. Furthermore, analysis from deliverable 3.2 related to individual perceptions of sufficiency have been considered.

Project Summary

The project FULFILL takes up the concept of sufficiency to study the contribution of lifestyle changes and citizen engagement in decarbonising Europe and fulfilling the goals of the Paris Agreement. FULFILL understands the sufficiency principle as creating the social, infrastructural, and regulatory conditions for changing individual and collective lifestyles in a way that reduces energy demand and greenhouse gas emissions to an extent that they are within planetary boundaries, and simultaneously contributes to societal well-being. The choice of the sufficiency principle is justified by the increasing discussion around it underlining it as a potentially powerful opportunity to achieve progress in climate change mitigation. Furthermore, it enables us to go beyond strategies that focus on single behaviours or certain domains and instead to investigate lifestyles in the socio-technical transition as a whole. The critical and systemic application of the sufficiency principle to lifestyle changes and the assessment of its potential contributions to decarbonisation as well as its further intended or unintended consequences are therefore at the heart of this project. The sufficiency principle and sufficient lifestyles lie at the heart of FULFILL, and thus constitute the guiding principle of all work packages and deliverables.

Project Aim and Objectives

- To achieve this overarching project aim, FULFILL has the following objectives:
- Characterise the concept of lifestyle change based on the current literature and extend this characterisation by combining it with the sufficiency concept.
- Develop a measurable and quantifiable definition of sufficiency to make it applicable as a concept to study lifestyle changes in relation to decarbonisation strategies.
- Generate a multidisciplinary systemic research approach that integrates micro-, meso-, and macro-level perspectives on lifestyle changes building on latest achievements from research into social science and humanities (SSH), i.e. psychological, sociological, economic, and political sciences, for the empirical work as well as Prospective Studies, i.e. techno-economic energy and climate research.
- Study lifestyle change mechanisms empirically through SSH research methods on the micro-level (individual, household) and the meso-level (community, municipal):
  - achieve an in-depth analysis of existing and potential sufficiency lifestyles, their intended and unintended consequences (incl. rebound and spillover effects), enablers and barriers

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(incl. incentives and existing structures) as well as impacts (incl. on health and gender) on the micro level across diverse cultural, political, and economic conditions in Europe and in comparison to India as a country with a wide range of economic conditions and lifestyles, a history which encompasses simple-living movements, and a large potential growth of emissions.

- assess the dynamics of lifestyle change mechanisms towards sufficiency on the meso-level by looking into current activities of municipalities, selected intentional communities and initiatives as well as analysing their level of success and persisting limitations in contributing to decarbonisation.

- Integrate the findings from the micro and meso-level into a macro, i.e., national, and European, level assessment of the systemic implications of sufficiency lifestyles and explore potential pathways for the further diffusion of promising sufficiency lifestyles.
- Implement a qualitative and quantitative assessment of the systemic impact of sufficiency lifestyles which in addition to a contribution to decarbonisation and economic impacts includes the analysis of further intended and unintended consequences, enablers and barriers.
- Combine the research findings with citizen science activities to develop sound and valid policy recommendations contributing to the development of promising pathways towards lifestyle.
- Generate findings that are relevant to the preparation of countries and the EU's next NDCs and NDC updates to be submitted in 2025 and validate and disseminate these findings to the relevant stakeholders and institutions for exploitation.
- Consider the relevance and potential impacts of sufficiency lifestyles beyond the EU.

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1. What we found out about local sufficiency initiatives

FULFILL has mapped and analysed local sufficiency initiatives in the European Union and India. Under dominant growth-oriented municipal regimes local **sufficiency initiatives offer a large, diverse and growing potential for alternative qualitative development of urban systems towards a good life**.

1.1. Mapping of sufficiency initiatives: A rich diversity of activities

Cities and towns harbour a rich and diverse spectrum of sufficiency initiatives (Moser et al. 2018). In the European FULFILL research project we have mapped 50 examples of such initiatives in Denmark, France, Germany, Italy, India and Latvia, which address sufficient lifestyles in housing, mobility, or food consumption. These initiatives encourage, for example, the re-use of vacant buildings or sharing of spaces. They stimulate car or ride sharing, the use of alternative modes of transport like cargo bikes, or public transport. They reduce energy-intensive delivery or material-intensive packaging of goods. Especially in the food sector, they promote new relationships between local producers and consumers. They foster alternative production, processing and distribution of food or save it from going to waste. Local sufficiency initiatives tend to reduce or slow-down the urban metabolism by setting examples for

a) a reduction of waste, for example, in packaging-free shops

b) reusing products in second-hand shops or networks

c) repair, e.g. in repair cafés

d) recycling, e.g. by converting used products into raw materials for new consumer goods

The sufficiency initiatives analysed in FULLFIL are mostly voluntary and non-profit, e.g. associations and cooperatives of civil society but there are also commercial sufficiency initiatives.

1.2. Potential of local sufficiency initiatives

Our surveys, interviews and workshops suggest that urban actors engage in sufficiency initiatives, primarily because they realize an experience of shared purpose. Even though urban systems allow and encourage material and energy intensive production and consumption, urban sufficiency initiatives seem to anticipate physical limits to growth, which contemporary urban systems are unable to realize, because they are locked in exploitive system rationalities. **Urban sufficiency initiatives are manifestations of resistance** against these rationalities offering recessive alternatives development options. They might be referred to as frontrunners of a "new enlightenment" (Weizsäcker 2017) enabling an emancipation from hegemonic exploitive urban systems. **In patchy urban systems they establish pockets of alternative futures with less resource-intensive consumption**. They have systemic potential, because the resilience of urban systems may rely on their skills, when eventually limits to growth can no longer be denied, restricting framework conditions will kick-in and exploitive strategies will become dysfunctional. Under the condition of physical limits to growth, **the future of urban systems might depend on knowledge generated by the multitude of intentional communities, ecovillages and sufficiency initiatives where alternatives to dominant production and consumption patterns, lifestyles and social practices are developed and tested**.

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1.3. Local sufficiency initiatives and municipalities: a difficult relationship

Local sufficiency initiatives emerge in urban or rural town settings which are anything but sufficient. The metabolism of cities or rural towns almost completely depends on the primary production of other systems. In order to perpetuate their resource-intensive operation and expansion, cities and towns absorb growing quantities of material and energy from complex globally organized production and supply chains. In return they excrete harmful emissions and waste. The physical expansion of cities and towns degrade and destroy the surrounding landscape. The urban "development" of land usually implies a removal of the fertile layers of soil and vegetation degrading into urban ecosystems with a highly reduced biological diversity and functionalities.

In sum, modern cities have the ecological properties of parasites (Rees 1997) and seem to follow their aggressive reproductive behaviour by definition on the expense of their host systems. Driven by population growth, affluence and technology, cities and towns have expanded and spread as dominating manifestation of the human colonization of the planet (Kraas et al. 2016). Their governance is programmed for supporting economic and physical growth. Knak (2021) analysis of municipal spatial policies in Germany has exemplified how **the governance of cities and towns is characterized by mutually reinforcing political, fiscal and legislative rationalities that drive their physical expansion**.

Based on our analysis of the literature, our survey, workshops and case studies, we would like to propose the hypothesis that **local sufficiency initiatives represent frugal lifestyles (Sachs 2022), which co-evolved as countermovement against unsustainable urban lifestyles and expansionism**. We have found no evidence that local sufficiency initiatives have resulted in a transition of growth-oriented urban regimes or landscapes, which is under the current conditions highly unlikely. Many of the initiatives we have studied are tolerated and sometimes meet individual or even collective support from municipal administrations. In these cases, they provide a recognised benefit to the local society, for example, by demonstrating sustainable options for local transport, repair, or better use of infrastructure. However, **the majority of representatives of local sufficiency initiatives reports altogether precarious development perspectives and lacking support**.

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2. Sufficiency: Ready for policymaking?

Is sufficiency a salient concept and has it matured for contributing to policymaking?

During our interaction with local initiatives, we could only find evidence in France that sufficiency is a concept of major importance for contemporary municipal policymaking. In the sufficiency literature there are major deficits in two areas, which might contribute to explaining the limited knowledge and acceptance of the concept beyond educated academic milieus:

- Definition
- Metrics

2.1. Definition of the sufficiency concept

"[Sufficiency is] a set of measures and daily practices that avoid demand for energy, materials, land, and water while delivering human well-being for all within planetary boundaries."

IPCC, Intergovernmental Panel on Climate Change, SPM AR6, 2023, p. 31

The FULFILL reviews of literature has confirmed a systematic literature review of more than 300 articles that sufficiency can be referred to as doctrine, worldview and paradigm. "Thus, it seems that sufficiency has a rather abstract role of influencing sustainability thinking in the broad sense attributed to it, leaving the more tangible meaning of the concept undefined" (Jungell-Michelsson and Heikkurinen 2022, 4).

FULFILL understands the sufficiency principle as creating the social, infrastructural, and regulatory conditions for changing individual and collective lifestyles in a way that reduces energy demand and greenhouse gas emissions to an extent that they can remain within the planetary boundaries and simultaneously contribute to social well-being (FULFILL D2.3). Thus, sufficient lifestyles are conducted in the safe operating space or sustainable consumption corridor between a social foundation, which is the ability to satisfy human needs and an upper limit (ceiling) defined by planetary boundaries. Akenji et al. (2021) conceptualize sufficiency as "fair consumption space". Like sustainability, sufficiency is about the satisfaction of human needs, however, their satisfaction is not limited by an abstract ability of future generations to meet their needs (as in the Brundtland definition of sustainability), but more concretely by planetary boundaries (which can also be referred to as ecological carrying capacity or environmental maxima). A popular framing of sufficiency is the concept a "doughnut economy" (Raworth 2012) that defines a "safe and socially just space in which humanity can thrive". Thus, sufficiency has the advantage of being more explicit in the determination of limits than the sustainability concept. However, **the ecological framing of sustainability in the academic sufficiency literature is no theoretical advancement but rather a re-framing of the concept of "fair shares of environmental space"** that had been promoted almost 30 years ago by Friends of the Earth and the Wuppertal Institute (Spangenberg 1995, Carley 1998). **During our interaction with sufficiency initiatives, we could only find evidence in France that sufficiency is broadly accepted.** Some initiatives questioned its usefulness for their purposes because it can be associated with sacrifice. The representatives of initiatives which had been interviewed in FULFILL rather refer to sustainability, climate protection or other more established or tangible concepts than sufficiency.

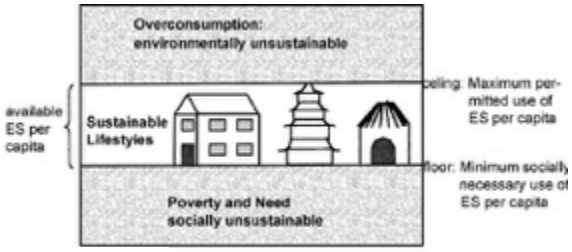

Figure 1 : Sufficiency as environmental space (Spangenberg 1995)

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2.2. Metrics of sufficiency: ♥ > €

A major obstacle for developing evidence-based sufficiency policies is that policymakers cannot rely on established economy-wide metrics for sufficiency. Thus, it is only partially possible to model or evaluate economy-wide impacts of local sufficiency measures or policies. At this stage sufficiency of an economy - as the ability to satisfy human needs within planetary boundaries - cannot be measured by generally accepted metrics.

Econometric models in the sufficiency literature represent the degree of satisfaction of human needs in an economic sector or an economy by determining the value of consumed goods and services in line with the established economic core belief that the consumption of goods and services corelates with the satisfaction of human needs. However, this belief is usually rejected by sufficiency proponents, but at this stage of the state of the art the sufficiency literature has not been able to build on generally accepted alternative metrics for the satisfaction of human needs or, in other words, "the good life". A persistent methodological obstacle for defining sufficiency metrics is that the satisfaction of human needs relies to a large extent on mutual recognition and care as well as other natural, social and psychological imponderables, which cannot be captured by econometric data. Thus, **the "social floor" of the sufficiency corridor remains abstract - and debatable**.

The physical metrics of the environmental sufficiency ceiling are also to a large degree undefined. In some environmental impact areas of global relevance common definitions and statistics are not available. In other areas data can be generated, but a political consensus on acceptable target levels or planetary boundaries is missing. A prominent exception are the metrics for climate change. In this area a political consensus about a measurable target is defined by the 1.5°-target of the Paris agreement. This allows to model compatible economic activities (e.g. Akenji et al. 2019). As mentioned before, these models rely on standard econometric models, which exclude non-economic contributions to the satisfaction of human needs and thus only give an insufficient picture of reality, usually with unknown impacts, e.g. on the care economy and on other environmental impact areas.

A work-around the absence of generally accepted metrics on the macro level is to isolate human needs such as food, housing, or mobility. Here the determination of a functional unit can also be challenging. In specific areas such as housing it is possible to define limited indoor temperature or use of living space per capita as a metric for energy sufficiency, however, this could also indicate poverty. In the food sector the measurement of needs is complicated. Eating, for example, is much more than the intake of calories, as it has a broad range of social, psychological, cultural, and even religious meanings with varying implications for the definition of need.

In order to capture the full spectrum of social, economic and ecological impacts of sufficiency initiatives in specific urban contexts FULFILL successfully tested an adapted Theory of Change methodology in case studies in five EU-Member States. This might offer a perspective for improved bottom-up modelling of sufficiency policies as this is currently tested by the junior research group "The Role of Energy Sufficiency in Energy Transition and Society" (ENSU)[1].

[1] https://energysufficiency.de

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3. State of the art

Only a part of the academic sufficiency literature is relevant for the development of concrete policy recommendations e.g., in the framework of the European Green Deal and corresponding national, regional, and local policies. Many publications imply concepts of social change in which policymaking is not necessarily considered. Based on a semi-systematic review, Lage (2022) identifies three different ways of approaching social change in the contemporary sufficiency literature. Among the three approaches only one directly addresses policy design and policymaking. The other two approaches are about societal change, but they usually avoid references to existing policies, politics, or polities. The authors of the two approaches often refer to sustainability transitions. However, their assumptions on societal change are rarely related to governance and real policymaking. Central assumptions are often based on a combination of political theories and wishful thinking and are only sporadically based on evidence. The corresponding literature is therefore hardly useful for informing evidence-based policymaking.

According to Lage (2022) the first and most prominent approach to social change in the academic sufficiency literature assumes that a bottom-up diffusion of supposedly sustainable changes in individual behaviour and lifestyles accumulate in a critical mass which can induce cultural shifts and eventually set the right conditions for political change. The other approach offers "a perspective for the critical reflection of current patterns of unsustainability and planned measures" aiming at "overcoming capitalist power and domination relationships and a growth logic" (Lage 2022, 16). Theoretical reflections about overcoming capitalism resonate not only in specific academic milieus, but they can also achieve high sales rates on the book market. Their political impact is at best limited to an agenda-setting, but they usually offer little transformative perspective, especially for policy designs which aim at climate-neutrality within the upcoming two decades. In addition to a perspective on a bottom-up transition and theoretical reflections on overcoming capitalism, **only a fraction of the scientific literature** in a third category of publications identified by Lage (2022) **relates to policymaking**, however, **in that perspective strengths and shortcomings of the sufficiency literature should be considered**.

3.1. Strengths and shortcomings

A strength of the sufficiency discourse is that it reaches out to basic concepts of human existence and meaning. It is therefore not surprising that it has primarily resonated with social science and humanities including economics (Jungell-Michelsson and Heikkurinen 2022). **By putting less emphasis on technology, it has inspired a broad interdisciplinary reflection of the social and physical conditions of economic affluence and the satisfaction of human needs**.

Population dynamics have remained "an anathema on principle in most western countries" (Huber 2004, p.25). Thus, the sufficiency literature does not provide a comprehensive discussion of the driving-forces behind global environmental change as defined by the IPAT formula[2] (Ehrlich and Holdren 1972, Chertow 2000, see section 3). In a global perspective the contribution of economic affluence (and consequently of sufficiency) to global resource extraction varies over time in different world regions depending on population as well as technological dynamics (Oberle et al. 2019). The neglect of population as a driving-force of global environmental change in contemporary sufficiency literature limits its policy-relevance in low-income economies, especially in those with high population dynamics.

At least in industrialized societies with stable populations, the sufficiency debate enables a much broader interdisciplinary reflection of the causes of global environmental change and possible responses than past discourses about end-of-pipe environmental protection, eco-efficient technologies, or green growth. Much like the sustainability concept sufficiency had a fruitful agenda-setting effect in policymaking as well as in science, most likely primarily in academic high-income milieus.

[2] Impact = Population x Affluence x Technology

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3.3. Opportunities and risks

Even though a broad interdisciplinary reflection on the satisfaction of human needs and global environmental change can be useful, it **risks drifting off into a theoretical debate with insufficient consideration of down-to-earth policymaking**. If the added value of sufficiency can be identified and framed as a complement to established environmental policies rather than an alternative, it might have the potential to contribute to absolute reductions of environmental pressure. The IPAT formula and its variations such as the Kaya identity are not only the conceptual backbone for quantifying global environmental pressure (e.g. GhG emission models), but can also be used as a frugal heuristic for making this point: Technological improvements are only one variable for decreasing environmental impact (I). **So far, the ecological effectiveness of technological improvements (T) has to a large degree been offset by growth in population (P) and affluence (A).** This central evidence-based argument for sufficiency could have the potential to bring the simple, but inconvenient message of the IPAT heuristic across. In this context the dominance of scholars from social science and humanities in the sufficiency debate could be an asset. If they manage to reach out to their mainstream disciplinary discourses, the scholars of the sufficiency debate could increase the chances for developing the right coding of the IPAT heuristic, which over the past 50 years resonated in social science and humanities only to a limited degree. Thus, **the sufficiency debate could be an opportunity for overcoming wide-spread incomplete and flawed analysis** as well as associated misconceptions of global environmental change as well as their driving forces such as population dynamics, income distribution or technological development (Rosling, Rosling, and Rönnlund 2018).

A considerable risk is that sufficiency remains a rather blurry doctrine, worldview or paradigm of primarily academic relevance for high income milieus "leaving the more tangible meaning of the concept undefined" (Jungell-Michelsson and Heikkurinen 2022, p.4). The reference to equally opaque concepts like the doughnut economy is not a solution but is just another framing of the problem that since the 1980ies science only partially made progress in defining and quantifying human needs and physical limits to satisfying these needs (see metrics).

Another risk is that sufficiency might be misunderstood as individual change of personal lifestyle rather than a collective challenge requiring political responses and structural change (Spangenberg and Lorek 2019). Especially with regards to the implications for the care economy the privatization of change in individual consumption and routines could proliferate a gender-bias in the sufficiency debate. Therefore, gender-responsive ways of addressing sufficiency could be further developed by promoting structural change which could enable an emancipation from the need to use material and energy intensive goods and services. Along these terms, affluence – or quality of life - could be defined not as consumption of a growing quantity of goods and services, but as access to a quality of goods and services enabling an emancipation from exploitive structures. However, this would require not only a better understanding of the relation between the satisfaction of needs and monetary as well as the care economy, but also a concrete perspective on emancipative governance and structural change (Spitzner 2021).

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4. Policy recommendations

Urban sufficiency initiatives have an antagonistic relation towards dominant unsustainable rationalities and practice, offering recessive alternatives development options. They are always endangered because they work against the prevailing rationalities and selection pressures of industrial societies. However, these pockets of alternative futures should be preserved because they could become pivotal when ecological limitations begin to shape the development of urban systems.

We have structured our policy recommendations in **three phases**, with a subsequent short-term, medium-term, and long-term perspective:

1. In a **short-term** perspective **strategic, niche management** (SNM) could offer niches, in which sufficiency initiatives would be temporarily protected from the full force of prevailing selection pressures within unsustainable urban systems (Kemp, et al 2000).
2. In a **medium-term** perspective **metrics and indicators** for the climate-neutral satisfaction of human needs could inform an evidence-based development of sufficiency governance.
3. In a **long-term** perspective only a **change of framework conditions** would eventually allow the emergence and stabilization sustainable urban structures and practice.

4.1. Short-term: Strategic Niche Management

Our research and interactions with local sufficiency initiatives in five EU-Member States has confirmed findings of Moser et al. (2018) analysing options for supporting sufficiency initiatives in Switzerland and identified four areas of strategic niche management where municipalities can support local sufficiency initiatives:

Resources and competences
Sufficiency initiatives rely on voluntary work. Cities can offer financial support and training especially in financial, administrative, and legal matters, which are usually not a core competence of local sufficiency initiatives.

Infrastructure and legal conditions
Physical infrastructures, economic and legal frameworks usually promote material and energy-intensive production and consumption patterns (e.g. roads for cars, regulations on food hygiene, expansive land-use planning). Municipalities can adapt urban transport infrastructures and sometimes have scope for developing flexible responses to sufficiency objectives in other areas such as food processing and end-of-life use, planning of the built environment or land-use.

Formal support, venues, and networking
Sufficiency initiatives are usually valuable organizations of benefit for the public and should be officially recognized and treated as such. They should have central contact persons and guidance when dealing with local administrations. Ideally, local networking and mutual learning among the initiatives also in cooperation with municipal staff could be encouraged, e.g., by offering venues, communication, and training facilities. Furthermore, municipalities can offer space and venues for meetings and public engagement, including collaborations with local housing cooperatives and neighbourhood associations.

Political legitimation and communicative support
Many sufficiency initiatives struggle to survive. A continuous challenge is the recruiting of a voluntary and active membership. During our interactions with the initiatives, they often indicated difficulties reaching the general public. In that context, they would welcome public recognition and support. Municipalities could directly inform citizens about existing initiatives in their community, but they could also be a mediator between sufficiency initiatives and potential donors. For example, they

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could mediate public private partnerships, networking, and association.
Eventually, sufficiency initiatives could become partners in the planning and development of cities and towns. Sufficiency principles could be integrated in municipal strategies and planning. There is evidence that especially, the introduction of concrete targets and timetables seem to motivate cooperation, e.g., with the introducing carbon budgets at municipal level. Regional food cooperatives as well as repair and sharing initiatives could make valuable contributions not only to meeting climate change mitigation targets, but also to improving neighbourhoods, citizenship and social cohesion.

4.2. Medium-term: You can't manage what you can't measure

The sufficiency debate has inherited from the broader societal sustainability discourse substantial **conceptual deficits concerning the operationalisation in terms of metrics and indicators**. In the medium-term this will inhibit the development of evidence-based policies because this would require the ability to measure their effectiveness. So far, **the state of the art of the scientific literature defines sufficiency as the ability to satisfy human needs within planetary boundaries, however, neither the satisfaction of human needs nor planetary boundaries (beyond climate change) are sufficiently defined** to allow measurement to a degree that would be needed for making informed decisions in the multi-level governance system within the European Union and beyond. Thus, the relations between planetary boundaries and local activities need to be better understood and better defined in ways that allow operationalisation in policies. Where the relations are reasonably well understood, as for example, in the case of climate change mitigation, they need to inform multi-level policies. Climate change mitigation could be a frontrunner of evidence-based policy designs aiming at the limitation of environmental impacts within planetary boundaries in partnership with the rich diversity of local sufficiency initiatives.

4.3. Long-term: System dynamics

In general, the analysis of sufficiency literature has revealed large differences in the conceptualization of societal change. Generally accepted theories of change for sufficiency policies and metrics for testing these theories would be desirable. However, so far only anectodical evidence is available. This limits the ability of a realistic assessment of the potential of sufficiency initiatives and policies.

In the long term, it would be desirable to shift the prevailing dynamics of exploration, exploitation, and expansion of urban systems. Ideally, **the evolutionary process of variation, selection and stabilization within urban societies should favour the development of sufficient solutions rather than goods and services which require increasing amounts of energy and material**. In the long term these systems dynamics might only be realized by a smart policy-mix consisting of the right price signals and infrastructures in combination with adequate legal and social norms. However, this would require a considerable acceleration of evidence-based policy-learning. So far, policymaking lacks the necessary operational concepts, metrics and institutions which would allow a broad change of urban system dynamics towards sufficiency. **More implementation-oriented research and development would be desirable for taking advantage of the rich potential which the multitude of local sufficiency initiatives offer at local level**.

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