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Social Sciences and Humanities priority research questions for smart consumption in Horizon Europe



ENERGY SOCIAL SCIENCES & HUMANITIES INNOVATION FORUM TARGETING THE SET-PLAN

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The European Union's (EU) Horizon Europe programme provides exciting opportunities for Social Sciences and Humanities (SSH) research to contribute to the fulfilment of the EU's ambitious policy goals on energy and climate change. This report presents 100 questions that have been identified by experts as priorities for SSH research on **smart consumption** (i.e. related to the use of digital technologies for energy production, distribution and use). This list of priority questions aims:

To demonstrate how Social Sciences and Humanities (SSH) must play a leading role in smart energy transitions, in dialogue with technologists and policy makers, to accelerate a shift towards a sustainable energy future. To communicate that the social and technical aspects of smart cannot be separated, and the value of SSH in addressing challenging questions including those around values, justice, institutional change, democracy and participation. To reframe the smart consumption conversation, by highlighting how consumption is anchored in existing institutions and systems, which means that transitions challenge power structures and vested interests.

The 100 priority questions are grouped into seven themes, as follows:

1. Power relations and smart energy transitions

Asks how the use of smart energy technologies affects power relations, including across policy, business and industry, as well as issues over data control and privacy.

2. Engagement and trust in relation to smart technology roll-out

Concerns engagement, dialogue and knowledge-exchange processes related to smart consumption, including the role of SSH itself in working with other groups.

3. Exclusion and unevenness in smart futures

Discusses issues of ethics, just transitions, equality, deprivation and vulnerability with a clear focus on

how to avoid exclusion from future smart energy initiatives.

4. Building communities for smart consumption and prosumption

Emphasises how smart technology initiatives always take place within distinct local contexts, made up of different people, cultures and infrastructures.

5. How smart can become part of, or disrupt, everyday life

Focuses on the role of smart in transforming the relationship between people and their energy use, as well as how social relations change how we use smart technologies.

6. Beyond smart: evaluating assumptions and alternatives

Challenges dominant assumptions that smart consumption will always benefit future societies, as well as exploring low-tech/no-tech ways to achieve low-carbon futures.

7. Citizen, worker, parent: different roles involved in smart

Highlights a wide range of actors beyond 'smart consumers', recognising that consumption is also shaped by e.g. innovators, policyworkers, built environment and transport practitioners.

To identify the 100 questions, we undertook a Horizon Scanning exercise over August 2019 -November 2020. This involved a Working Group of 26 energy-SSH experts (as well as 5 Steering Committee members) from across Europe, encompassing diverse SSH disciplines, interdisciplinary experiences, genders, geographies, research interests and career stages. A Horizon Scan survey including this group and their wider contacts (74 respondents in total) generated a list of possible questions, which after an initial editing process resulted in 273 revised questions that were presented to the Working Group to be ranked according to their priority, using a second survey. The results of this survey fed into two virtual workshops with Working Group members in September 2020, where questions and the themes under which they sat - were discussed and revised. This deliberative process resulted in a final list of 100 priority questions for SSH research on smart consumption.

This list is not intended to be exhaustive, but aims to stimulate discussion between policymakers, funders and researchers on how SSH evidence on smart consumption and related issues can best support policy goals on energy and climate change. We hope the questions serve as inspiration for direct use, as well as a further adaptation and development by SSH researchers.



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1. Introduction

1.1. Background: the start of Horizon Europe

The end of 2020 sees the start of the handover between European Union (EU) Framework Programmes (FP). Specifically, Horizon 2020 (FP8) which ran principally over 2014-2020, is coming to an end, just when Horizon Europe (FP9) is releasing its first funding calls for 2021-2022. As such, the outcomes of the European Commission's (EC) recent strategic planning exercises for European research and innovation over the period 2021-2027 are now being made clear. As part of this handover, the European Commission has maintained its commitment both to mainstreaming Social Sciences and Humanities (SSH) across all of its funded research (which is likely to be predominantly technical and natural science-led research), as well as to creating opportunities for dedicated SSH-led research where needed.

It is these contexts - of strategic change in European research and innovation, and renewed commitments to SSH (before final decisions on what forms these may take) - that provide the foundations for this report on research priorities. Indeed, there is an opportunity for truly cutting-edge programmes of research and innovation to be funded, and this is a key moment for SSH communities to constructively develop and communicate their own priorities. Such opportunities must be urgently grasped, not least in energy-related research and innovation, where the vast majority of funding has gone to the natural and technical sciences (c.f. Overland and Sovacool, 2020) and efforts towards interdisciplinarity have had limited effect (Baum and Bartkowski, 2020). Moreover, there is clear evidence indicating the funding of energy-related SSH in Horizon 2020 to be minimal, disciplinarily-narrow, overly-instrumental and lacking critical perspectives (Genus et al., 2018; Kania et al., 2019; Foulds and Christensen, 2016; Robison and Foulds, 2019). It is clear that much still needs to be done for the EC to get the most out of energy-SSH.

1.2. Aims and hopes for the use of this report to support the European Commission

The aim of this report is to present priority SSH research questions for the EC to consider funding in Horizon Europe, specifically in relation to smart consumption (see definition in Box 1). This is one of four reports each detailing 100 priority SSH research questions for key topics associated with the EU Energy Union: renewables; smart consumption; energy efficiency; and transport and mobility. These topics were set to align with existing EC research and innovation funding priorities, as part of contributing to EU energy policy commitments.

Box 1. Definition: smart consumption

We are taking 'smart' to refer to technologies which are digitally enabled and networked for (usually real time) monitoring and/or control. The term 'consumption' in the Working Group's title shows an emphasis on these technologies in homes, workplaces and communities, rather than within industrial scale production or use of energy. In considering boundaries with the other Working Groups, the Smart Consumption Working Group did not focus in detail on debates concerning smart transport and mobility. During Working Group discussions, some members also emphasised that in future smart energy systems, consumption may increasingly become *prosumption*, the co-production and management of energy within distributed energy systems.

Smart is positioned as a priority in Horizon Europe's Cluster 5 on 'Climate, energy, mobility' (EC, 2019b: Annex 5), specifically through reference to smart communities, smart cities, smart buildings – including going "*beyond smart meters*" (ibid, p.10) – smart energy management and smart grids. In addition, one of the Horizon Europe Missions is centred on the aim ambition of creating 100 'Climate-neutral and smart cities' by 2030. From the well-established Strategic Energy

Technology Plan to the newly launched European Green Deal, smart is seen as an essential part of European low-carbon energy system policy targets (see quotes).

> "The future smart EU energy system, with the consumer at the centre", Strategic Energy Technology Plan (EC, 2015, p.11)

> "The transition to climate neutrality ... requires smart infrastructure" European Green Deal (EC, 2019a, p.6)

Our hope is therefore that this report enables energy-SSH to inform and support policy ambitions, as the EC begins writing more funding calls around smart consumption and smart cities. Whilst member state interests will also help construct these calls, we hope that these priorities from SSH communities themselves are useful. Indeed, a concern of SSH researchers has long been that their own research agendas have been overtly directed by non-SSH specialists, who may have expectations of what SSH can do in supporting policy ambitions – both conceptually and practically – that can lead to misunderstandings and poor outcomes.

1.3. Using Horizon Scanning methods

In identifying our 100 priority SSH research questions, we undertook a Horizon Scanning exercise over August 2019 – November 2020. Horizon Scanning methods are "used to gain foresight about emerging opportunities and risks, identify knowledge gaps at the frontiers of fast-evolving phenomena, and set strategic priorities for decision-makers or researchers" (Foulds et al., 2019, p.10). Over the last 10-20 years, Horizon Scanning has become relatively well-established in policy circles, with policy actors keen to anticipate problems and develop novel solutions.

Within the range of Horizon Scanning methods on offer, there have been numerous 'question selection' exercises (e.g. Ingram et al., 2013; Pretty et al., 2010; Sutherland et al., 2019). These exercises have tended to create research agendas "by better aligning research questions with policy needs... [so as to be] more relevant to policy makers and thus increase its real-world salience" (Rudd, 2010, p.861). It is exactly this approach that inspired the Horizon Scanning exercise we used.

Our own Horizon Scanning began with a core team producing Terms of Reference (Robison et al., 2019), which set the boundaries and starting points for the Smart Consumption Working Group. Each Horizon Scanning exercise involved a Working Group of 25+ energy-SSH experts from across Europe. The Terms of Reference fed into the production of methodological guidelines (Foulds et al., 2019), which all Working Groups followed. Please see these guidelines for an in-depth overview, but in brief¹:

- 1. We systematically constructed a Working Group that prioritised diversity of e.g. SSH disciplines, interdisciplinary experiences, genders, geographies, research interests, career stages, etc. Appendix 1 includes a breakdown of final Working Group member characteristics.
- We utilised the contacts of Working Group members, to gather submissions of priority questions via a first Horizon Scan survey (generating 254 questions in total) from European energy-SSH communities. Appendix 2 includes a breakdown of respondent characteristics.
- 3. We centrally processed and edited the submitted questions, to address e.g. irrelevance to smart consumption, non-SSH focus, cross-question similarity, English language, as well as separating out questions that had multiple parts (Appendix 3).
- 4. Working Group members evaluated the newly-produced list of 273 SSH questions, via a second Horizon Scan survey, scoring them on a scale of 1 ('definitely exclude') to 5 ('definitely include'), and providing other qualitative feedback. Appendix 4 includes the headline results from this Working Group member evaluation task.
- 5. Evaluation results were centrally analysed, feeding into two virtual workshops with Working Group members, where question selection decisions were deliberated as well as final gaps identified and filled. Appendix 5 includes information on the systematic procedure adopted in creating and discussing the 'longlist' of questions that was provided to members for deliberation. This deliberative process resulted in the final list of 100 priority questions.

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¹ All four Energy-SHIFTS Working Groups followed the same five steps, albeit with each yielding e.g. different numbers of questions.



Sitting alongside this Horizon Scanning exercise were nine interviews with an interdisciplinary cross-section of Working Group members and other energy-SSH experts. These interviews were undertaken shortly before the launch of the first Horizon Scanning surveys, and were focused on past SSH developments and debates on smart consumption. They provided context on the past and future directions and contributions of SSH on smart consumption, which will feed into a future Working Group output highlighting key literature from the field.

1.4. Mission statement from Smart Consumption Working Group members

As highlighted in section 1.2, this list aims to help increase the presence of SSH in EU energy research and innovation. Unexpectedly, our work on these 100 priority research questions took place at a time of huge upheaval due to the COVID-19 pandemic which will undoubtedly provide lasting lessons for transformative social change. Against this backdrop the Working Group discussed what we hoped the list would convey to policy, research and other stakeholder groups. We thus constructed our mission statement as follows:

To demonstrate how Social Sciences and Humanities (SSH) must play a leading role in smart energy transitions, in dialogue with technologists and policy makers, to accelerate a shift towards a sustainable energy future. To communicate that the social and technical aspects of smart cannot be separated, and the value of SSH in addressing challenging questions including those around values, justice, institutional change, democracy and participation. To reframe the smart consumption conversation, by highlighting how consumption is anchored in existing institutions and systems, which means that transitions challenge power structures and vested interests.

We now delve into this statement in a little more detail.

First, members were keen to emphasise that the role of SSH is not simply to provide critique of technology-led efforts, from the sidelines. Instead, SSH understandings of social change are necessary to achieve a smart energy transition and SSH researchers must and can play leadership roles, while recognising the expertise of others. Members wanted this list to be a tool for interdisciplinary and cross-sectoral collaborations (including across the many different disciplines which make up SSH), not to foster polarised disciplinary groupings.

Second, the 'socio-technical' nature of (smart) energy systems is a fundamental assumption underlying many of the questions. As spelled out in the mission statement, the term socio-technical signifies that social and technical elements are interrelated in any system, not separate entities. By definition, a transition involves fundamental changes in society (Rotmans et al., 2001). This means the role of SSH must go beyond simply boosting the effectiveness of any pre-determined smart technology roll-out, because the technical evolution of (smarter) energy systems interrelates with social and behavioural processes such as transforming institutions, working towards just outcomes, advancing energy democracy and enabling low-carbon living. It is impossible for SSH to ignore such issues, and members emphasised the value that SSH offers in addressing challenging questions about the society we want.

Third, there was agreement among members about the role of SSH in reframing conversations about (energy) consumption. This relates to, for example, moving beyond a focus on individual consumers to consider the roles of institutions and power structures. Existing patterns of consumption are locked into the way current institutions operate as part of our energy system. Due to this, some members were keen to promote questions that consider the radical transformation of consumption, as energy systems come to rely more on *prosumption*, where energy production is decentralised, and individuals and communities take a more active role in generation, transmission, storage, distribution and demand response.

As highlighted at the start of this subsection, the COVID-19 pandemic has brought a sharp focus on how large-scale societal change requires an interconnection between institutions, policy, workplaces, individual behaviours and social meanings. We have all seen first hand how change such as this, especially when undertaken rapidly, is as reliant on social structures as it is on technological breakthrough. SSH research is vital to ensure we are in a strong position for low-carbon energy transitions, and the 100 questions of this report are intended to contribute towards this end.



1.5. Navigating our 100 questions

As with all four Energy-SHIFTS Working Groups, we do not to claim to have produced a definitive set of research priorities for all SSH communities. These questions therefore do not represent an end point, but rather a tool to stimulate discussion with the EC and other stakeholders, and amongst energy-SSH communities. With this in mind, we turn now to how the reader can navigate the questions.

Our 100 research questions are organised under seven themes. Each theme includes a short introduction which outlines the topics covered. The themes were generated through an iterative process whereby the Chair and Co-chair reflected on points of discussion at the first Working Group workshop, and then refined them based on member feedback. Each theme raises issues that complement and point forward to issues within the following theme, until we come full circle – see Figure 1. Within each theme, the first question is of an overarching nature. These should give the reader an immediate sense of the topics covered, but do not capture everything within that theme. Apart from choosing a broader question at the start, the ordering of the questions does not reflect any order of importance. We have however sought to put questions on related topics next to each other, and such topics can be seen through the 'keywords' listed in each theme's introduction.

Since these are research questions, generated directly from research communities, they do use SSH jargon². The use of particular words, and the specific meanings they convey, is important within academic work and it was right to preserve this. To help the reader, we have therefore included a glossary of 23 definitions of SSH terms in Appendix 6 (p. 31). We also note that we did not want to completely homogenise language, in order to reflect the real-world diversity of how these topics are discussed.

Citizen, worker, different roles involved in and smart energy smart $\left(\right)$ **Beyond smart:** evaluating Engagement assumptions and trust in and alternatives relation to smart technology roll-out 5 07 become part Exclusion of, or disrupt, everyday life and unevenness Building 04 futures communities 03 for smart consumption and prosumption

Figure 1. Each theme raises issues that complement and point forward to issues in the following theme.

Every question could be rewritten in many ways, and indeed would be rewritten depending on the discipline mobilised to address it. The questions represent examples of what SSH can allow us to do. There are therefore questions which seek different types of answers. Some seek to describe a phenomenon, while others encourage explanations. Some are geared towards evaluation e.g. of interventions or technologies, while others address the relationship between societal goals (e.g. justice, gender equality, democracy) and smart. Some questions seek to consolidate and strengthen current research areas, whereas others open new avenues. This diversity is deliberate and reflects different positions across SSH. We hope that researchers from across all SSH communities will find the list meaningful. As part of this we would hope that the questions can be used directly, but just as importantly, that they can serve as inspiration for future adaption and further development. SSH scholars have unique knowledge and skills, and it is important that these are mobilised to tackle key elements of energy transition, such as smart consumption.

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² Specialist terminology can be seen within around 20% of the questions.



2. Presenting 100 priority questions for Social Sciences and Humanities (SSH) research on smart consumption





2.1. Theme 1: Power relations and smart energy transitions



Keywords control; empowerment; policy and governance; business and industry; data; privacy.

This theme includes questions on how the use of smart energy technologies affects power relations, especially across policy and governance, business and industry. An important aspect is how current energy consumption patterns are embedded in institutions, which themselves contain power dynamics. In this way, energy transitions often require institutional change. On the one hand, questions here ask about unequal distributions of power and control within energy systems, and how this may lead to unequal distribution of benefits. Questions about who has control of data also raise privacy issues. These complement questions on trust raised in Theme 2. There are also questions on whether and how citizens and communities can become empowered through smart technologies. These complement questions about a so real so and inclusion raised in Theme 3.

How do smart technologies (and political targets associated with their manufacture, rollout and use) intermesh with pre-existing politics and power relations across different cultures and socio-technical* systems?

2 In what ways do issues related to energy independence and energy security (of a given country or region) align or conflict with smart consumption ambitions?

Which gaps exist between *energy* governance* and *digital* governance systems; and how are these affecting the development of smart, low-carbon consumption?

In what ways do different interest groups or lobbies mobilise discourses* and agendas (e.g. technological promises*, economic models, efforts of 'framing' energy issues etc.) that promote (or resist) specific smart technologies; and what are the institutional conditions supporting these discourses?

*Indicates SSH terms defined in Appendix 6: Glossary. Individual terms are flagged up the first time they appear within the questions. What new routes to empowerment (e.g. democratic influence, changed property regimes etc.) do smart technologies offer; and how can we transition to a more democratic smart energy system that truly empowers citizens and communities?

Who benefits from mass implementation of smart energy technologies; and to what extent can the benefits be shared fairly?

What issues of equality, equity and justice arise upon study of the manufacture, supply chains and business models of smart technologies; and how can desired outcomes be achieved?

Begin areas: or conversely how do they open up options for the 'sharing economy'*?



What are the conflicts and alliances (at multiple scales, from household, to community, to business, to political economy) that smart consumption strategies spur?

10 Which are the key social issues relating to privacy and cybersecurity for people who use smart technologies; and how can this privacy/security be assured?

How are datafication and Artificial Intelligence (e.g. deep learning, sophisticated algorithms etc.) impacting citizens' trust in (private and public) institutions in the energy sector; and to what extent does this require new tools aimed at fostering this trust?

12

What is the nature and scale of abusive use of smart technology; and what actions could be taken to reduce this?



2.2. Theme 2: Engagement and trust in relation to smart technology roll-out



Keywords education; social acceptance; participation; SSH knowledgeexchange; SSH methods.

This theme concerns many aspects of engagement and dialogue between groups, related to smart consumption. Trust features in this theme, with questions going beyond the traditional policy emphasis on social acceptance amongst the public. The latter represents a narrow focus which has led in the past to the neglect of questions about social acceptance among other relevant actors, and other important social issues. Questions therefore ask what conditions enable trust – among all relevant actors – in the roll-out of new technologies, and how the ways in which smart technologies are implemented interplay with trust relations across society. In addition, the roles of knowledge-exchange in engagement and participation are presented here, which complement questions in Theme 3. This includes the role of SSH knowledge-exchange in enabling new policy pathways and working with other groups.

13 In what ways do the introduction and use of emergent smart energy technologies create new means of engagement in wider energy and climate issues; and what are the impacts of this engagement?

> How do the uses of smart technologies (and their associated socio-technical energy systems) affect relations of trust?

15

What are the conditions that enable trust in complex smart socio-technical systems, especially for non-expert users?

16 What are the multiple and diverse ways in which publics engage with smart technologies and smart consumption (i.e. the ecologies* of public engagement); how do they relate to one another; and how can knowledge of these help inform further efforts to engage the public in energy transitions?

How may the inclusion of the arts, creative and cultural industries, generate new pathways to enable smart communities and smart cities align with citizens' and local businesses' interests? 18 How can the introduction of smart and digital technologies help to engage those who are currently disengaged from energy issues but willing to contribute more broadly to a sustainable future?

10 How can smart technology design practices* enable energy transition participation in ways beyond economic incentives; and avoiding unintended effects of economic incentives?

20 In what ways are different combinations of economic and non-economic incentives effective in encouraging a socio-technical energy system that includes smart consumption?

21 What are the relationships between citizens' energy literacy* (i.e. knowledge about key energy issues of relevance to everyday life) and effective public engagement in smart consumption and energy transitions?

> How can understandings of smart consumption be integrated into modern education practices?

23 What is the interplay between community acceptance* and market acceptance ambitions (of developers or policymakers) related to smart technologies, and the level of agency* therefore afforded to users; and how can agency be maintained?

24 How can diverse modes of energyrelated Social Sciences and Humanities, including critical perspectives on smart consumption, be brought into genuine two-way knowledge exchange within projects led by industry and innovation? 25 How can Social Sciences and Humanities insights help formulate smart consumption policies, e.g. within domains such as distributional challenges, gender equality, or to stimulate companies to use energy smarter?

26 What are the key opportunities for Social Sciences and Humanities methods development (e.g. social experiments, longitudinal panel data etc.) in terms of understanding smart consumption?



2.3. Theme 3: Exclusion and unevenness in smart futures



Keywords just transitions; ethics; equality; deprivation; vulnerability; socio-economic development; participation; democracy representation of marginalised groups.

Just transitions have become a key scholarly focus area, also reflected in research related to smart consumption. This theme discusses issues of ethics, justice, equality, deprivation and vulnerability across sites and actors. There is a clear focus on how to avoid exclusion from future smart energy initiatives, as well as questions of fairness, particularly around affluence levels. An important aspect is recognising the differences between countries, both in the European context and globally, and therefore how smart futures might differ across regions. A key priority is research which supports working toward democratic goals at the same time as low-carbon goals. Exclusion contrasts with empowerment issues, so this theme complements Theme 1.

27 What ethical issues do the use of smart technologies raise; and what are the implications of smart technology use for equity and just transitions*?

28 Which strategies are available to avoid a bias of involving only 'green elites' (i.e. those with the resources to participate) in smart consumption, but also ensuring the participation of people in socially vulnerable positions?

How do smart services and their business models contribute to the additional inclusion or exclusion of certain groups (e.g. large families, older people, women, and vulnerable consumers etc.) from active participation in low-carbon energy transitions?

Bob How are issues of smart consumption and energy deprivation or energy poverty interconnected; and what is the potential role of smart consumption innovations in tackling these? 31 What are the systemic traits underpinning digital exclusion (e.g. lack of internet access, low levels of digital literacy etc.) and therefore hampering smart consumption?

32 How can smart technology initiatives engage citizens from socio-economic classes associated with higher carbon emissions, in order to lower emissions?

> Where can unevenness be identified in urban, regional and national geographies of smart consumption initiatives?

34 What are the patterns of (and conditions for) smart consumption in countries (or regions) with different socio-economic development contexts and different resource availabilities?

35 How can the Social Sciences and Humanities contribute to building new methods that support a more participatory, user-centred or democratic design approach for the development of smart technologies?



36 How do socio-technical imaginaries*, vanguard visions and expectations (of both citizens and communities) influence smart consumption futures? Box How do the use and understanding of smart technologies differ across the heterogeneity of consumers (e.g. young/ elderly, ethnic minorities, western/non-western etc.); and how can these differences inspire future developments of smart technology?



2.4. Theme 4: Building communities for smart consumption and prosumption



Keywords local contexts; community energy; lock-in; smart communities; smart cities; local government.

This theme emphasises how smart technology initiatives always take place within distinct local contexts. These (socio-technical) contexts are made up of different people, cultures and infrastructures. Importantly questions consider how smart consumption may require new modes of *prosumption* – where individuals or communities become producers as well as consumers of energy. Prosumption may thus offer a route away from the institutional lock-ins found in the current, high emission, energy supply systems. Whilst communities and collectives were referenced more than cities, questions here are also relevant for urban contexts. This theme, focussing on inclusion in communities, contrasts with themes of exclusion in Theme 3. This includes looking at the role of policy in building such communities. The next theme (Theme 5) dives in to look more closely at everyday life for the individuals and households who make up these communities.

Box How can inclusive approaches to smart consumption be furthered through citizen energy communities; and how may citizen energy communities be furthered through inclusive approaches to smart consumption?

Bow can the socio-technical system of power supply move away from centralisation, to be transformed into a smarter system where energy may be co-produced and consumed as a common good (e.g. as managed by prosumer* communities)?

40 What are the drivers that enable certain groups of energy users to act together and develop collective solutions for smart consumption and prosumption; and what are the institutional lock-in* factors obstructing this?

What are the potential roles of prosumers in the transition towards a system with active smart users instead of passive consumers; and how can institutional conditions better enable this? 42 How can we effectively design the application of peer-to-peer deliverance, as a crucial element in decentralised or distributed systems of energy from renewable sources?

43 How are smart technologies (and the businesses developing them) supporting new modes of community-scale energy generation and distribution; and what potential do they have to support them further?

How may co-production*, open innovation, and citizen and community empowerment to find good local solutions (as well as lessons from Social Sciences and Humanities research in these areas) be used as key drivers towards smart and sustainable consumption?

45 How have current narratives* (or discourses, or visions) of smart energy systems been shaped by different historical narratives of citizen and community empowerment?



How are smart technologies producing new ways of 'knowing'* energy supply and demand in cities?

47

How can rural and urban areas be more socially connected through smart energy consumption?

48 What are the roles of different technology user groups and actors in efforts to successfully upscale from local pilots, experiments and bottom-up initiatives within the area of smart consumption?

40 What is the role of the EU in promoting low carbon energy systems with smart consumption, and how can EU schemes (e.g. Community-Led Local Developments, or future instruments) be used to promote such energy systems?

50 What are the roles of local government in promoting smart consumption, particularly in areas with high levels of digital exclusion?

51 How can national and international smart consumption agendas better incorporate multiple and evolving community definitions of what it means for an energy system to include smartness?



2.5. Theme 5: How smart can become part of, or disrupt, everyday life



Keywords households; workplaces; transformational change; interconnected systems; electromobility.

Smart technologies are often intended to transform the relationship between people and their energy consumption (or production). This theme focuses on the role of smart in changing lifestyles, as well as how our lifestyles and social relations change how we use smart technologies. This includes questions exploring how smart technologies can end up being used very differently to their original design intention. The importance of developing energy systems which are resilient to disruption, and how smart may help or hinder this goal, is also included. Here, the experiences and impacts of the COVID-19 pandemic are likely to be highly relevant in the coming years. The next theme (Theme 6) moves on to questions which consider further whether the transformations sought through the use of smart technologies are always achieved.

52 How are smart technologies disrupting or reconfiguring well-established practices in everyday life; and how might this encourage low-carbon lifestyles?

How will new potential roles for households, homes and workplaces in future energy systems (e.g. active, flexible, smart etc.) affect everyday practices played out within them?

by How do household social relations and dynamics impact on the use and uptake of smart technologies; conversely, what are the long-term implications of smart technology use on household dynamics?

> What are the prospects of Home Energy Management as a social practice*?

56 How are different working patterns changing associated energy consumption patterns; and how may this interplay with the use of smart technologies?

577 How and why do the time-space patterns (e.g. rhythms, flexibility etc.) of everyday energy-consuming activities differ in respect to specific population segments and types of households; and with what implications for smart technology use?

58 How can longitudinal studies of participation in smart energy technologies provide insights on how they may be 'domesticated'* in the lives of households over time?

59

How do smart technologies shape expectations of indoor comfort?

600 What are the behavioural, societal or material means of achieving demandside flexibility (i.e. not price and technology, and not managed by providers or grid managers), to synchronise demand with the timing of renewable energy supply?



What role do emotions play in energy consumption practices; and what does that mean for smart consumption?

62 How and to what extent can societallevel disruptions such as economic crises, political turmoil, climate change and natural catastrophes, or public health emergencies affect smart consumption ambitions and implementation?

> How can smart consumption initiatives support the resilience of cities and societies?

64 What is the capacity of smart technology implementation to instigate or respond to radical, transformative changes in energy consumption behaviours across society?

655 How can our histories of consumption (including e.g. histories of cultures, behaviours, social norms, education practices etc.) shed light on and inspire today's development of smart consumption? 66 How could the use of smart technologies help countries prepare for a major and potentially controversial transition to electromobility?

677 How might consumers be prepared for the widespread adoption of battery technologies in a future smart, decentralised renewable energy systems?

68 What is the role of smart energy technologies in enabling systemic transitions to '1.5 degree lifestyles' considering entanglements with food provision, electromobility, community prosumerism, and other common goods of the 'sharing ecoomy'?

60 To what extent does the smart consumption of energy have spill-over* effects on the consumption behaviour of other domestic services, like water supply and wastewater services?



2.6. Theme 6: Beyond smart: evaluating assumptions and alternatives



Keywords unintended consequences; alternative futures; degrowth; sufficiency.

This theme actively challenges dominant assumptions about smart consumption and explores claims that smart will always benefit future societies (complementing issues raised back in Theme 1). On the one hand, there are questions that critique smart technology, but also those which explore the relationship between smart technologies and low-tech/no-tech ways of achieving low-carbon futures. Important elements of critique lie in asking about new economic models, questioning growth ideals, and sufficiency. This theme asks if smart can contribute beyond just producing new ways to consume, which complements questions that go beyond consumers in Theme 7. It highlights the ways SSH can help challenge and innovate energy systems - both on its own and working together with other disciplines.

How can we measure the outcomes of smart consumption and evaluate if potential (low-carbon and social) benefits of implementing smart consumption technologies justify their use?

How may the commercial push from smart technology interests divert attention from, or undermine, progress with low-tech energy initiatives such as insulation or active mobility programmes?

Given that the word 'smart' is associated with advanced technologies, what are the low-tech and 'stupid' technologies (or assets) that can help us achieving emissions reduction in a more sustainable way?

73 Since retrofitting of households and introducing new technologies is expensive, what potential is there for re-imagining and developing old technologies with new smart practices in order to produce smart consumption practices?

74 What indirect impacts (including but not limited to increased societal reliance on Information and Communication Technologies), and rebound* effects, of the use of smart technologies might contribute to increasing energy consumption?

75 What are the unexpected or negative social impacts of smart consumption interventions in the home, workplace or community?

76 What are the ethical and social considerations regarding the use of private data generated through delivery of smart services for provision of public goods?

How can design be used to decouple the use of smart energy technologies, and associated automation, from alienation and deskilling?

78Given that smart energy systems are
increasingly complex, impacting their
resilience, when do the benefits of
digitisation of energy consumption outweigh the costs
associated with new complexities in the operation and
architecture of smart systems?



How can 'smart' be mobilised in the production of alternative futures (and alternative economic systems) that are not based on consumption or waste?

80 What expectations are held of smart consumption, in terms of if and how it may contribute to human welfare and wellbeing (e.g. in the form of happiness and resilience)?

81 Can smart be mobilised to impact other aspects of the human experience than consumption, e.g. creating more sustainable and liveable experiences? 82 How can smart technologies enable sufficiency*-based practices/activities and simple living to become (more) conceivable, enabled and satisfying, in order to realise essential carbon savings?

83

What are the existing and possible interconnections between smart futures and sharing economies?

84 How do discourses of smart consumption interplay with alternative discourses (e.g. around degrowth, technological sovereignty etc.)?



2.7. Theme 7: Citizen, worker, parent: different roles involved in smart



Keywords smart consumer; smart citizen; gender; households; organisations; networks.

This theme discusses a wide range of actors, groups and roles of relevance to smart consumption. Thus, questions highlight important research agendas that both explore and go beyond 'Smart Consumers' – a group EU policy usually targets. In highlighting this diversity, the theme shows how SSH recognises consumption as shaped by the actions, interests and ideas of innovators, policyworkers, built environment and transport practitioners, as well as groups like households, workplaces, corporations and the media. As such, this theme also implicitly addresses power relations, complementing questions in Theme 1.

85^{thow} can future research on smart energy systems engage with broader and more diverse publics and collectives (e.g. with different aspirations, political interests, and practices), rather than only seeing people as individual consumers?

86 citizenship?

How does the notion of 'smart consumers' (e.g. in EU policy discourses) change the modern understanding of

877 What are the social, institutional and economic dynamics behind the creation of today's smart consumer; and how may this evolve in future?

Are any types of knowledge prioritised over others (e.g. economic theory vs. practical know-how*) within advocacy coalitions and policy discourses related to smart consumers?

89 What strategies and initiatives open pathways for smart citizenship, in ways that transgress the idea of participation in the energy system as only involving consumption?

900 What are the self-conceptions* of smart technology users and non-users; and how are these impacted by whether use is voluntary or mandatory?

91 system?

What are the potential roles of households and workplaces as participants in the future smart energy

92 How could participation within and across networks of communities facilitate learning of new, smart energy consumption practices?

DB To what degree will new actor groups (e.g. energy communities aggregators, etc.) provide essential flexibility to broader energy systems and energy markets?

94 In what ways does gender have an effect on private households' use of smart technologies; and how can gender perspectives be practically included in interventions and energy policy?



95 Why do developers and implementers anticipate people will use smart energy technologies in a more 'efficient', or different, way than they do?

96 From an energy planner's perspective, what are the rationales and conditions for successfully including citizen-driven energy perspectives in smart energy systems?

977 What are the barriers for network operators (e.g. legal, economic, regulatory etc.) who want to introduce smart consumption options for their customers? 98 If markets are the dominant organisational form within smart consumption, what other types of organisation might be blocked out; and does this present any barriers to energy transitions?

What are the interests and roles of global digital monopoly-like corporations (e.g. Alphabet, Amazon, etc.) for future smart consumerism as connected to e.g. ambient assisted living, smart home appliances, adaptive smart energy purchase tools, etc.?

100 technologies? How is the media influencing people's understanding of and meanings attached to new smart



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5. Appendices

5.1. Appendix 1 – Socio-demographic breakdown of Working Group members

Socio-demographic criteria	Соинт	%
Working Group members (excluding steering committee) participating in the Horizon Scanning exercise ³	26	100.00
Held a researcher identity	26	100.00
Based in organisations/countries eligible for Horizon 2020 funding	26	100.00
Had research interests directly relating to Working Group topic area	26	100.00
Different countries represented ⁴	19	N/A
Number of members in Northern Europe	8	30.77
Number of members in Eastern Europe	7	26.92
Number of members in Southern Europe	4	15.38
Number of members in Western Europe	7	26.92
Male	10	38.46
Female	16	61.54
Different SSH disciplines represented	30	N/A
With prior STEM backgrounds	>8	30.77
Frontrunners ⁵	11	42.31
Field leaders ⁶	15	57.69

³ The Smart Consumption Working Group began with 31 members plus 5 Steering Committee members, with five members dropping out for different reasons throughout the Horizon Scanning exercise. Three of those who dropped out were from institutions in Southern Europe, hence leading to lower representation here in the final make up of the group.

⁴ European regions classified using the UN's Geographic Regions classifications for Europe's regions (https://unstats.un.org/ unsd/methodology/m49/). For those Horizon 2020 Associate Countries, which fell outside of UN European regional classifications, they were classified/counted in accordance with their nearest neighbouring European country.

⁵ Full guiding definition available in methodological guidelines (Foulds et al., 2019, p.18). Focus on researchers working at the boundaries of conventional academic structures and conventions, perhaps through their research's interdisciplinarity, practical applications, exploratory nature, etc.

⁶ Full guiding definition available in methodological guidelines (Foulds et al., 2019, p.18). Focus on representatives of key SSH projects/communities, as well as on theoretical expertise, rather than practical application.



5.2. Appendix 2 – Socio-demographic breakdown of respondents to Smart Consumption Horizon Scanning survey

Socio-demographic criteria	Соилт	%
Survey respondents	74	100.00
Male	40	53.33
Female	33	44.00
Other	0	0.00
Rather not say	1	1.33
SSH (sub-)disciplines represented ⁷	45	N/A
1 st most represented (sub-)discipline – Sociology	16	21.33
2 nd most represented (sub-)discipline – Environmental/Energy Social Science	13	17.33
Joint 3 rd most represented (sub-)discipline – Geography	12	16.00
5 th most represented (sub-)discipline – Economics	12	16.00
6 th most represented (sub-)discipline – STS	11	14.67
Different countries represented ⁸	18	N/A
1 st most represented country – UK	14	18.67
2 nd most represented country – Norway	11	14.67
3 rd most represented country – Netherlands	7	9.33
4 th most represented country – Poland	6	8.00
5 th most represented country – Sweden	5	6.67
Different nationalities represented ⁸	25	N/A
1 st most represented country – British	11	14.67
2 nd most represented country – Norwegian	7	9.33
Joint 3 rd most represented country – Polish, Italian, Dutch	6 each	8.00
Joint 4 th most represented country – Czech, Danish, German, Swedish	4 each	5.33
Joint 5 th most represented country – Finnish, Slovenian	3 each	4.00
Completed PhD	60	80.00
Not completed PhD	14	18.67
Of those without a PhD: Not currently participating in a PhD programme	6	8.00
Of those without a PhD: Currently participating in a PhD programme	8	10.67
0-5 years since graduating PhD	11	14.62
6-10 years since graduating PhD	18	24.00
11-15 years since graduating PhD	14	18.67
16-20 years since graduating PhD	9	12.00
21-25 years since graduating PhD	4	5.33
26-30 years since graduating PhD	4	5.33

7 Self-assigned in open textbox question.

8 Representation indicated by at least one Horizon Scanning respondent completing the survey. Country representation was specifically based on the location of their organisation.



5.3. Appendix 3 – Processing of submitted questions via Horizon Scanning survey, prior to Smart Consumption Working Group member evaluations

PROCESSING STEP	Соилт	%
Number of questions submitted via first Horizon Scanning survey	254	100.00
Number of submitted questions immediately deleted due to: lack of SSH grounding, lack of relevance to smart consumption, or not containing question content.	38	14.96
Number of additional questions generated through disaggregating multiple questions from one single submitted question, or through sourcing further questions from accompanying explanatory texts that were provided by the respondents	61	24.02
Number of questions removed due to merging, i.e. where a same question had been posed multiple times in overly similar ways.	4	1.57
Final number of questions sent to Working Group members for evaluation in the second Horizon Scanning survey.	273	107.48



5.4. Appendix 4 – Aggregated quantitative findings from Working Group member evaluations of the 273 edited questions

Working Group members evaluated a list of 273 SSH questions, via a second Horizon Scan survey, scoring them on a scale of 1 ('definitely exclude') to 5 ('definitely include'), and providing other qualitative feedback.

Тнеме9	No. of questions in evaluation survey	Mean score	Variance of means	No. of questions with median ≥4	% scores of 5 , across all QS IN THEME ¹⁰	% SCORES OF 4	% scores of 3	% scores of 2	% scores of 1
Everyday life, lifestyles and technology use	21	3.53	0.19	11	25	30	24	16	6
Unintended consequences	21	3.60	0.18	14	28	30	22	14	5
Collective action/energy communities	15	3.78	0.76	13	35	27	24	11	4
Behaviour and behavioural change	18	3.14	0.11	4	19	23	25	19	14
Research methods	6	3.68	0.12	5	29	32	24	10	5
Justice, access, and spatial disparities	23	3.65	0.09	14	26	30	30	10	4
The many roles of contemporary and future consumers	19	3.92	0.24	10	21	27	30	14	8
Risk, crisis, and security	11	3.45	0.08	5	21	31	29	10	9
Flexibility	17	3.38	0.08	4	19	26	34	18	4
Democratization, inclusion, and participation	23	3.61	0.06	17	25	32	25	13	5
Institutions, industry, and innovation agendas	32	3.37	0.07	14	19	29	27	17	7
Critiquing the logics of 'smart'	14	3.61	0.07	9	26	34	21	14	5
Data/privacy	7	3.58	0.16	4	29	26	24	16	5
Design and new technologies	20	3.34	0.10	8	16	31	31	15	7
Policy, politics, and power	12	3.37	0.12	4	18	29	32	13	8
Economies and business models	9	3.10	0.11	1	11	27	34	19	10
Miscellaneous	5	3.41	0.20	2	24	26	26	15	9

⁹ The 273 questions were organised and presented for evaluation in 17 inductively-generated themes. These themes were intended only to aid the evaluation exercise and was not intended to directly feed into to our final themes, which were also inductively-generated, albeit on the basis of a different question set.

¹⁰ In some cases percentages may not sum to 100 due to rounding.



5.5. Appendix 5 – Systematic procedure used to create and deliberate on the longlist of questions for the Smart Consumption Working Group

Working Group members evaluated a list of 273 SSH questions, via a second Horizon Scan survey, scoring them on a scale of 1 ('definitely exclude') to 5 ('definitely include'), and providing other qualitative feedback. From this the following procedure decided the final 100 questions.

- 1. The 50 questions (out of 273) with highest mean scores AND medians greater than 4 were proposed to members for automatic inclusion in final list.
- All questions with median 3 or lower AND 5 or fewer 5s were proposed to members for automatic exclusion from the final list. This meant more than 50% of voters scored the question 3 or less, and 5 or fewer (out of 28) gave it a 5.
 - 80 questions (out of 273) excluded.
- 3. The rest of the questions were longlisted for deliberation through direct member feedback and within the first Working Group online workshop.
 - 143 questions on longlist
- 4. Longlist questions were colour coded in order to illustrate likelihood of inclusion, in case members may wish to 'save' what some might consider particularly important questions:
 - Questions with 10 or more 5s were colour coded dark grey, as the most likely to be *included* (7 questions out of 143)
 - Questions with median 3.5 or 3 were colour coded light grey, as the most likely candidates to be *excluded* (54 questions out of 143)
 - All other questions were colour coded midgrey (82 questions out of 143).

- 5. A spreadsheet of questions all 273, their scorings, and the detailed analysis steps above, were sent to the Working Group for consideration. Members were asked to select three questions they would prioritise for inclusion from the longlist of 143, and to send these to the Chair and Co-chair with brief reasoning.
 - 41 questions out of the longlist prioritised by members before first online workshop
- 6. Members, prioritised questions from the longlist were discussed at the first online workshop. Following this, the Chair and Co-Chair revisited the top 50 questions, the 41 questions prioritised by members, as well as looking at whether there were particular gaps filled by the remaining questions on the longlist. At this stage editing of the questions took place, in particular to merge similar questions, and to expand the wording of some questions to increase clarity.
 - A list of 93 revised questions, under eight new themes, were proposed to members ahead of the second online workshop.
- 7. At the second online workshop, a key point of discussion was any final gaps and priorities for the final 7 spaces. Following the workshop, members were also able to send in specific editing recommendations relating to the list of 93 which had been circulated. The Chair and Co-Chair then chose questions to fill the remaining spaces, based on member feedback.
- 8. The final list of 100 was circulated for member comment before publication.



5.6. Appendix 6 – Glossary of selected SSH terms

Here we provide short definitions of some of the specialist SSH terms used within the 100 questions; note that these are not intended to be academic definitions and that some terms which are not included nevertheless do have particular understandings within particular disciplines. Terms were identified by the Chair and Co-Chair as being words or phrases which may not be commonly understood (in particular by non-native English speakers); Working Group members then suggested six final additions:

Acceptance – See social acceptance.

Agency – The ability to act and do things. In classical social theory agency was typically a human trait. Today, however, many SSH scholars are also interested in the way that things such as technologies and infrastructures 'act'.

Co-production – When citizens or other stakeholders are involved in the creation of e.g. public policies and services.

Discourses – Ways of talking or writing about things. The interest in studying discourses indicates that the language we use to describe e.g. smart consumption differs between actors, reflecting different interests and understanding.

Domesticated – Integrated into the everyday life of a household.

Ecologies – Points to the ways that a phenomenon may be part of a broader environment which includes other humans, organisations, technologies etc.

Governance – Refers to processes of governing, but deliberately includes other actors beyond formal 'government', e.g. local organisations.

Imaginaries – Shared visions for the future, often held within e.g. a large organisation or a nation.

Just transitions – Involving a fair distribution of burdens and benefits of transitions. This concept indicates that transitions impact social groups differently, creating winners and losers, as well as some voices being heard more than others.

Know-how – Practical knowledge about how to do something (like operate your central heating), as opposed to theoretical knowledge.

Literacy – e.g. energy literacy, digital literacy. Level of knowledge about something (e.g. key energy issues of relevance to everyday life) or ability to do something (e.g. use digital technologies).

Lock-in – A recognition that existing patterns of consumption are not just a product of decisions made here

and now, but are built into the way existing energy systems are designed and run. Three types of carbon lock-in are (1) infrastructural and technological, (2) institutional, and (3) behavioural.

Narratives – Talking or writing in story-like forms, for example about overcoming challenges or drawing connections between a series of events.

Practices – see social practices.

Promises – Parts of narratives and discourses (see separate entries), which include hopes about what may be achieved in the future.

Prosumer/prosumption – An actor (e.g. citizen, community energy group or company) that both produces and consumes energy.

Rebound effects - The observation that increases in efficiency often result in increases in consumption (rather than decreases), because there is now the capacity to do more cheaper / faster etc.

Sharing economy – An economic model based on providing access to goods as opposed to individual ownership.

Social practices – Everyday activities, that are repeated by individuals across society, such as cooking or shopping. A focus on practices means looking at how these activities themselves are reproduced across society or change over time, rather than focussing on how individuals may change their own behaviour.

Social acceptance – Refers to support for new technologies e.g. renewable energy, or smart energy technologies. Although it is often taken to mean broad support amongst the general public, sometimes a distinction is made between community acceptance (amongst local groups and citizens), market acceptance (e.g. amongst industry) and socio-political acceptance (amongst policy makers).

Socio-technical – Signifies that social and technical elements are interrelated in any system, not separate entities. Highlights that processes of innovation, technology use and technology change are also fundamentally societal processes.

Spill-over effects – Refers to how actions, behaviours or consumption in one domain might influence action, behaviour or consumption in another.

Sufficiency – The aim of providing enough (sufficient) energy for all, while keeping a limit on energy consumption in order to live within planetary boundaries. It has been formulated as a contrast to aims of energy efficiency, which many highlight tend to result in rebound effects (see separate entry).

Self-conceptions – The ways that people think about or understand themselves.

Ways of 'knowing' – Refers to how new types of knowledge – e.g. from sensors, screens, control rooms and other smart technologies – can change how we understand things like energy as well as make them more tangible.



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Energy Social sciences & Humanities Innovation Forum Targeting the Set-Plan











• NTNU Norwegian University of Science and Technology

