ENERGISE

EUROPEAN NETWORK FOR RESEARCH, GOOD PRACTICE AND INNOVATION FOR SUSTAINABLE ENERGY

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LEGAL NOTICE

DISCLAIMER

ENERGISE is a Horizon 2020 project funded by the European Commission. The views and opinions expressed in this publication are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Commission.

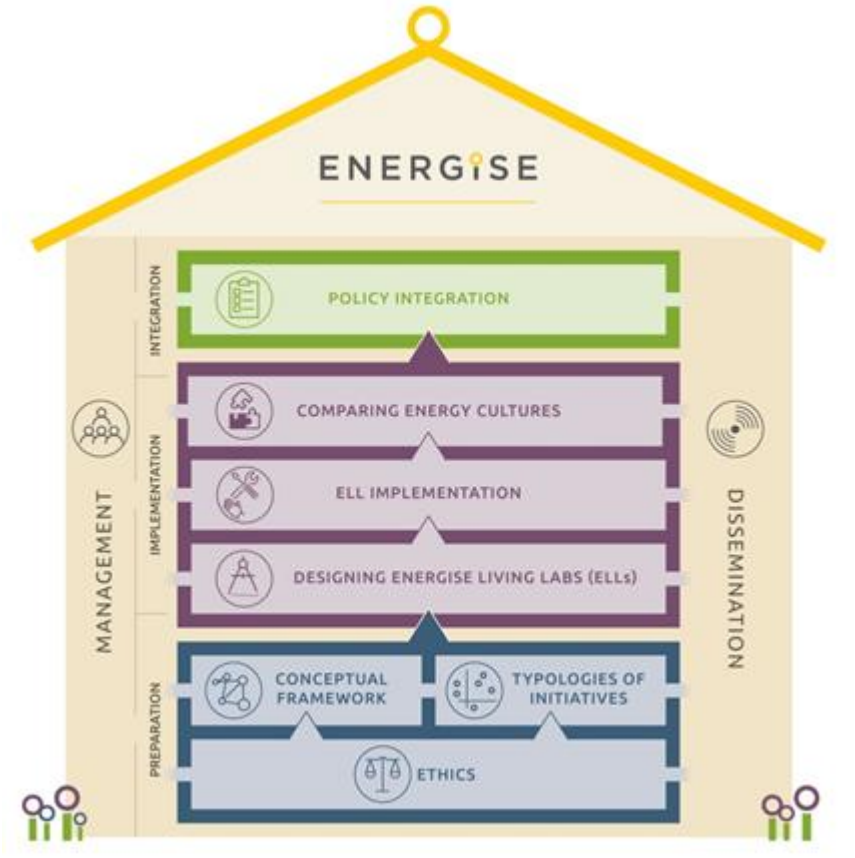
LIST OF ABBREVIATIONS

BBSRC	Biotechnology and Biological Sciences Research Council (UK)
BEIS	Department for Business, Energy and Industrial Strategy (UK)
BMBF	Federal Ministry of Education and Research (Germany)
CEF	Connecting Europe Facility
CPI	Climate Policy Integration
CREST	Competence Center for Research in Energy, Society and Transition (Switzerland)
DFG	German Research Foundation
EBP	Evidence-Based Policy-making
EC	Economic Commission
EFRE	European Regional Development Fund
EPA	Environmental Protection Agency (Ireland)
EPI	Environmental Policy Integration
EPSRC	Engineering and Physical Sciences Research Council (UK)
ERC	European Research Centre
ESRC	Economic and Social Research Council (UK)
EU	European Union
FOEN	Federal Office for the Environment (Switzerland)
FP7	Seventh Framework Programme for Research and Innovation
H2020	Horizon 2020 (Eighth Framework Programme for Research and Innovation)
IRC	Irish Research Council
JDI	Jacques Delors Institute
MaREI	Marine And Renewable Energy research, development and Innovation Centre (Ireland)
NERC	Natural Environment Research Council (UK)
NRP	National Research Programme (Switzerland)
NOW	The Netherlands Organisation for Scientific Research
OECD	Organisation for Economic Cooperation and Development
R&I	Research and Innovation
RCUK	Research Councils UK
RVO	Netherlands Enterprise Agency
SDGs	Sustainable Development Goals
SEAI	Sustainable Energy Authority of Ireland
SFOE	Swiss Federal Office of Energy
SNIS	Swiss Network for International Studies
SNSF	Swiss National Science Foundation
SRC	Strategic Research Council (Finland)
SSH	Social Sciences and Humanities
STEM	Science, Technology, Engineering and Mathematics
UKERC	The UK Energy Research Centre
UN DESA	United Nations Department of Economic and Social Affairs

ENERGISE PROJECT

ENERGISE is an innovative pan-European research initiative to achieve a greater scientific understanding of the social and cultural influences on energy consumption. Funded under the EU Horizon 2020 programme for three years (2016-2019), ENERGISE develops, tests and assesses options for a bottom-up transformation of energy use in households and communities across Europe. ENERGISE's primary objectives are to:

- **Develop an innovative framework** to evaluate energy initiatives, taking into account existing social practices and cultures that affect energy consumption.
- **Assess and compare the impact** of European energy consumption reduction initiatives.
- **Advance the use of Living Lab approaches** for researching and transforming energy-related practice cultures.
- **Produce new research-led insights** into the role of household routines and changes to those routines towards more sustainable energy.
- **Encourage positive interaction** between actors from society, the policy arena and industry.
- **Effectively transfer** project outputs towards the implementation of the European Energy Union.



EXECUTIVE SUMMARY

The setting for this deliverable (ENERGISE 6.4) concerns the effectiveness of policies to realise the energy transition and how best to understand and to tackle the social and technical challenges which need to be overcome in order to do so. Some fundamental issues involve the relation of energy policy with other EU and national policies, the integration of social scientific knowledge with that generated by science disciplines and how such findings might inform energy policy-making.

The deliverable reviews the state of the art concerning energy policy integration in the EU, focusing on the integration of social science and humanities within EU energy research and policy-making. Central to the report is the application of the concept of sociotechnical imaginaries, which is employed to analyse prevailing approaches to integrating knowledge from social sciences with energy research and policy-making in the EU.

On the basis of a review of relevant policy literature and a questionnaire completed by a sample of social science energy and sustainable consumption researchers providing data on national research funders, research centres, and over 60 research projects, the report presents a range of findings. The deliverable concludes that the prevailing imaginary supports a policy focus on technical efficiency and individual choices made by consumers, echoed in research funding which undervalues qualitative social sciences and emphasises science, technology and engineering research and positivist, quantitative social sciences.

However, the kinds of problems which need to be addressed in connection with the energy transition, and specifically the EU Energy Union, are cultural in nature, or to do with the engagement of citizens in a more effectively governed and participatory energy system. These call for better funding for and integration of social scientific disciplines and approaches which place a high value on the co-creation of knowledge and energy policy, within a new imaginary of energy policy and research in the EU.

1 INTRODUCTION

This deliverable is a report on the state of the art of the integration of social science and humanities (SSH) with EU energy research and policy-making. Whilst the central thrust is to assess the current situation, the report is at the same time partly a historical reflection and review of recent developments and partly a statement of possibilities for the future. The core themes of the report concern the nature and funding of EU SSH energy research, various ways in which environmental and energy-related research and policy integration may be understood and achieved, and possible imaginaries of EU SSH energy research and policy-making.

The structure of the report is as follows. The remainder of this introductory chapter outlines some features of EU policy that inform the activities and debates which are addressed in subsequent chapters of the report, focusing on the policy concerns and priorities underpinning the adoption of recent measures to establish the EU Energy Union. It includes sub-sections that outline some of the key issues connected with the need for energy policy integration in the EU, and provides background to development of the EU Energy Union. The chapter also considers the contribution expected by energy policy makers and energy research funders of social sciences research, for example in relation to its role as a cross-cutting theme in Horizon 2020 research, and examines why this might not be fulfilled, or might fail to address energy demand reduction questions as effectively as it could.

Chapter 2 introduces the idea of sociotechnical imaginaries into the discussion of the integration of social sciences with energy policy and research. At the core of the chapter is the argument that to pursue stronger energy policy integration requires the prioritisation of energy concerns across policy domains and measures to counter fragmentation within the energy sphere (e.g. EU member states 'going it alone'). The EU Energy Union could be considered to be a response to problems of lack of integration. However, this invites questions regarding what visions of the Energy Union and EU energy policy prevail and with what consequences, for example in relation to the roles that *qualitative* social sciences research might play in informing energy policy-making in the EU.

Chapter 3 examines the impact of social sciences on EU energy policy, arguing that their potential impact (in particular that of qualitative research) has not been fulfilled. Chapter 4 tells a similar story but in relation to the integration of social sciences with national-level energy policy-making, in spite of (or perhaps because of) the emergence of evidence-based policy-making in a number of countries. These two chapters (3 and 4) are based on analysis of data from documentary sources, a questionnaire and information provided by ENERGISE consortium partners.

The analysis presented in chapters 3 and 4 informs the view that the imaginaries employed by energy research funders and policy-making actors in Europe are what are currently preventing social sciences energy research from making more effective contributions to energy research and policy-making in the EU. Chapter 5 summarises the

arguments for this position, while pointing to the possibility of alternative imaginaries of social sciences energy research and energy policy-making and their integration.

1.1 EU ENERGY POLICY INTEGRATION

EU energy policy integration is a central matter of concern to EU policy-making institutions and related organisations, which is deeply enmeshed with debates about the 'integration' of energy research and the contribution and impact of SSH, which are at the heart of this deliverable. Drawing primarily on previous work by the Jacques Delors Institute (JDI 2015), the following paragraphs demonstrate how EU energy-related policy integration is manifest in a number of different ways.

Overall, the integration of energy within EU policy in general should allow it to "speak…with one voice" (JDI 2015: 99) on the international energy scene. However, there is much concern about the 'integration' of member states and EU policies and actions, since national initiatives have not always been decided and implemented in concert with the EU. The Jacques Delors Institute argue that:

"*EU member states have taken unilateral measures without discussing with their neighbours the consequences of such decisions or their possible involvement or assistance. These unilateral national interventions in the energy markets, not coordinated at EU level, have been denounced by stakeholders as costly and creating major disruptions. They can directly affect the price of energy and of its transport, and can have serious distortive effects on cross-border exchanges, impeding competition and threatening the foundations of the internal market and its current level of integration. They also reflect a lack of confidence in the European process and in market forces"* (JDI 2015: 70).

The JDI also express concern about the integration of the internal energy market "through cross-border infrastructure, but also on the application of communication and network interaction tools that will quickly overhaul the entire energy system" (JDI 2015: 10). This necessitates "the removal of energy islands [which] must be stepped up. The retail market must operate within a European framework" (JDI 2015: 10). These concerns are reflected in the EU's adoption of the 2013 Infrastructure Package, which includes infrastructure such as transmission lines, interconnections, LNG terminals and storage facilities (JDI 2015: 53). This "also requires an integrated approach [to] security of supply, addressing national, regional and European markets to ensure a high level of security of supply" (JDI 2015: 107).

The integration of intermittent renewables into the energy market has become a matter of some debate. The European Council has also called for a further integration of renewables into the market (JDI 2015), a development that may require stronger intra-national coordination with regional level policy-making or coordination between EU member nation states at regional level. A related issue concerns the integration of climate considerations into project financing, e.g. in relation to renewable energy projects and the functioning of the European financial system and public and private investment decisions (Pellerin-Carlin

et al. 2017). Beyond energy per se, the argument has been made for the integration of EU energy policy with other policy domains. For example,

"EU energy objectives and strategies should be better integrated into the definition and implementation of other relevant EU economic, industrial, social, digital, agricultural, environmental, consumer protection, and transport policies and activities." (JDI 2015: 119)

Furthermore, beyond the EU there is a discourse of pan-European integration (including with neighbouring states to the EU, e.g. Russia, Turkey, Norway). Here, the JDI argue that "governance must be strengthened in the field of energy and the regional dimension must be seen as an essential intermediary step to a broader geographical integration" (JDI, 2015: 11).

Fragmentation of the European energy system

Thus far this section has outlined a number of areas of concern identified by the JDI in relation to EU energy policy integration. The extent to which progress in these areas has been insufficient has been cast by the JDI in terms of 'fragmentation':

"*Although much has been achieved in the last decade, it has not removed the fragmentation of the European energy system. Sometimes, even positive developments have come with shortcomings which remain largely unaddressed. The integration of the EU energy market is far away. The EU struggles to act collectively on the international scene. And renewed national interventions have increased the risk of diverging and conflicting responses and prove the reluctance of the member states to govern together the energy challenges and to trust each other. The adequate EU governance to deal with the lack of coordination and cooperation between EU member states and stakeholders is missing."* (JDI, 2015: 14)

The EU Energy Union may be understood as a response to the problems of integration and fragmentation discussed in the preceding paragraphs. Thus the EU Energy Union includes a requirement for member states to produce periodic integrated national energy and climate action plans. The following section discusses the origins, policy context and content of the Energy Union, and its relevance to EU energy research.

1.2 THE EU ENERGY UNION

The Energy Union has been described as being "about accelerating the modernisation of Europe's entire economy, making it low carbon and efficient in energy and resources, in a socially fair manner" (European Commission 2017d: 2). According to the President of the European Commission, the Energy Union is underpinned by the aim for the EU to achieve global leadership in renewables and the desire to enhance energy efficiency (Juncker 2014). One can understand the Energy Union in context if other EU priorities are taken into account. These include EU sustainable development goals; the circular economy agenda; the capital markets union; the digital single market; the new skills agenda for Europe; the investment plan for Europe; and the security union. Specifically, the Energy Union is being developed in the context of three domains of EU Energy Policy, namely: (i) security of

supply - bearing in mind that in 2015, the EU28 imported 54% of energy supplied; (ii) sustainability – noting that in 2015 fossil fuels contributed 75% of the fuel mix of EU energy supplied; (iii) greenhouse gas emissions – which for the EU in 2015 was 22% less than the equivalent measure in 1990; (iv) the role of renewable energy in energy supply and use – 16% of final energy consumption for the EU in 2015; and (v) competitiveness of the EU in the energy sector (European Commission 2017d).

The Energy Union was mentioned in July 2014, in a speech by Jean-Claude Juncker in which the then candidate and future European Commission president outlined ten priorities for the EU. Subsequently, 2015 saw a movement from the Energy Union as a 'vision' enshrined in the Energy Union Framework Strategy to more specific, concrete proposals. 2016 has become known as the year of 'delivery', in which proposals included a commitment to the goal of clean energy for all Europeans, within a 'winter package' presented on 30 November 2016. The main elements of the winter package are given in Table 1.

Table 1: Elements of the energy union 'winter package' (November 2016)

Elements of the Energy Union
Energy efficiency target binding at EU level.
Regulatory framework to support renewables development, innovation, employment.
Ensure the right of every individual to produce renewable energy, self-consume, store and/or sell it into the grid; boosting energy cooperatives.
Empower/protect energy consumers, citizens, communities, prosumers, fuel poor (e.g. through the right to request a smart meter, electronic billing, electricity contract etc.).
Encourage competition, innovation and investment
Relevance to electricity, retail and renewable energy actions of EU Energy Union roadmap

The winter package refers to five dimensions of the Energy Union, against which performance targets may be set and monitored. These dimensions are: energy security, solidarity and trust; integrated EU internal energy market; energy efficiency moderating demand; decarbonising the economy; and research, innovation and competitiveness (European Commission 2016). The dimensions concerning energy efficiency and the moderation of demand, and research and innovation are clearly relevant to the ENERGISE project. For research and innovation, indicators employed to assess performance against targets include the number of patents obtained and the level of related public and private investment. For energy efficiency and demand moderation, performance indicators include energy demand per m^2 and per capita final energy consumption measures. Beginning in

2017, the 'implementation' of the Energy Union in the EU has concerned securing agreement of EU Parliament and Council on legislative matters and the enforcement of state aid and competition rules, and so on. Governance is a 'missing' dimension of the Energy Union – with a successful energy transition requiring more central roles for citizens and social sciences (JDI 2015; Pellerin-Carlin et al. 2017). However, it is important to reflect on what 'social sciences' might mean in this regard.

1.3 THE NATURE OF AND ROLES FOR SSH RESEARCH

The first task of this section is to unpack the term 'SSH research'. There is a tendency in some quarters to refer to 'SSH' in the singular (i.e. social *science*), eliding differences between various academic disciplines including Geography, Sociology, Economics, Business and Management Studies, Psychology and Environmental Social Science.[1] In any case, to refer to 'disciplines' may be misguided given the inexact fit between approaches adopted, research foci and disciplinary boundaries and contemporary calls for inter-disciplinary, multi-disciplinary, trans-disciplinary and post-disciplinary research. Within one 'discipline' – sociology - Burawoy (2005) identifies four types of research, distinguishing between more instrumental policy research and the critical or public roles of sociology (and sociologists) in an eco-system of sociology. Within scientific 'fields' Knorr-Cetina (1999) identifies 'epistemic cultures', which are the distinctive arrangements and everyday practices constituting the 'normality' of knowledge generation with particular disciplines. Here, it is proposed that the epistemic cultures concept could be extended to apply to sub-disciplines, or to project-level or cross-disciplinary phenomena (e.g. ENERGISE), or to wherever ways of understanding, defining and addressing research problems are shared and taken for granted whether in or between social sciences, humanities or sciences.

There is currently a lively debate about the nature and future of SSH in climate change and energy research. In reviewing fifteen years of energy research, Sovacool (2014) and Sovacool et al. (2015) conclude that 'social dimensions' are 'frequently' neglected whilst there is greater emphasis on material and technical questions. Shove (2014) is concerned that research on social aspects of energy often relies upon a narrow conception of behaviour, which emphasises individual choices, habits and attitudes. In the journal *Nature Climate Change*, Castree (2016) notes that the social science (typically Economics or Psychology) which tends to dominate climate change and energy research funding is 'scientistic', i.e. that which most resembles the kinds of approaches adopted in research within the 'harder' science and engineering disciplines. Moreover, social sciences are treated as secondary to technical and economic sciences in energy research, something Sovacool (2014) refers to as 'disciplinary chauvinism' and which emphasises quantitative approaches and technical 'solutions' and downplays inquiries into the use of energy or questions of justice and fairness.

[1] SHAPE ENERGY states that its activities span the 'full range of social sciences and humanities, including energy-related research (both current and potential) within: Business, Communication Studies, Demography, Development, Economics, Education, Environmental Social Science, Gender, History, Human Geography, Law, Philosophy, Planning, Politics, Psychology, Science and Technology Studies, Sociology, Social Anthropology, Social Policy, and Theology. See: https://shapeenergy.eu/index.php/about/

Attention has been drawn to a homogeneity of perspective, implicated for example in over-representation of white males from Western, affluent countries and under-representation of women, people of colour and people from less developed countries. This has served to narrow the kinds of questions and approaches which might otherwise be brought into play in energy research. These negative tendencies prompt Sovacool and colleagues (2015) to call for better integration of social sciences in energy research, promoted for example by problem-oriented funding of inter-disciplinary research, cross-disciplinary education programmes and changing publishing priorities of peer-reviewed journals. This stands in contrast to the presumption of a single, scientised, essentialist view of SSH which is to integrate with policy.

There is a plurality to social sciences and humanities research, which tends to be ignored in calls for research to uncover 'the human dimension' of climate change (Castree 2016). Methodologically, social sciences and humanities comprise multiple analytic approaches, having different ontological premises with various fits with alternative policy-making approaches (Geels et al. 2016). More specifically, Geels et al. (2016) identify the following broad categories of approaches: a) integrated assessment models with the global scale and policy as design and planning; b) research on socio-technical transitions or employing the multi-level perspective of systemic technological transitions with national sectoral scale investigations, consistent with a focus on policy networks, advocacy coalitions and power struggles among interest groups; and c) practice-based action research at local scale, with a fit with policy as experimentation, learning by doing and incrementalism. Geels et al. (2016) argue for bridging rather than full assimilation of approaches with, possibly, incommensurate ontological assumptions into a single overarching inter-disciplinary framework. Rather differently, Schuitema and Sintov (2017) argue for:

"…*a system make-over, one which challenges, promotes and supports high quality inter-disciplinary (energy) research to contribute to complex societal problems, alongside much valued mono-disciplinary work."*

This, they say, requires a "serious re-think of norms, values, evaluation criteria, rankings, and impact factors [and] a stronger focus on scientific rigour to aid inter-disciplinary energy research in reaching its full potential."

To miss the variety within SSH only compounds the problems highlighted in the previous paragraphs, which concern ill-attention to core aspects of the climate change/energy challenge which Castree (2016) argues are as much as about moral questions about human needs as they are about technical and material facets of the biosphere.

Fundamentally, the message of this section is that there is a multiplicity of disciplines, approaches, roles and actors which could be applied to the term 'social sciences and humanities research', including that which could inform energy research and policy at EU and EU member state levels. SSH has suffered in comparison with STEM (i.e. Science, Technology, Engineering and Mathematics) disciplines in energy research funding and perceptions of the policy relevance of SSH. Further, only a relatively thin slice of SSH has yet been incorporated into energy research, i.e. that which is most like the sciences. Finally, there is a need to differentiate between: a) calls for SSH to make an impact on

policy and regulation, which tend to adopt a narrow understanding of problem-orientated SSH and the transfer of knowledge from research to policy; and b) the capacity of SSH to influence policy agenda and governance in a broader sense (politics rather than policy). The distinction has its roots in differing conceptions of (social) science-research-policy 'integration' and imaginaries of SSH adopted by researchers, funders of research and policy-makers. Chapter 2 elaborates on these various ideas, while the content of, and implications for, EU and national SSH energy research and policy are addressed in subsequent chapters.

2 INTEGRATION AND IMAGINARIES

This chapter begins with a short discussion (in section 2.1) of what kinds of 'integration' are of concern to policy-makers and funders of energy research and why this matters. Section 2.2 then moves on to argue that 'sociotechnical imaginaries' is a perspective helpful to highlighting factors affecting integration as it relates to the contribution made by SSH to understanding better and tackling energy demand reduction policy challenges. The chapter sets the scene for the analysis of the integration of SSH energy research and policy at EU and national levels, which take up much of the rest of the report.

2.1 UNDERSTANDING 'INTEGRATION'

In order to clarify what is of interest here, it is necessary to consider various ways in which 'integration' has been defined in relation to environmental and energy policy and SSH research. Researchers have identified and drawn attention to a number of possible meanings of policy integration. For example, Meijers and Stead (2004: 2) identify various related or synonymous terms for policy integration, which include – "policy consistency, holistic government, joined-up government and, most especially, policy co-ordination". Meanwhile, working in the field of international relations, Rosenau (2003) sees integration as the antonym of fragmentation. Thus scholars working in disparate fields including public administration and organisational studies field have been concerned with matters of inter-organisational coordination (Hogl et al. 2016). A baseline assumption is that effective coordination is instrumental for policy-making in complex policy areas (Hogl et al. 2016). However, policy 'integration' is "more ambitious than mere policy coordination… [whereas] policy coordination aims at minimizing contradictions among policies, policy integration envisages common, integrated trans-domain policies" (Hogl et al. 2016: 400). Along similar lines, a number of contributions distinguish between strong and weak forms of environmental policy integration (Jordan and Schout 2006; Jordan and Lenschow 2010).

The United Nations Expert Forum on Policy Integration for Sustainable Development introduces the idea of a strategic triangle of policy integration (see Figure 1). It may help to keep in mind this trio of policy integration elements in reading the paragraphs which follow on different types and challenges of policy integration.

> **Policy design** involves: priority setting; generation of possible solutions; and evaluation of required resources.

Policy implementation involves: development of logical, feasible and legitimate action plans; resource planning; and enhancement of operational capacities (both EU-wide and in particular states and localities).

Developing effective stakeholder support involves: the identification of relevant key stakeholders; skilful facilitation and preparation of participants regarding their roles in integration processes; building trust and responsiveness to others; and the provision of resources to allow participants to play their roles effectively in policy integration networks.

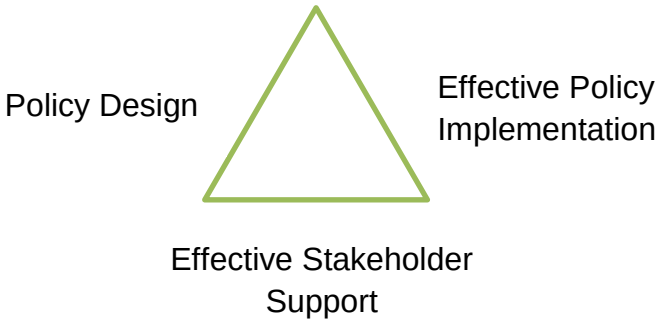


Figure 1: Strategic triangle of policy integration for sustainable development (Source: United Nations (2015))

The distinction has also been made between 'vertical' integration (Giessen 2011; Jordan and Lenschow 2010; Meijers and Stead 2004) and 'horizontal' integration (Berger and Steurer 2009; Jordan and Lenschow 2010; Meijers and Stead 2004). Within the literature in environmental policy, for example, the 'problem' of environmental policy integration is considered by the United Nations Department of Economic and Social Affairs (UN DESA, 2015) to be to fulfil the transformative potential of SDGs [Sustainable Development Goals] given the challenges of integration, such as vertical silos, but without introducing new silos e.g. horizontal ones. In this regard, integration refers to coordination of policies across domains such as transport, housing, agriculture and education, or between national and supra-national policy-making bodies, without incurring new difficulties of incoherence through increasing attention to, say energy efficiency or the enhancement of IT capability. For UN DESA (2016), integrated policies are appropriate to the achievement of sustainable development goals due to their 'inherently long-term nature', their amenability to stakeholder engagement and the 'soft' quality of policy analysis they entail (i.e. compared with harder input-output analyses).

Two core questions concern: a) how to achieve environmental policy integration (EPI); and b) how to know when it has been achieved. On the first question, Jordan and Lenschow (2010) point to the importance of leadership and the availability of resources to support EPI. They identify four types of integration instruments in relation to a stage-based approach to EPI: (1) instruments that aim to influence the objectives of sectoral policy-making ex ante; (2) instruments that target the allocation of resources in support of certain sectoral policy objectives; (3) instruments that focus on structuring the interaction of and

the coordination between sectoral policy makers during policy formulation and decision making by changing the administrative system; and (4) instruments that monitor and evaluate the impacts of past instruments. Writing about 'climate policy integration' (hereafter 'CPI'), Dupont and Primova (2011) highlight four core factors: (1) the level of political commitment to climate policy and to CPI; (2) the nature of the functional overlap between climate policy and the other policy field in question; (3) the level of engagement of climate policy advocates and the level of procedural safeguards for CPI in the policy process; and (4) the institutional and policy context.

Le Blanc (2015) gives the example of the Sustainable Development Goals. The SDGs may be considered to represent a more integrated system than the Millennium Development Goals, with the former more facilitative of policy integration across sectors. Yet in Le Blanc's (2015) view, many of the links among goals that have been documented in biophysical, economic and social dimensions are not explicitly reflected in the SDGs. The consequence of this is that attempts at policy integration across multiple domains have had to be based on studies of the biophysical, social and economic systems at appropriate scales rather than at the overarching SDG level.

On the matter of how to ascertain when environmental policy integration has been achieved, UN DESA emphasises the need to know what works where and why (UN DESA 2015). Underdal (1980) concludes that: 'a policy is integrated when the consequences of that policy are recognized as decision premises, aggregated into an overall evaluation and incorporated at all policy levels and into all government agencies involved in its execution.' Underdal (1980) identifies three requirements that policies must satisfy in order to qualify as being integrated: comprehensiveness; aggregation; and consistency. These criteria may be elaborated as follows: (1) comprehensiveness refers to the inclusiveness of space, time, actors and issues at the input stage; (2) aggregation entails the application of overarching criteria to evaluate alternatives at the processing stage; and (3) consistency concerns the accordance of components of a comprehensive policy with one another.

This 'rationalist' ideal of policy integration can be viewed as a claim for overcoming institutional misfit by structurally and procedurally reflecting the substantial interdependencies found in the problem domains in the course of policy-making processes that address cross-cutting problems (Hogl et al. 2016: 400-401).

2.1.1 EU SSH ENERGY RESEARCH POLICY INTEGRATION

In order to analyse integration of SSH with the EU Energy Union it is necessary to understand approaches to and the conceptualisation of research–policy linkages and research utilisation in policy-making, as well as 'disciplinary' integration of social sciences and humanities with STEM, and within SSH.

The science–policy interface has been addressed in different contexts, such as research and innovation policies and funding, research and knowledge utilisation, policy development and policy learning, diffusion of innovation, etc. In academic literature, SSH integration with policy has been approached using concepts of co-production of science and policy; knowledge brokerage and knowledge transfer; participatory approaches; and

SSH as creators of 'nexus forums' and facilitators for multi-stakeholder governance. The discussions are often focused on how to characterise SSH–policy interactions, how such interactions should be organised, and what the processual and substantive problems/challenges are that need to be addressed.

The concept of evidence-based (or evidence-informed or inspired) policy-making (EBP), as the most elaborated approach(es) to research integration with policy, recognises research use as complex, contingent and context dependent. Typologies of research use have been developed. These identify different strategies of research utilisation (instrumental and conceptual; strategic and tactical; the process use of research), and models (knowledge-driven, problem-solving, interactive, political and tactical, enlightenment models, research as part of the intellectual enterprise of society) (Nutley et al. 2007; Rau et al. 2018). The analysis of factors shaping the use of research, and barriers and enablers, provides insights into complexity of processes surrounding (social) science–policy integration, channels of research flow and how policy and practice communities and cultures handle the input of knowledge.

In energy-related research, SSH integration with policy is often addressed as part of wider debates on energy transitions, socio-technical systems design, and discussions about the role of SSH in inter-disciplinary (energy) research (e.g. Rochlin 2014; Cooper 2017; Castree and Waitt 2017; Stern 2017). One of the biggest challenges for (non-economic or qualitative) SSH is to produce research that is recognised as having impact on policy and practice. In energy-related research, the problem of (limited) impact on energy policy-making and failure of social sciences to be 'influential' (i.e. influence government decisions and energy transitions in general) is partly explained by the limited use of physical science, i.e. reference to physical units in social studies of energy (Cooper 2017). It is suggested that, for example, research on energy consumption needs to be attentive to the physical facts of energy systems in order to be more influential and be problem–oriented. At the same time, there are areas where SSH can make a contribution to policy without needing to reference physical energy units (e.g. public acceptance, international agreements) (Stern 2017). Castree and Waitt (2017) argue that social sciences are often perceived as 'unrealistic' because what counts as realistic is too narrowly defined in the current policy arena. They state that an understanding of the policy arena as differentiated and 'stretched out', extending way beyond government, can produce a broader and deeper understanding of the role of social sciences.

Part of the problem of achieving policy impact is sometimes exaggerated expectations of policymakers of what SSH can do and what policy relevance means in both short- and long-term, and what it means to social scientists (Rochlin 2014). The crucial distinction between ad-hoc actors such as policymakers, advisors, politicians who are licenced to make quick judgements on at best imperfect evidence, and professional social science which cannot come up with anything 'quickly' on a new or unfamiliar problem adds to the differences between two distinct cultures (Rochlin 2014). Besides, policy relevance often means that research should have some applicability to the reduction of uncertainty about the course of future events. Thus, what is often requested of social scientists is some form

of prediction given some physical or technical scenario, which can be difficult, if at all possible (Rochlin 2014).

A clearer understanding of what it is that social sciences and humanities can and cannot contribute, and what level of resources and involvement are required, would help to make SSH integration with policy more efficient and satisfying for both sides/communities. Stern (2017) suggests that although the openness of policy to SSH research partly depends on the mental set of the policy audience, policy makers are more open to social science input when issues cannot be addressed with available tools. A recent paper in Energy Policy by two members of the European Commission Joint Research Centre's unit for Energy Efficiency and Renewable (Labanca and Bertoldi 2018) highlights the limits of EU energy policy approaches to energy conservation focusing on energy efficiency and behaviour change of individuals, informed by quantitative analyses. Instead, they suggest, more nuanced understanding of everyday energy demand-related social practice is required, such as might be gained by applying qualitative SSH to their analysis and the design and implementation of policy instruments based thereon. Shove (2017) takes this further, stressing that what is 'wrong' with a policy focus on energy efficiency is its tendency to remove from view what energy is for as well as to reproduce notions of use and service which are ultimately unsustainable, thus rendering energy efficiency measures ineffective, if not counter-productive.

Overall, the prevailing idea of policy impact reflects a rather narrow understanding of the role SSH research, which is oriented towards specific societal problems set by policy-makers. This has become particularly prominent in discussions about inter-disciplinary collaboration, i.e. integration of different disciplines under the umbrella of energy research, and inter-disciplinary funding programmes. A broader notion of impact and integration implies an inclusion of different disciplinary perspectives in research policy and funding calls (e.g. Horizon 2020). Here, integration of SSH is commonly viewed as integration with STEM in inter-disciplinary programmes and projects, which poses certain challenges as hierarchies and asymmetries still persist (Pedersen 2016). Pedersen (2016) illustrates this point with a critical analysis of the Horizon 2020 programme suggesting that the political rhetoric of inter-disciplinarity is driven by research user needs and political incentives rather than bottom-up research interests.

Other aspects of disciplinary integration are integration of different SSH perspectives/expert cultures, integration of academic and non-academic stakeholders' approaches, and the facilitation of the role of civil society or 'public researchers' in the articulation or prioritisation of research problems to be tackled. The pursuit of such integration tends to invite questions about how to bridge or transcend disciplinary boundaries or ones between expert and lay knowledge, to realise inter- trans- or post-disciplinarity. In connection with the first of these terms, the SHAPE ENERGY 'Energy and the active consumer' report (Fox et al. 2017) concludes that "inter-disciplinarity" is not a magic bullet solution, and that insurmountable disagreement often exist between SSH approaches across disciplines; only certain ways of combining SSH approaches add value and are feasible.

In practice, recognition of the need for more integrative research has increased within the European Commission and European Union policy-making bodies, for example within its Framework Programme calls. Rodriguez et al. (2013) considers this to be mostly instrumental in character, underscored by EC/EU policy-makers' need to legitimise policies and counter societal scepticism. This could be symptomatic of a global development in science-policy which idealises an 'integration imaginary', and which is becoming increasingly prevalent in EU funding. However, this kind of imaginary could also be subject to critique in relation to who or what aspects are being left out (Cairns and Krzywoszynska 2016).

2.2 INTEGRATING SOCIAL SCIENCES WITH EU ENERGY POLICY: THE CONCEPT OF 'SOCIOTECHNICAL IMAGINARIES'

This section argues that employment of the concept of 'sociotechnical imaginaries' could generate insight into the expected contribution of social sciences to energy policy-making in the EU. Though its value will be elaborated in the paragraphs below, for now it can be stated that the promise of an imaginaries perspective lies in the potential to highlight the policy foci, actors and types of knowledge considered to be pivotal in energy futures envisioned and acted upon by policy-makers, funders and other influential players. It is a perspective which can help to delineate what it is that actors have in mind regarding the 'energy transition', its purposes, how it might be governed and how it may be accomplished (including the role of social sciences in its realisation).

A growing literature has developed in the past ten years around 'sociotechnical imaginaries'. Sociotechnical imaginaries are defined as 'collectively held, institutionally stabilized, and publicly performed visions of desirable futures, animated by shared understandings of forms of social life and social order attainable through, and supportive of, advances in science and technology' (Jasanoff 2015: 4). 'Sociotechnical' imaginaries is one of 96 typologies and conceptual approaches to sociotechnical change found across 22 disciplinary and inter-disciplinary areas identified by Sovacool and Hess (2017) and is the seventh most frequently mentioned approach cited by the thirty-five experts they interviewed. More directly than 'narratives', sociotechnical imaginaries serve an 'explanatory and justificatory' purpose, though they are considered to be less explicit and accountable than policy agendas. Instead they are 'instrumental and futuristic; they project visions of what is good and worth attaining' (Sovacool and Hess 2017: 719). Pfotenhauer and Jasanoff (2017) see sociotechnical imaginaries as informing locally co-produced understandings and implementation of universal models or 'best' practices, for example in the articulation and transfer of models of innovation cross-nationally.

Jasanoff et al. (2007) note that the 'term [sociotechnical imaginaries] itself is hybrid, straddling the humanities (imaginaries), social sciences (socio-), and science and technology studies (technical). Quoting Castoriadis (1987), Jasanoff and Kim (2009: 122) state that: "imagination helps produce collective systems of meaning that enable the interpretation of social reality". Imagination is thus "an organized field of social practices", which operates in itself as a collective social fact, and "serves as a key component in the making of social order" (Jasanoff and Kim 2009: 122; see also Appadurai 1996; Taylor

2004). 'Social imaginaries' encode "collective visions of the [future and] good society…they reside in the reservoir of norms and discourses, metaphors and cultural meanings out of which actors build their policy preferences" (Jasanoff and Kim 2009: 123).

Methodologically, (sociotechnical) imaginaries approaches are interpretivist or critical, and are well suited to investigating the meanings attached to, and institutionalisation of and change in, EU energy union and research funding policies relating to the integration of SSH. Jasanoff and Kim (2009) refer to six dimensions that may be employed in the analysis of sociotechnical imaginaries and are adapted to inform the work of this deliverable. The dimensions are: 1) framing of societal challenges and opportunities which SSH energy research might address; 2) policy focus e.g. as present in the text of work programme calls for funding; 3) controversies – over what do they arise; 4) stakes – what could be won or lost in resolving controversies; 5) closures – how the issues at stake are or will be resolved; and 6) civic epistemologies – e.g. the prominence and legitimacy of positivist and subjectivist, quantitative and qualitative research methods or methodologies and processes governing relations among state authorities, experts and civil society. These dimensions, and how they might be applied to EU funding calls, are elaborated in section 5. Firstly, chapter 3 examines the extent to which SSH research is integrated with EU energy policy.

3 STATE OF THE ART OF INTEGRATION OF SSH RESEARCH WITH EU-SCALE ENERGY POLICY

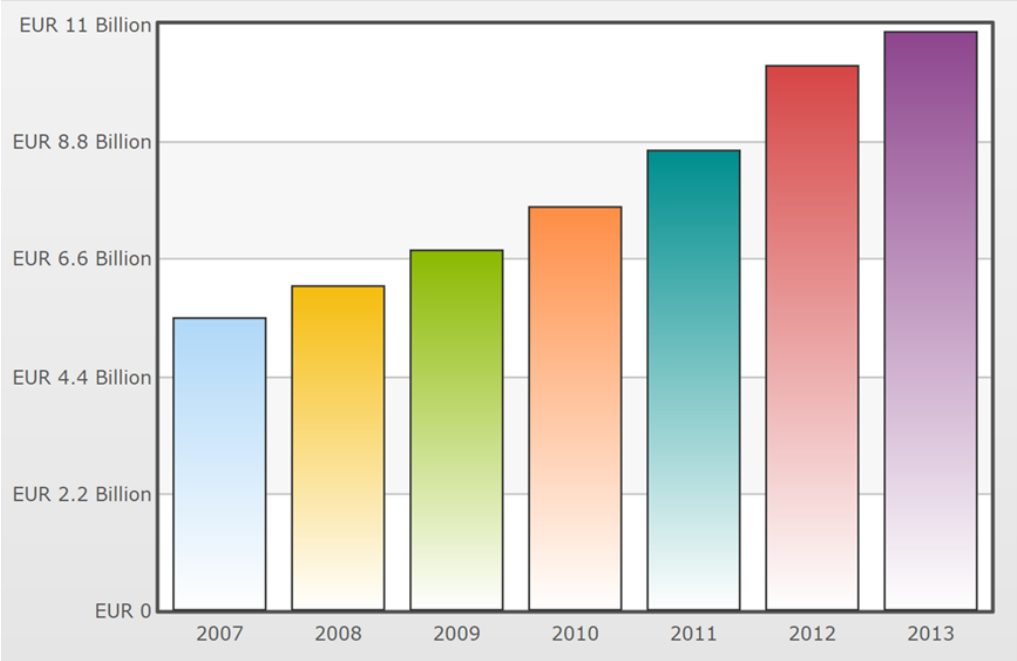
In connection with the integration of SSH within EU energy research and policy, it has been argued that "social sciences are important components for innovation in general and energy innovation in particular. Their approaches help to increase the chances that a given innovation tackles societal needs, as well as increase the chances of delivering a cost-efficient and applicable solution" (Pellerin-Carlin et al. 2017: 87). Accordingly, this chapter considers the funding and integration of SSH within energy research supported by the European Commission through the last two of its framework funding programmes which began in 1984: FP7 (2007 – 2013); and Horizon 2020 (2014 – 2020). Section 3.1 focuses on FP7, while sections 3.2, 3.3 and 3.4 are concerned, in turn, with the state of progress within Horizon 2020, the extent to which the potential for SSH-energy research and policy integration has been undermined, and evidence of this from three of its work programmes.

3.1 FUNDING AND POLICY INTEGRATION OF SSH ENERGY RESEARCH UNDER FP7

FP7 funding over 2007-13 consitituted the largest allocation in the world for SSH research. The top-down, response-mode FP7 COOPERATION research programme (which was

responsible for about two-thirds of FP7 total funding) funded over 250 projects for a total of 579 million Euros (see Figure 2 for a breakdown of annual funding allocations under FP7 and Figure 3 for a breakdown by thematic area of the total FP7 budget across 2007 – 13). In the process, it brought together close to 3,000 institutional partners in the SSH research fields. These partners represented "not only the 28 EU countries, but also an additional 65 countries worldwide on all continents".[2]

An ex-post evaluation of FP7 (High Level Expert Group 2015) comments on the relatively low share of funding enjoyed by the dedicated 'socio-economic sciences and humanities' sub-area of COOPERATION (see Table 2). SSH accounted for the lowest shares of projects and funding within 'COOPERATION', gaining only 1.3% of the programme's total budget (although in relation to share of funding from the FP7 IDEAS programme, 15% of ERC grants were awarded to SSH disciplines). Proportionally-speaking, there were more small and medium-sized projects in the SSH sub-area than for others within the FP7 COOPERATION programme. "Economics and other social sciences are the most reported main or associated discipline, while Humanities disciplines represent only a small share" (High Level Expert Group 2015: 68). Business organisations were less prevalent as partners in SSH funded projects compared with projects in which other disciplines were central; civil society organisations found it generally difficult to participate in FP7.



* 2012 and 2013 data are estimates of planned expenditure

Figure 2: FP7 total budget per year 2007-2013 (*Source: European Research Council. Facts and figures. https://erc.europa.eu/projects-figures/facts-and-figures)

[2] European Commission. Socio-economic Sciences and Humanities. List of projects 2007- 2013 https://ec.europa.eu/research/social-sciences/pdf/project_synopses/ssh_projects_7-13.pdf#view=fit&pagemode=none

There is a mixed picture of FP7 SSH integration and impact. Evaluations of FP7 state that funded SSH research did achieve relevant impacts (High Level Expert Group 2015; Impact-EV 2015) – though it is unclear whether this contention applies specifically to energy-related projects. The analysis of SSH projects funded under the EC FP6 (last call) and FP7 gives a number of examples of how such funded projects have achieved scientific, political and social impact. For instance, the average of publications per researcher in the Joint Research Centre is 3.71 (a calculation which includes young or early career researchers with no publications, see Impact-EV 2015). The impact is also to be seen in the emergence of open access to research data, responsible innovation and societal foresight activities (High Level Expert Group 2015). Some notable achievements have also been made in relation to political impact. There are, for example, projects the findings of which have provided a basis on which to inform EU legislation and policy-making, as well as policies of the OECD, and at national, regional and local levels.

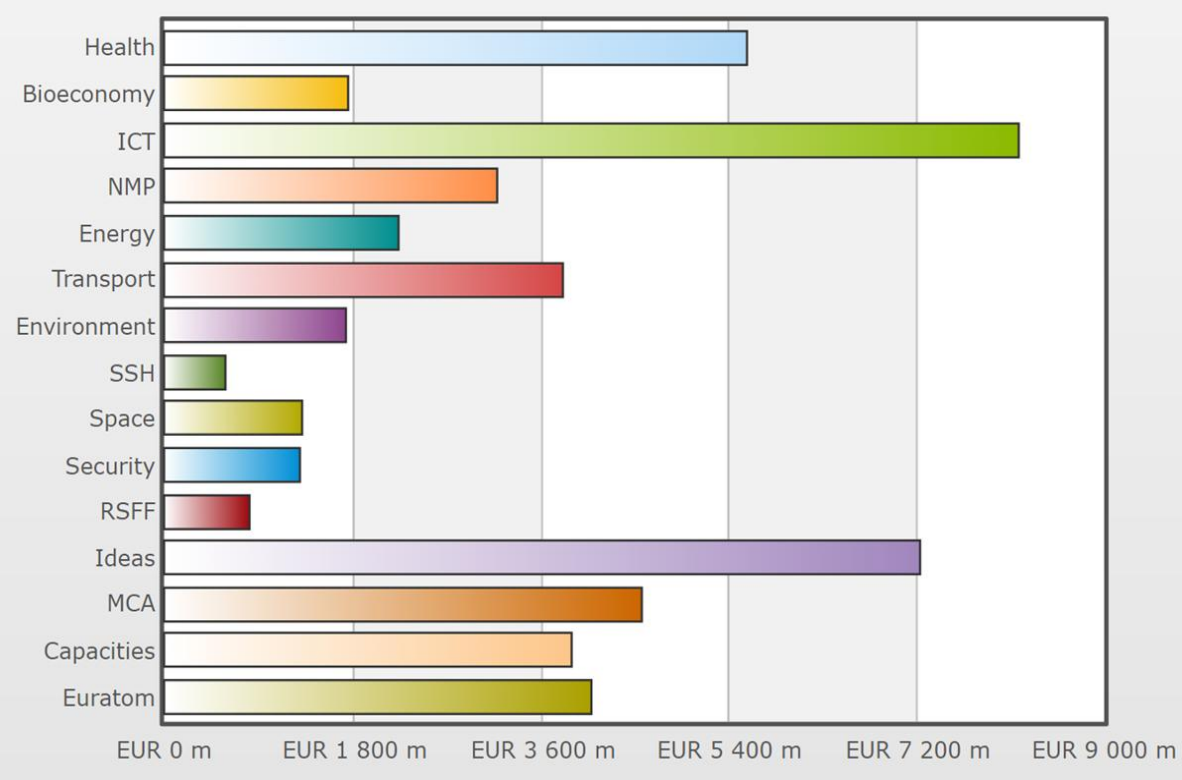


Figure 3: FP7 budget by theme 2007-2013 (Source: European Research Council. Facts and figures. https://erc.europa.eu/projects-figures/facts-and-figures)

There are also projects that have achieved significant social impact, for example by contributing to established societal goals (i.e. the Lisbon strategy, EU2020 targets, and the Agenda for Jobs, Growth, Fairness and Democratic Change) (Impact-EV 2015: 2). On the last of these, SSH is considered to have made a substantial contribution by providing hard quantitative evidence, solid qualitative analyses and sound foresight scenarios. The High Level Expert Group review of FP7 (2015: 58) notes that “a number of policy-analytical and foresight research lines funded in the FP7 SSH area helped to better understand ongoing and futures challenges and options for European research and innovation and related

policy." However, it also comments that in general "this policy advice function of FP7 has been performed in an only weakly coordinated and strategic way."

Table 2: FP7 budget per sub-area within cooperation programme

Sub-area (Theme)	Total EC Contribution (millions euro)	% of EC Contribution	Number of Projects	% of Projects
Health	4792	11	1008	4
KBBE (European knowledge-based bio-economy)	1851	4	516	2
ICT (Information and Communication Technologies)	7877	18	2328	9
NMP (Nanosciences, Nanotechnologies, Materials and new Production Technologies)	3239	7	805	3
Energy	1707	4	368	1
Environment	1719	4	494	2
Transport	2284	5	719	3
SSH	580	1	253	1
Space	713	2	267	1
Security	1295	3	314	1
ERANET	313	1	104	0
Joint Technology Initiatives (JTI)	1966	4	736	3
Sub-total for FP7 Cooperation	**28366**	**64**	**7912**	**31**

Source: High Level Expert Group (2015)

3.2 HORIZON 2020: A WORK IN PROGRESS

Before moving on to discuss the nature and position of SSH research funding, it is interesting to consider the standing of energy research within overall EU energy funding. First, estimates of current energy-related EU funding are provided in Table 3, below. Table 3 shows that the energy-related portions of the Horizon 2020 research and innovation funding roughly equals the funding available for the energy network through Connecting Europe. However, it is much lower than that available for infrastructure and structural funds added together.

More specifically, Horizon 2020 promises much in relation to integration (a term employed in various senses) and impact. The systematic and strategic integration (or "mainstreaming") of SSH into each of the priorities of Horizon 2020 is one of the novelties of the programme, and entails that social sciences and humanities will be mainstreamed as an essential element of the activities needed to tackle each of the societal challenges to enhance their impact. Within the European Commission: the 'Open and Inclusive Societies' unit seeks to coordinate the integration of social sciences and humanities (SSH) across Horizon 2020, to ensure their contributions to the R&I activities and as such reinforce the delivery of the Europe 2020 objectives and EU policies.

Table 3: Energy-related EU funding 2014-2020

Instrument	Timing	Objective	Budget 2014-2020
Connecting Europe Facility (CEF)	2014–2020	Strengthening the European infrastructure	€5.85 billion for energy networks
Projects of Common Interest	2014–2020 (1st list adopted in 2014 but instrument is older)	Listing projects which strengthen the European energy infrastructure	Can benefit from CEF funding
European Structural and Investments Funds	2014–2020	Multiple, smart, inclusive growth and reducing divergence amongst member states in different policy fields	€23 billion have been ring fenced to “shift to low-carbon economy”
Horizon 2020	2014–2020	Strengthen the EU’s position in the scientific and R & D sector	Overall budget: €79.4 billion, €6.6 billion to be dedicated to “energy efficiency, to smart cities and communities and to secure, clean and low carbon technologies”

Source: JDI (2015: 81), based on European Commission data

Topics like competitiveness, climate change, energy security or public health are complex and multi-faceted and seem to require cross-disciplinary, inter-disciplinary or trans-disciplinary thinking. Indeed, the idea to focus Horizon 2020 around "challenges" rather than disciplinary fields of research implies recognition of such demands. The challenge approach potentially brings several benefits. First, if successful, SSH research should be fully integrated with each of the general objectives and challenges of Horizon 2020, for which they may generate new knowledge and competences, and support evidence-based policymaking. Second, embedding SSH research across Horizon 2020 in this way maximises the returns to society from investment in science and technology. Third, such embedding means that SSH disciplines can make contributions where they are most needed or best placed to do so. Fourth, integrating socio-economic considerations into the design, development and implementation of the research itself, and of new technologies being developed, can help find solutions to societal issues which are founded upon the needs, concerns or knowledges of users/citizens. Approaches identified with the conduct of SSH research have the potential to give EU citizens a unique opportunity to understand their past, current and future environment, and to propose answers to complex and challenging questions. Fifth, embedding SSH research throughout the whole Horizon programme may open up new areas (possibly unforeseen areas) of research and may foster excellent research conducted under the auspices of the European Research Council.[3] [4]

In terms of SSH's specific potential contribution to evidence-based policy-making, Regulation (EU) 1291/2013 of 11.12.2013 of the European Parliament and of the Council establishing Horizon 2020, provides the legal basis and the main guidelines for the integration of SSH as a cross-cutting theme across the Framework Programme. It states that: social sciences and humanities research will be fully integrated into each of the priorities of Horizon 2020 and each of the specific objectives and will contribute to the evidence base for policy-making at international, European Union, national, regional and local levels. In relation to societal challenges, social sciences and humanities will be mainstreamed as an essential element of the activities needed to tackle each of the societal challenges to enhance their impact. The specific objective of the societal challenge 'Europe in a changing world - inclusive, innovative and reflective societies' will support social sciences and humanities research by focusing on inclusive, innovative and reflective societies (European Commission 2017a: 8).

Communication of SSH research results is seen by the Commission as crucial to ensuring the impact of SSH on policy-making as well as for informing the broader public. It argues that communication helps to ensure that SSH research not only has academic outreach, but also reaches a wider audience and is communicated in ways that match a variety of audiences, needs and contexts. Translating research findings into clear recommendations

[3] https://ec.europa.eu/programmes/horizon2020/en/area/social-sciences-humanities
[4] The European Research Council (established by the European Commission) complements other funding activities in Europe such as those of the national research funding agencies, and is a flagship component of Horizon 2020, the European Union's Research Framework Programme for 2014 to 2020. See: https://ec.europa.eu/programmes/horizon2020/en/area/social-sciences-humanities

to policy makers is thus an important part of EU funded social sciences and humanities projects.[5]

3.3 SSH IN HORIZON 2020: POTENTIAL UNDERMINED?

There is a sense that the potential integration and impact of SSH in Horizon 2020 may go unrealised, including in relation to energy research and policy. A core weakness concerns the relatively low level of funding for SSH. An interim review of the first three years of Horizon 2020 states that SSH comprised 12.9% of signed grants, representing funding of EUR 4.4 billion (European Commission 2018). Pellerin-Carlin et al. (2017: 87) observe that:

"*[W]hen it comes to EU funding, social sciences are too neglected. Only 6% of the EU H2020 funding [from the 2014 budget went] to all "social sciences and humanities" (SSH) with the best-integrated SSH disciplines being economics, business and marketing. Disciplines like geography or anthropology, that are critical to understand energy behaviours are nearly absent from H2020 funding. What is even more worrying is that, according to the European Commission, only a third of the "projects funded under topics flagged for SSH show good integration of SSH", while SSH integration is judged to be "weak" in 12% of the projects and inexistent in a third of them".*

The European Research Council has given greater discretion to investigators over the focus of proposals for funding from the European Commission since its inception under FP7 in 2007, compared with other funder-led, top-down calls in Framework/Horizon 2020 programmes. Since 2014, ERC funding has constituted the 'excellence' pillar of Horizon 2020 and has a total budget of €13.1 billion for the period 2014-2020. According to the ERC website its total budget in Horizon 2020 has enjoyed a real terms increase of 60% compared to FP7 and it comprises 17% of the overall Horizon 2020 budget.[6]

European Research Council funded projects identified as SSH have consistently made up a small proportion of the total of over 7,500 funded since 2007 (see Table 4 and Table 5, note that there is a discrepancy in ERC reporting of total projects funded and the breakdowns given for each research domain and per year). Within this, the authors reviewed all ERC-funded projects 2007-2017 using 'energy' as a search term and looking for projects selected for funding on topics relating to energy supply, energy efficiency and energy demand. The search found that the share of projects funded relating to energy supply, efficiency or demand was about 7.4% of the number of 'energy' projects funded by ERC as found in the key terms search conducted on 18 March, 2018 (83 out of 1122 projects). SSH accounted for 0.6% of all ERC-funded 'energy' projects, and 8.4% of energy supply, efficiency or demand projects funded (7 of the 83 projects).[7]

A concern expressed about Framework programmes in general (bearing in mind that Horizon 2020 is the eighth framework programme) is about the type of organisations

[5] See: https://ec.europa.eu/research/socialsciences/index.cfm?pg=policies&policyname=integration

[6] See: ERC website: https://erc.europa.eu/projects-figures/facts-and-figures

[7] See: ERC website: https://erc.europa.eu/projects-figures/facts-and-figures

funded. Albeit in relation to societal challenge 2 on food security, some users consulted by the expert group reporting on framework programmes are of the view that funding is very concentrated in terms of participants, and that large universities and research organisations and bigger companies are advantaged (European Commission 2017b: 38). These organisations are regarded by some users of research as having no ambition in relation to impact and innovation (Rau et al. 2018). They are said not to be market-oriented nor interested in producing impacts, but more interested in obtaining funding to finance their research activities and continue their employment (Wiek et al. 2012). Users perceive a cultural problem at the heart of academic organisations that are leading the great majority of projects. At a career development level, they say, publications and academic prestige are more rewarded than applied research and business development (Rau et al. 2018).

Table 4: Proportion of European research council funded projects for three research domains (2007-2017)

Research Domain	Number of projects funded	% Share of total
Physical Sciences and Engineering	3451	45.4
Life Sciences	2651	34.9
SSH	1496	19.7
Total	**7598**	**100.0**

Source: Authors, based on ERC data on funding by research domain (https://erc.europa.eu/projects-figures/erc-funded-projects/results?search_api_views_fulltext=energy&items_per_page=100)

Table 5: Proportion of European research council funded projects for three research domains (per year, 2007-2017)

Research Domain	Physical Sciences and Engineering		Life Sciences		Social Sciences and Humanities		Total no. projects funded per year
Year	No. projects	% of total	No. projects	% of total	No. projects	% of total	
2007	137	45.8	105	35.1	57	19.1	299
2008	128	45.4	98	34.8	56	19.9	282
2009	218	44.5	175	35.7	97	19.8	490
2010	326	46.1	255	36.1	126	17.8	707
2011	361	45.9	280	35.6	146	18.6	787
2012	394	44.5	327	36.9	164	18.5	885
2013	399	44.1	336	37.2	169	18.7	904
2014	412	43.9	353	37.6	173	18.4	938
2015	423	45.5	301	32.4	205	22.1	929
2016	438	46.8	290	32.0	208	22.2	936
2017	215	48.8	131	29.7	95	21.5	441
Total	**3451**	**45.4**	**2651**	**34.9**	**1496**	**19.7**	**7598**

Note: percentage totals in year rows may not sum to 100 due to rounding

Source: Authors, based on ERC data on funding by research domain https://erc.europa.eu/projects-figures/erc-funded-projects/results?search_api_views_fulltext=energy&items_per_page=100)

A review of social innovation research funded across FP6, FP7 and Horizon 2020 argues that some Horizon 2020 projects do not take SSH seriously and that this results in the low integration of SSH in research and low impact of SSH on policy-making (European Commission 2017c). Therefore SSH fails to attain the status that it should have. The review of a number of European research projects confirms that various socially innovative actions, successfully initiated and carried out by individuals and communities, failed to sustain themselves in the absence of clear strategic policy or political backing by national authorities or the European Commission. On many occasions, a lack of policy and practice support and encouragement beyond vague promises and short-term, over-bureaucratised funding schemes tend to create an atmosphere of uncertainty and distrust (European Commission 2017c).

The European Commission (2017c: 43-44) laments the absence of inter-disciplinary cooperation between 'hard' science and SSH, which it says limits considerably the

potential of these projects, and therefore their technological, economic and social relevance. Thus whilst Horizon 2020 emphasises the benefits of inter-disciplinary endeavours, it is claimed that in practice projects are not inter-disciplinary and are coordinated by teams with 'thematic expertise but insufficient inter-disciplinary affinity". Moreover,

"[*f*]*ew hard science coordinators really understand how to valorise SSH knowledge to the benefit of their projects, but tend to deal with it as a salute to ethics, an add-on to the otherwise technological efforts, or a way to further the social acceptance of tools or technology*" (European Commission (2017c: 43-44).

3.4 INTEGRATION OF SSH IN THREE HORIZON 2020 WORK PROGRAMMES

The previous section argued that SSH has been under-utilised in EU energy-related research and policy-making, in spite of their considerable potential. However, there are moves towards better utilisation and integration of SSH, illustrated by work programmes and funding calls in recent years both at the EU and national levels (see the examples given in Box 1 below).

Box 1: SSH integration in relation to Horizon 2020

1. 'The systematic and strategic integration (or "mainstreaming") of the SSH into each of the priorities of Horizon 2020 is one of the novelties of the Horizon 2020 programme, and entails that social sciences and humanities will be mainstreamed as an essential element of the activities needed to tackle each of the societal challenges to enhance their impact.' https://ec.europa.eu/research/social-sciences/index.cfm?pg=policies&policyname=integration

2. FET Advisory Group, December 2016 'The need to integrate the Social Sciences and Humanities with Science and Engineering in Horizon 2020 and beyond' http://ec.europa.eu/transparency/regexpert/index.cfm?do=groupDetail.groupDetailDoc&id=30290&no=1

3. European Commission 2015 'Integration of Social Sciences and Humanities in Horizon 2020: Participants, Budget and Disciplines. Monitoring report on SSH-flagged projects funded in 2014 under the Societal Challenges and Industrial Leadership' https://ec.europa.eu/programmes/horizon2020/en/news/integration-social-sciences-and-humanities-horizon-2020-participants-budget-and-disciplines

In relation to the integration of SSH in EU Horizon 2020 funded energy research, it is notable how this has begun to change over the course of the framework programme. For example, in the text of the 2014-15 Horizon 2020 work programme for Secure, Clean and

Efficient Energy (hereafter 'SC3'), 'social sciences' is explicitly mentioned only once.[8] This is in connection with a specific challenge requiring socioeconomic research on energy efficiency (EE 12 – 2014, p. 25), wherein energy efficiency is stated to be:

'*playing a growing role in local, national and European policy development. It is a complex issue spanning different disciplines including engineering and social sciences.*'

In addition, there is a reference to the need for applicants to 'take gender issues into account as well as existing macroeconomic and microeconomic models and results of socio-economic sciences and humanities' (again on p. 25 in EE 12 – 2014: socioeconomic research on energy efficiency), with 'a specific priority [being] given to the development of micro-economic analysis of the latest energy efficiency measures.'

In the 2016-17 Horizon 2020 SC3 work programme[9], SSH became more prominent. There are two references to SSH in headings in the Competitive, and Low Carbon Energy call within the SC3 work programme and a stronger and more frequent appeal to SSH both in the introductory 'blurb' of the work programme and in the subsequent text. For example, (on p. 10) the work programme considers that:

'*New approaches will therefore have to be stimulated as regards business models, competitive services, and an increasingly smart and dynamic system utilizing, wherever possible, a multi-disciplinary approach, integrating different social sciences and humanities fields.*'

Unlike its predecessor, text (on p. 106) in the 2016-17 work programme[10] refers to the need for 'solid involvement of social sciences and humanities and local communities and civil society to understand best practices and to increase knowledge' [about social and environmental impact of wind energy].

Further, it is recognised (on p. 126, in relation to a European Platform for energy SSH)[11] that 'researchers in the Social Sciences and Humanities (SSH) have a particular expertise in analysing and understanding deep change and in designing innovation processes, including social innovations' and that 'they *must* [our italics] play a stronger role in addressing energy-related challenges. Accordingly, SSH aspects *must* be better integrated into all stages of the research process.'

It should be noted however that, aside from the above, other references to SSH continue to exemplify weaker integration of SSH in ways that do not depart significantly from the 2014-15 work programme.

[8] https://ec.europa.eu/research/participants/data/ref/h2020/wp/2014_2015/main/h2020-wp1415-energy_en.pdf
[9] http://ec.europa.eu/research/participants/data/ref/h2020/wp/2016_2017/main/h2020-wp1617-intro_en.pdf
[10] See Call text for LCE-21-2017: Market uptake of renewable energy technologies
[11] See Call text for LCE-32-2016: European Platform for energy-related Social Sciences and Humanities research

In the text of the 2018-2020 SC3 work programme[12], there is a continuation of the stronger version of SSH integration discussed above. Indeed, there is a prescriptive tone throughout the text in relation to SSH. In a number of cases it is stated that funded projects 'will use' or make 'paramount' use of techniques and methods of SSH to identify relevant stakeholders and analyse needs and increase awareness, and assess impact on society.[13]

At the same time, there are appeals to 'balance', such that technology development is to be balanced by assessments of societal readiness, 'i.e. Proposals will combine the relevant scientific and technological elements of these fields with relevant social sciences and humanities'[14]. For example, the 2018-2020 SC3 work programme text outlining the call LC-SC3-RES-28-2018-2019-2020: Market Uptake support states that the 'complexity of [the] challenges…calls for multi-disciplinary research designs, which should include contributions *also* from the social sciences and humanities' [pp. 71-72, our italics].

The section has highlighted factors contributing to poor integration of social sciences and humanities research with EU energy policy. SSH energy research funding and numbers of projects funded are low relative to STEM disciplines, and 'socioeconomics' is more prevalent than qualitative SSH approaches in EU energy research work programmes and projects. This is in spite of recent demands to take greater account of the social sciences and humanities in energy research. Overall, there remains a sense of SSH being necessary yet subordinate to science and engineering, while cross-disciplinary research is sought after but impeded by the inability of STEM researchers to value properly or make sense of knowledge generated through SSH. Chapter 4 considers the issues as they apply to national level support for energy research in the social sciences and their integration with policy.

4 STATE OF THE ART OF INTEGRATION OF SSH RESEARCH WITH NATIONAL ENERGY POLICY-MAKING

In this chapter, an overview of SSH integration with energy and environmental policy-making in eight European countries is provided. This includes Denmark, Finland, Germany, Hungary, Ireland, the Netherlands, Switzerland, and the UK. The countries selected are the same as the ones in which energy living labs will operate during the ENERGISE project, with data being collected through a survey completed by staff of ENERGISE consortium members. The chapter articulates the approaches taken in these countries to the utilisation of SSH knowledge within national energy policy-making, national research funding priorities and policies and energy-related projects funded at the national level. The chapter identifies through comparative analysis common threads

[12] http://ec.europa.eu/research/participants/data/ref/h2020/wp/2018-2020/main/h2020-wp1820-energy_en.pdf
[13] See Call text for LC-SC3-NZE-3-2018: Strategic planning for CCUS development
[14] See Call text for LC-SC3-CC-5-2018: Research, innovation and educational capacities for energy transition

across the individual countries examined, which illustrate the state of the art of SSH integration with energy policy in the EU.

4.1 RESEARCH INTEGRATION AS 'EVIDENCE-BASED' POLICY

One finding from the study is that increasing emphasis is being placed in EU states on the value and need for 'evidence-based' policy (EBP). To take one example, the idea of evidence-based policy-making is well established in the UK. The Labour Government (1997-2010) attempted to place EBP at the heart of their modernisation programme in order to reform the policy process, based on the idea that policies to improve society should be developed on the basis of an awareness of the best evidence.

The need for better use and sharing of evidence for policy-making is now widely acknowledged in UK policy circles. The Government Office for Science claims to work as a 'transmission mechanism' between expert scientific communities working in academia, industry and government, and governmental policy makers, and to take advantage of the very best insights from academia and industry in the UK and around the world. Major partners include the Council for Science and Technology, national academies, expert professional bodies and universities. The increased commitment to evidence-based policy has led to a growth in the number of scientists and analysts and in their status; qualitative social scientists have become organised as a formal cadre within UK central government in the same way as economists and statisticians. There are about 1,000 researchers, who work alongside other analysts, such as economists, statisticians and operational researchers, as well as policy makers, in all central government departments as well as devolved administrations and other government bodies. Another illustration of the Government commitment to EBP is the What Works Network (7 independent centres and 2 affiliate members), which supports more effective and efficient services across the public sector at national and local levels. It is claimed to be a world first: i.e. the first time that any government has taken a national approach to prioritising the use of evidence in decision-making.

To give another example, in Ireland, the most recent government energy policy paper 'Ireland's Transition to a Low Carbon Energy Future 2015–2030' (DCENR 2015) outlined the country's ambition to make the transition towards a low carbon energy system. It reaffirmed an evidence-based approach to policy development and implementation stating that: 'Government will ensure that policy measures are evidence-based and subject to rigorous analysis and appraisal prior to being implemented. This will include analysis of the distributional impact of policy measures.'

Typically, the practice of EBP was first established in sectors other than energy/climate change or environmental policy. For example, evidence-based policy began to be established in Denmark since the late 1980s, initially gaining ground in three areas: health; social work; and education. More recently, the idea has influenced discussions on management methods in the public sector. In Finland, EBP first took root and is now most established in health policy.

In certain countries, the institutionalisation of EBP is not complete, needs to be qualified, or has not even begun. For example, in Germany, the term evidence-based policy (evidenzbasierte Politikgestaltung) is recognised and considered desirable. However, the EBP process is likely to be overruled by political interests. Thus, 'consultative' may be a more accurate description than 'evidence-based' of the current relationship between public policy research and public policy formation. Similarly, in the Netherlands where the term 'evidence-informed policy' is only slowly gaining traction, research centres and universities may be consulted on specific questions or may be invited to provide (scenario-based) evidence regarding long-term developments. This is considered problematic, with the governmental study group on 'public budget growth' recognising that existing knowledge and research are not sufficiently considered by public policy. In Hungary, considerable effort has been made by the government to move towards evidence-based policy-making, however, according to an OECD summary policy brief published in 2016, '[i]institutional arrangements and capacities are not yet fully in place in Hungary to support open and evidence-based policy-making'. The policy brief suggests that further capacity building, the development of a robust monitoring and evaluation framework as well as greater use of stakeholder consultation throughout the policy cycle are needed for the realisation of open and evidence-based policy-making in the country. For Switzerland (which has access to the single market but is not a member of the EU), we do not have sufficient information to confirm or deny the prevalence of EBP. However, there is apparently increasing emphasis being placed on inter- and trans-disciplinary partnerships in research, seen as potentially leading to more policy-relevant results. These may involve partnerships with other actors – such as associations, cities, utility-companies, etc., – with an emphasis on 'knowledge transfer and communication', which involves stakeholder engagement and policy outreach. Often additional funds are available to ensure that such knowledge transfer can be supported.

As discussed above, evidence-based policy has grown in prominence in a number of EU countries. However, this growth has been accompanied by concerns about several issues including the transparency of the evidence base; the quality of the evidence base, including what counts as evidence; and the ways in which this evidence is applied.[15] Thus, some controversies surrounding EBP concern: the evidence hierarchy; the importance of context and whether and how this is taken into account in gathering and using evidence; and the degree to which evidence is constructed according to political needs, rather than gathered and deployed as objective data with which to determine policy.

4.2 IMPORTANCE OF POLICY AND POLICY IMPACT TO PUBLIC FUNDERS AND IN FUNDING CALLS

The idea of research informing policy and practice (research impact) seems to be very important for public funders in seven of the eight countries studied, with Hungary being the only exception. The way the expected impact of research is framed differs – from more

[15] https://www.instituteforgovernment.org.uk/sites/default/files/publications/4545%20IFG%20-%20Showing%20your%20workings%20v8b.pdf

general statements about societal impact and applied research to very explicit reference to anticipated policy impact of funded projects. Policy relevance/impact of research is often addressed as an aspect of societal (and economic) impact.

In Denmark**,** funders emphasise 'applied research' i.e. research should 'change' something or 'be used for something', and most funding calls require applications to be focused on 'applied science'. Some funders do talk more explicitly about policy implications and policy acceptance, particularly in recent calls with an emphasis on how to research and inform societal transitions.

A (wider) societal impact rather than policy relevance specifically is a criterion adopted by funders in Finland. The Academy of Finland encourages researchers to consider how their work is connected with wider issues, extending beyond academia. The Strategic Research Council (SRC) also funds high-quality research that has great societal impact, i.e. the research should seek to find solutions to grand challenges requiring multi-disciplinary approaches. The main review criteria are societal relevance and impact as well as scientific quality.

While potential policy impact is given a certain level of prominence in Germany, the relevance of research for the economy/society is given much more weight. For example, the DFG – German Research Foundation emphasises 'knowledge transfer' between science and practice (industry or the public sector) as a central element in research proposals. For funding calls it is more common to have a requirement of open publications of findings, which may be useful for policy makers, rather than expectations of findings resulting in policy outcomes.

In Hungary, the presence of potential policy impact in funding calls is rather limited. National funders, the National Research, Development and Innovation Fund (NKFIA) and Hungarian Scientific Research Fund (OTKA), as well as Operational Programmes (OP) of the EU Structural Funds, do not refer to policy relevance in their funding calls. The government required sustainability and energy SSH research only sporadically, when facing an obligatory introduction of a new field of policy-making, e.g. climate change mitigation and adaptation.

In Ireland, the Irish Research Council (IRC), the primary funder that supports basic research in the arts, humanities and social sciences, aims to develop the knowledge, understanding and insights required by citizens, employers and government. A strong focus on knowledge exchange – between research, government agencies, enterprise and civil society – is supported by established partnerships across government and civic society to assist in supporting research with a societal focus. However, the IRC funding calls do not have a strong policy component/focus, although policy recommendations are generally expected as an outcome of most sustainability and energy research projects. For the Environmental Protection Agency (EPA) and the Sustainable Energy Authority of Ireland (SEAI) policy impact is important, although the funded research is largely STEM based (e.g. all EPA funded research should inform policy and develop solutions in final

reports, and SEAI funds research to support the work of the government department dealing with energy). SEAI consider policy impact as part of the research relevance and impact criteria ('facilitates guidance to policy makers on practical, regulatory, technological and/or market opportunities') alongside relevance to the needs of the energy sector, accelerating R&D of energy products, processes and systems in the Irish marketplace, and building national capacity for R,D&D activities. It is essential for EPA-funded proposals to demonstrate that the expected outputs will have policy relevance, address a knowledge gap and be efficiently transferred/applied to the implementation of sustainability-relevant policies and the protection of our environment (Rau et al. 2018).

Publicly funded research in the Netherlands is supposed to address questions of societal relevance and benefit society in the short-term. Rather than the integration of research findings into policy, the use of knowledge for the economy is emphasised. The Netherlands Organisation for Scientific Research (NWO) does not mention policy relevance explicitly in its vision, mission or strategy. Instead, key words like 'welfare, well-being and need for knowledge' and the Dutch word 'samenleving' (meaning social cohesion, society, or living together) are used. Since 2013, research proposals need to explain the use of knowledge, how findings will be of relevance to society and to the economy. Some calls for proposals include a section on policy relevance and some research programmes have an explicit policy focus (e.g. energy transitions programmes in the period 2010-2012, and policy relevance in the Sustainable Living Labs call of 2018).

Research funders in Switzerland continuously stress the importance of policy relevance in their strategies and funding programmes. The federally-funded Swiss National Science Foundation (SNSF) requires policy-relevant outputs ('[s]pecial importance is to be attached to the integration and consolidation of the findings, and thus to fostering their transfer at the political and economic levels'); National Research Programmes (NRP) such as the NRP71 specifically deals with the socioeconomic and regulatory side of energy transitions, relating to Swiss Energy Strategy 2050; NRP70 focuses on technological innovation including socioeconomic aspects, in relation to this transition. Policy impact is also important for the Federal Office for the Environment (FOEN) and the Swiss Federal Office of Energy (SFOE), indeed 'the objective of the research programme [energy, economy and society] is to establish the scientific basis for the various political decisions which will have to be taken in the energy sector'. One of the objectives of the Swiss Academy of Humanities and Social Sciences is to make recommendations for competent authorities. For Volteface, a funding program supported by a regional energy provider, the research and action-research projects must have a practical dimension and provide concrete results that are applicable in practice. For the Swiss Network for International Studies (SNIS) policy relevance is an 'additional evaluation criteria'.

In the UK**,** funders' expectations for impact to be demonstrated in research proposals is a result of a more evidence-based approach to policy-making and expectations that researchers will be more effective if they prepare and supply that evidence. All funders have a common understanding of the importance of societal and economic as well as academic impact. The research councils invest in excellent research to bring about

positive impact in society and economy: academic impact, and economic and societal impacts (the demonstrable contribution that excellent research makes to society and the economy). Economic and societal impacts embrace all the extremely diverse ways in which research-related knowledge and skills benefit individuals, organisations and nations by: fostering global economic performance, and specifically the economic competitiveness of the United Kingdom; *increasing the effectiveness of public services and policy*; enhancing quality of life, health and creative output. In line with the Research Councils UK (RCUK) position on Excellence with Impact, the Economic and Social Research Council (ESRC) expects researchers to consider the potential scientific, societal and economic impacts of their research. In the funding calls, policy issues are included in the thematic scope and are addressed as part of investigating socio-economic impact of innovation/technologies, through involvement of different stakeholders including industry and policy (co-design), as part of governance of sustainable resources. In the research proposals, policy relevance is addressed through the pathways to impact statements (regarding academic, socio-economic and policy impacts).

4.3 THE IMPACT OF SSH RESEARCH ON ENERGY POLICY-MAKING

Considering the importance of societal progress and impact for funders, it is interesting to note that where it exists the influence of SSH on policy relating to energy and environment matters seems either a) to be concentrated mainly within the discipline of economics; or b) is only indirect. In Germany, policy advice tends to be dominated by findings based on positivistic analytical approaches. For example, in relation to environmental policy issues, arguments rooted in economics have found their way into the political discussion. There seem to be problems in the communication between science and public policy; part of the problem is that there is no official or regulated structure through which social scientific information can take a direct route to decision making. Often such issues take an indirect route to politics in terms of sustainability issues and do not exert any direct power/influence in the decision making process. The Federal Government does however create platforms where representatives from science, industry, civil society and politics join forces to stimulate sustainable development: the City of the Future innovation platform, the Green Economy Platform, the National Platform of Education for Sustainable Development, the Construction of the Future research initiative, the Energiewende Research Forum, the Energiewende Research and Innovation Platform and the Energy Research Networks are some examples where collective action is taking place.

Similarly, in Denmark, whilst SSH research outside of economics is undertaken in the universities, it is not common for policy makers to consult this type of research, and not much of this follows a direct or formal path to informing policy. However, research results influence policies in more indirect ways through public debate, public hearings etc. In Finland, although most SSH research has been rather external and critical, there are signs of greater utilisation and integration into policy making. Since 2015, a new instrument has been set up, the Strategic Research Council under the Academy of Finland. It explicitly contracts large (4-8 million euro), inter-disciplinary and trans-disciplinary consortium

projects (including sustainability, environment and energy) in which social sciences and even humanities are prominent. The Council is explicitly funding research that aims to support and even influence policy.

In Hungary, SSH research in the field of environmental/sustainability/energy policy-making is only considered to a rather limited extent in policy-making, with the exception of a few cases. These occur especially when the government needs to create strategies and introduce policies in a new field. In these cases it often commissions research (e.g. in the case of developing the first national sustainable development strategy) or cooperates with research institutions to design and implement large-scale research activities. A notable example of the latter is the 'VAHAVA' (Change – Impact – Response) project in the field of climate change mitigation and adaptation that was conceptualized and implemented by the Ministry of Environment and Water and the Hungarian Academy of Sciences between 2003-2006, and involved SSH researchers as well. This project provided a solid scientific basis for drawing up the National Climate Change Strategy (finalised in 2008) as well as its revision and republication in 2017. The Energy and Climate Awareness Raising Action Plan (2015) refers to the need for carrying out primary research in the field of identifying lifestyle and consumer habits of the Hungarian society, but no proof that planned SSH research was actually conducted.

The UK seems to provide a contrary case, with a number of examples of social sciences informing environmental/sustainability/energy policy-making. Social science research plays a significant role in addressing many of the research challenges that the government departments face; e.g. for Department for Business, Energy and Industrial Strategy (BEIS)[16] these include understanding people, institutions and markets. The Research Councils UK Energy programme[17] claims to have made a significant policy impact, including to: the Nuclear Industrial Strategy (2013); the Bioenergy Strategy (2012); the Low Carbon Industrial Strategy (2009); the Energy White Paper (2007); and the Stern Review (2006). There is increasing emphasis on cross-cutting challenges (e.g. globalisation, climate change, innovation, changing behaviour etc.) requires an integrated approach drawing on expertise in SSH as well as in natural sciences. This can help policy makers to understand and redefine problems as their complexity requires, and design policies to tackle them.[18] One of the key messages in the Foresight review of how science and technology could contribute to better energy management in the future[19] is that looking at socio-technical systems policy makers should not focus on technological options in isolation from the social sciences. The overriding conclusion is that the complexity of the challenge requires an integrated, multi-disciplinary, and long-term approach. Government

[16] BEIS Areas of Research Interest https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/666550/121217_BEIS_Areas_of_Interest_FINAL.pdf

[17] Led by the Engineering and Physical Sciences Research Council (EPSRC), the Energy Programme brings together the work of EPSRC and that of the Biotechnology and Biological Sciences Research Council (BBSRC), the Economic and Social Research Council (ESRC), the Natural Environment Research Council (NERC), and the Science and Technology Facilities Council (STFC).

[18] British Academy (2008) Punching our weight: the humanities and social sciences in public policy-making.

[19] https://www.gov.uk/government/publications/sustainable-energy-management-role-of-science-and-technology

Office for Science in its 5-year work plan for science in government (2015-2020) confirms that 'efficient and effective government needs all of the sciences: the natural and physical sciences, mathematics, engineering, technology, social science and the humanities.'[20]

4.4 OVERVIEW OF FUNDING POLICIES FOR SSH RESEARCH IN EIGHT EUROPEAN COUNTRIES

To understand the lack of impact of SSH on energy policy in European countries it is helpful to consider the nature and implications of funding policies. It is to be noted that contract/commissioned research (which aims primarily to inform policy following a tender process) is not included in this review. Although the same funders (e.g. government departments) can finance both research for academic purposes and contract research, and the distinction between the two is often blurred, the focus of the sub-section is on those public funders in each country who provide support for SSH research with an academic purpose (may still have policy relevance/impact). The amount of funding available for SSH energy research at the national level differs dramatically among the eight countries. For some countries it is possible to identify several levels and several streams of public funding for SSH research. For example, research and development in the UK is funded by the government, by companies, and by charitable organisations. Government funded research is carried out mainly in universities and to a lesser extent in research institutes, as well as government departments, local authorities and other public agencies. Two main streams of research funding coming from the government exist in the UK (and most other countries): (1) government departments (research commissioned for policy and practice) and (2) the UK research councils and other research funding bodies that support research in academia and sponsored by the government (academic research that also creates impact). There are also many partnerships between government departments and the research councils.
Germany provides a good example of two levels of funding in public energy research – national and regional. This is comprised of: (1) national funding by individual federal ministries, (2) funding at the level of the provincial states. Funding at provincial level accounts for about one third of publicly funded non-nuclear energy research (BMWi, 2015). Project funding is carried out often as co-financing with the European Regional Development Fund (EFRE). In addition, there are a number of state-specific funding programs such as the Bavarian Energy Research Program (formerly: BayINVENT), Baden-Württemberg Program Livelihood Environment and its security (BWPLUS) or 'BaWü Labs GO!'

Public funding opportunities for energy SSH research is often derived from and linked to politics and have fundamental political decisions behind them. For instance, energy research is an important pillar of energy policy in Switzerland and is explicitly defined as one of the strategic cornerstones of the federal government's 'Energy Strategy 2050'.[21] The National Research Programmes NRP70 and NRP71 have the main objective to

[20] GOS (2015) Government Office for Science – the next 5 years https://www.gov.uk/government/publications/government-office-for-science-the-next-5-years
[21] http://www.bfe.admin.ch/energiestrategie2050/index.html?lang=en

propose potential solutions that can be implemented in Switzerland in the coming 10 to 30 years.

Private funding can play a significant role in supporting SSH energy research, e.g. private foundations in Denmark who fund environmental, sustainability and energy-related research, including SSH (e.g. the Velux Foundations including Villum Foundation; KR Foundation). Another example is the Mercator foundation[22] in Switzerland, a private foundation that supports research on environmental issues, especially on sufficiency. However, the scarcity of funding for SSH research compared with technical sciences is obvious, even in the countries with multiple funding opportunities and significant amount of support available for SSH research. For example, the differences in budget allocations for the technical and socio-economic calls by SNSF in Switzerland are dramatic – funding for technical research received almost five times more. In Denmark the amount of public funding allocated for SSH energy research is also small compared with more technical areas of energy research. Moreover, public funding for energy research seems to have declined substantially the last decade. In Hungary both funding possibilities for and the practice of energy-related SSH research are very limited. There is no central policy for its support, thus, the funding landscape is very fragmented. See Appendix 1, Table A1 for main national public funders of environmental, sustainability and energy SSH research.

4.4.1 NATIONAL FUNDING CALLS FOR ENERGY-RELATED SSH RESEARCH

In most countries SSH energy research is funded under general open funding calls and sometimes under special thematic calls/programmes (SSH or inter-disciplinary). In countries like Denmark, Finland, Hungary and the Netherlands there are no specific energy-related funding calls for SSH disciplines. In Denmark it is common for SSH to be subsumed into some calls for strategic research and technical research programmes (e.g. this is the case for research related to smart grid innovations). The Strategic Research Council in Finland also promotes inter-disciplinarity with the aim to involve SSH in environmental and energy research as part of inter-disciplinary calls/programmes. Additionally, other funding bodies prioritise inter-disciplinarity and responses to grand challenges (e.g. the Academy of Finland programme ‘New Energy’; Sitra’s theme ‘Carbon-neutral Circular Economy’). The multi-disciplinary/inter-disciplinary approach for funding energy research is also common in the Netherlands. There have been a limited number of energy-related funding calls/programmes that were open to SSH (e.g. Joint Scientific Thematic Research Programme between China and the Netherlands ‘Smart Energy in Smart Cities’ in 2014, ‘The Energy Transitions programme’ in 2010, ‘Sustainable Living Labs’ in 2018). Although the programmes are not designed solely for SSH, they leave some scope for incorporating a social science component alongside applied/technical sciences and natural sciences stimulating ‘innovative multi-disciplinary research’. The open research calls funded by the National Research Development and Innovation Fund in Hungary provides funding opportunities for researcher-initiated energy SSH projects.

[22] https://www.stiftung-mercator.ch/fr/la-fondation/

Similarly, the Research Council in Ireland funds energy SSH projects under open calls. The Environmental Protection Agency does not have an 'energy' strand and specific calls for SSH energy research, but it can fund energy-related SSH projects under the sustainability research umbrella. The Sustainable Energy Authority of Ireland 2018 funding call includes two topics that could be related to SSH research, although the two projects funded by SEAI are classified as small-scale projects with a focus on socio-economics and behaviour change.

Other countries (Germany, Switzerland, and the UK) have pronounced funding programmes/calls for energy-related SSH, which are often addressed as part of broader sustainability programmes. The Federal Ministry of Education and Research (BMBF) in Germany funds SSH research under its Framework Programmes (since 2005); its 2015-2019 programme 'Research for Sustainable Development' has a strong inter-disciplinary, demand- and application-oriented focus. BMBF's funding programme for 'Social-ecological research' also has an explicit SSH component in the recent projects aimed at transformation of energy systems (e.g. 'Social Transformations in Climate Change'; 'Environmental and Socially Responsible Transformation of the Energy System'; 'Social Dimensions of Climate Change').

As conceived by the SNSF, the main funding body for research in Switzerland, the NRP71 call 2013 'Managing Energy Consumption' deals specifically with the socioeconomic and regulatory side of energy transitions; NRP70 'Energy Turnaround' focuses on technological innovation including socioeconomic aspects to ensure a sustainable energy policy for Switzerland. SFOE Energy – Economy – Society research programme promotes application-oriented research in the field of energy policy and focuses on economic, social, psychological and political issues throughout the energy sector supply chain. Volteface also funds projects around social aspects of energy transitions.
The UK Economic and Social Research Council (ESRC) has open calls and thematic calls, in line with seven research priorities one of which is Climate Change. Funding calls are often broad in scope; energy-related topics can be addressed relevant to sustainability, climate change, and innovation themes. Recent calls relevant to energy research include: Natural Environment Research Council (NERC) and ESRC joint call 2017 'Unconventional Hydrocarbons in the UK Energy System: Environmental and Socio-economic Impacts and Processes' which has three themes for SSH (public perceptions/community understanding; policy; and economic impact); Newton RCUK-CONICYT Broadening Impact call 2017 (Energy-Food-Water-Environment Nexus theme) for collaborative research between UK and Latin America that also considers questions around consumption and governance of sustainable resource use; 'Climate Change priority' call 2018 for inter-disciplinary social science-led research relating to climate and environmental change with an emphasis on co-design with a range of stakeholders including industry and policy; and the 'GCRF New Models of Sustainable Development' call 2017-2018 for inter-disciplinary research which has a theme 'Transitions towards Sustainable and Inclusive Societies'.

4.4.2 THE MAIN FOCI OF FUNDING CALLS

In terms of the main focus to be found in calls, the following remarks may be made regarding the prevalence of behaviour change, consumer choices, technological innovation and change in practices topics in national level energy-SSH funding priorities (see Table 6, below). In Finland, behaviour change, consumer choices and technological innovation topics dominate (although the SRC calls also address practices, or sociotechnical systems, but not exclusively under energy headings). Behaviour change, here, is mainly about awareness raising by means of e.g. carbon footprint calculators and technological innovation mostly concerns human-system interaction, usability, and user acceptance. The same three foci apply to Ireland and Denmark (where the focus is primarily on behaviour change, although practice-theoretical terminology is sometimes used in research applications that are successful in securing funding). In Germany, the Netherlands and the UK all four research themes are funded. In Hungary – none of them since funding possibilities for and the practice of energy-related SSH research are very limited. In Switzerland, behaviour change and consumer choice is a big part of the Swiss National Science Foundation's NRP71 call, and part of the Swiss Federal Office of Energy programme 'Energy – Economy – Society'.

Technological innovation is a big part of the NRP71 and NRP70 calls. In one NRP71 project, coordinated by a consortium member, there is an explicit focus on better understanding social practices related to energy services in the home, as well as experimenting with participative methods for changing practices ('Understanding household energy consumption: social practices, norms and learning how to change', 2015-2017), but this seems to be the exception rather than the rule.

4.4.3 EU NATIONAL MEMBER-FUNDED SSH PROJECTS AND RESEARCH CENTRES

The overview of the national publicly funded projects is based on the selection provided by the consortium partners. The search was conducted using publicly available online funders' databases, such as the UK Research and Innovation gateway to publicly funded research – gtr.rcuk.ac.uk (now gtr.ukri.org) – or Danish Research, Development and Demonstration Funding Programmes within Energy and Climate (energiforskning.dk). The following criteria were used:

Table 6: Main foci of funding calls for energy-related SSH in 8 countries

Country	Behaviour Change	Consumer Choices	Technological Innovation	Changing Practices
Denmark	✓	✓	✓	-
Finland	✓	✓	✓	✓

Germany	✓	✓	✓	✓
Hungary	-	-	-	-
Ireland	✓	✓	✓	-
Netherlands	✓	✓	✓	✓
Switzerland	✓	✓	✓	-
UK	✓	✓	✓	✓

Source: Authors, based on data collected by ENERGISE consortium partners

- most significant SSH energy research projects (or inter-disciplinary projects which are largely SSH based), funded at the national level[23] by public funders;
- research projects related to domestic energy consumption; for countries with a very limited number of such projects, a broader theme of domestic energy (e.g. energy efficiency), energy consumption, and/or sustainable energy was used for producing a list;
- projects from the last 10 years (2008-2017); for countries with a large number of projects to choose from, only ongoing and recently funded research projects on domestic energy consumption are included in the list (those that received funding in the last 5 years).

The aggregated list for eight countries comprised 62 research projects (including funded research networks): seven from Denmark, nine from Finland,[24] eight from Germany, four from Hungary, four from Ireland, ten from the Netherlands, ten from Switzerland, and ten from the UK. Although the list is not exhaustive, it is illustrative of SSH research funded by national public funding bodies in the area of sustainable energy and domestic energy consumption in eight countries.

[23] Although the sources of funding for Hungarian research projects included in this overview include EU (indirect funding, distributed in Hungary) and other countries (i.e. EEA and Norway Grants), the decisions about distribution of funds are made by the Hungarian government or its various institutions who also provide match funding in certain cases.

[24] UH is a partner on two projects from the list: a partner in charge of the learning from experimentation part (Smart Energy Transition); and a partner in charge of analysing the role of intermediation between consumers and energy companies (Intermediaries in the energy transition: The invisible work of creating markets for sustainable energy solutions (TRIPOD)).

More than half of all research projects (32) are inter-disciplinary involving collaboration between SSH and STEM researchers, although there are some variations between the countries. For example, the Finnish and German projects are primarily inter-disciplinary (a mix of STEM and SSH), as only few projects related to energy-research seem to be pure SSH; technology or engineering aspects are almost always a part of energy projects. SSH-based energy research projects are often funded through private organisations, the EU or other countries, rather than Danish public funds. An inter-disciplinary approach also dominates in Finnish and German research projects. Only four research projects that are SSH based were identified in Ireland, as almost all funded research in the energy sphere is STEM based. This probably illustrates the tendencies in national research funding policies that prioritise technical research over social science in the area of energy and funders promoting inter-disciplinary calls/programmes. Similarly, the prevailing methods of research mirror preferences of public funders. Only around 14.5% (9) of the projects from the list rely on qualitative research methods (solely or primarily); 16% (10) employ quantitative methods, and the remaining are reported as using mixed methods.

SSH disciplines are mainly represented by Economics (including Political Economy, Economic Sociology, and Behavioural Economics), Sociology (including STS), Psychology, Political Sciences, and Geography (including Human Geography and Environmental Planning).[25] This also corresponds to findings in the literature about funders' preferences for economic and behavioural sciences in energy research (see e.g. Cooper 2017; Stern 2017).

The most commonly studied phenomena are: sustainable/energy transitions; energy consumption practices and energy savings in households; social aspects of energy-related innovation/technology; sustainable communities and citizen-driven innovation; low carbon technologies and renewable energy; and energy poverty.

In relation to energy consumption in households (which is sometimes coupled with other forms of sustainable consumption, e.g. sustainable mobility) the research focuses on studying everyday social practices and energy choices, barriers to energy saving, behavioural interventions, role of incentives for energy saving, determinants of individual energy-related decisions-making, communication strategies to stimulate more climate-conscious consumption, effect of electricity tariffs and carbon taxes, energy efficiency and sufficiency of elderly households, effective and economically feasible feedback systems, individuals' energy biographies, the effect of government-funded initiatives, low carbon/energy efficient housing, domestic retrofit measures, and policy analysis in relation to electricity savings in households.

The community aspect is a prominent theme in domestic energy research. The range of topics investigated includes: solar community concepts; local service ecosystems; local investments in renewable energy for urban and rural communities; community gains and energy infrastructure; collaborative consumption for energy saving; financial models for energy transitions in neighbourhoods; promotion campaigns at city level and role of formal

[25] The list starts with more common/popular disciplines.

social groups; the role of community initiatives and knowledge networks in energy saving; and the role of schools in changing local energy practices.

According to the information available, around half of all research projects from the list claim explicit policy relevance or even impact. This can take the form of concrete steps towards incorporating research findings into policy papers and strategies and specific recommendations for policy-makers, as well as direct engagement or collaboration with government bodies and policy makers. This is more common for research projects in the UK, but also applies to Ireland, Switzerland, Finland, the Netherlands and Germany. Among them a significant number of projects have an aim to inform local policy makers and practitioners contributing to e.g. informing energy campaigns or sustainable transitions at the city or municipality level. It needs to be noted that the differences in national funding policies and availability of research funding affects the number and the focus of research projects (that also vary in scope and scale), as well as the expected policy relevant outcomes.

For more detail see Appendix 2, Table A2 National Energy Projects.
The energy-related research, including SSH, is often carried out by researchers affiliated with energy research centres and hubs which can be university based or established as independent research entities/institutions (see Table 7).

Table 7: Selected list of energy research centres in eight European countries

Country	Research centre(s)
Denmark	Universities have several institutes and centres specialising in different aspects of energy research: Technical University of Denmark; Aalborg University Institut for Forretningsudvikling og Teknologi (Centre for Energy Technologies), Aarhus University
Finland	VTT Technical Research Centre of Finland
Germany	Karlsruhe Institute for Technology: Future of energy systems Technical University Cottbus: Energy efficiency and sustainability Westfälische Weilhelms-University Münster: Energy Technical University Dresden: Energy and Environment University of Stuttgart: Sustainable Energy supply and Environment Leuphana University Lüneburg: Sustainability Science Technical University Munich: TUM Energy Ludwig Maximilan University Munich: Energy and SSH The Helmholtz Energy Alliances
Hungary	The Hungarian Academy of Sciences Centre for Energy Research University-affiliated research centres: Regional Centre for Energy Policy Research, the Corvinus University of Budapest; Sustainable Energy Planning Research Group, Eötvös Lóránd University; Center for Climate Change and Sustainable Energy Policy, the Central European University Energiaklub (NGO)

Ireland	The International Energy Research Centre, Tyndall National Institute at UCC (IERC) Ryan Institute, National University of Ireland, Galway The Centre for Marine and Renewable Energy (MaREI)
Netherlands	PBL Netherlands Environmental Assessment Agency Energy research Centre of the Netherlands (ECN) TNO Netherlands Organisation for Applied Scientific Research Research centres at universities: Energy and Sustainability Research Institute Groningen Energy and Resources Research Group at the Copernicus Institute of Sustainable Development, Utrecht University ICIS, Maastricht University Energy Research at the Tilburg Law and Economics Centre
Switzerland	The Competence Centre for Research in Energy, Society and Transition (CREST) Universities host several energy institutes and research groups, including: Energy Science Center (ESC), ETH Zurich Energy Centre, EPFL Chair for Energy Efficiency, Renewable Energy Systems and Energy Systems groups, UNIGE
UK	UK Energy Research Centre Centre on Innovation and Energy Demand, University of Manchester Tyndall Centre for Climate Change Research Energy Systems Research Institute, Cardiff University The Energy Systems Catapult; Offshore Renewable Energy Catapult STEP centre (pathways to sustainability, since 2018)

Source: Authors, based on data collected by ENERGISE consortium partners

4.4.4 ROLE OF SOCIAL SCIENTISTS IN ENERGY RESEARCH CENTRES

A closer look reveals that social scientists still play a limited role at the energy research centres/hubs in most of the countries represented in the review. This is particularly the case in Finland and Hungary where their role is very limited.

There are no large national energy research hubs in Denmark that specifically address social scientific aspects of energy use. Aalborg University probably has more activities than other Danish universities in relation to non-economic SSH energy research. A new independent research hub called Centre for Energy Technologies seems to be primarily about technical solutions. While SSH researchers are becoming increasingly involved in energy research centres in Germany, barriers still remain.

There appears to be limited engagement of SSH researchers in energy research centres in Ireland. IERC focus is on demand side energy efficiency and embedded energy generation, and as a result the core of the multi-disciplinary team is comprised of engineers and scientists with specialist expertise in areas such as energy systems, building energy management, techno economic modelling and electrical systems engineering. The MaREI centre is almost entirely STEM based.

In the Netherlands the focus of national energy research hubs is primarily on technology R&D and (calculation or modelling-based) policy advice. Although all energy research hubs feature some social science research, SSH projects and outputs seem to be more detached from ongoing policy processes. Social science research in the Netherlands is mostly concerned with energy use in relation to smart grids, consumer behaviour regarding energy efficiency renovations and renewable energy, and (community) engagement methods.

The Competence Center for Research in Energy, Society and Transition (CREST) in Switzerland is a good example of SSH collaborative research, which brings together research groups from nine major Swiss research institutions. The CREST is dominated by economists, psychologists and social-psychologists. The centre provides detailed, evidence-based recommendations on policies that help to reduce energy demand, foster innovation and increase the share of renewables in a cost-efficient way.

In the UK the research centres often take a whole system approach where social sciences play a more visible role. For example, the UK Energy Research Centre (UKERC) Energy Demand theme has a strong SSH focus and includes the following projects (among others): Energy Use in Buildings (2009-2014); Energy Policy, Markets and Governance; Social and Organisational Aspects of Energy Use (2009-2014); and Understanding Local and Community Governance of Energy (2009-2014). The UKERC report 'Transforming the UK Energy System: Public Values, Attitudes and Acceptability – Synthesis Report' explores public attitudes using a 'whole-system' approach, examining views on the drivers of energy policy, the different elements of energy system change, and the underlying values and principles that people draw on when they engage with this issue (Parkhill et al. 2013). The ESRC/EPSRC-funded Centre on Innovation and Energy Demand aims to develop an inter-disciplinary understanding of the emergence, diffusion and impact of low-energy innovations mobilising insights from consumption studies, economics, and human geography. The Energy Systems catapult's multi-disciplinary team includes experts in systems and solutions architecture, market modelling and analysis, smart and multi-vector energy systems, local area planning, data science and machine learning, consumer insight, behavioural science, business model design, systems engineering and integration and programme management.

4.5 SOCIAL SCIENTISTS' PERSPECTIVES OF POLICY RELEVANCE AND INTEGRATION

The members of the ENERGISE consortium have extensive experience in the field of energy and sustainability research. Their experience illustrates some tendencies in energy-related SSH (mainly qualitative) in terms of the thematic scope, approaches and methods, collaboration or networks, and stakeholder involvement.

The disciplinary scope of ENERGISE consortium researchers is rather broad, though mainly located within the social sciences. Researchers on the project have research

interests and training related to: Consumer Research/Sustainable Consumption; Ecological and Environmental Economics; Energy Policy; Engineering; Environmental Social Science; Geography (including Social Geography, Planning and Sustainability, Economic Geography); Industrial Ecology; Innovation and Technology Management; Science and Technology Studies; Sociology; and Social Anthropology. The main research areas pursued by researchers within ENERGISE consortium partners include the following:

- the social and cultural consequences of environmental change, environmental policy implementation, policy learning (NUIG);
- energy efficiency, resource intensive practices and institutional changes, sustainable transition and relationships between consumption and production; energy use and information technology as well as consumers' role within the smart grid (AAU);
- responsible innovation, institutional aspects of energy transitions, domestic energy use and consumption practices, digital feedback and domestic electricity consumption, small business and flood risk adaptation, smart communities and sustainable lifestyles; permaculture inspired entrepreneurship (KUL);
- social innovation, innovation experiments, transition management, reflexive governance and knowledge integration; demand-side management, behaviour change, sustainable practices and lifestyles; diffusion of sustainable energy technologies – in the energy, mobility, food and waste sectors (UM);
- household energy transitions, with a focus on social practices and electricity consumption, Living Lab methodologies, natural resource consumption patterns and practices, in relation to environmental promotion and social equity (UNIGE);
- social innovation, sustainable lifestyle and energy saving, sustainable consumption, low-carbon lifestyles, behaviour change for sustainable lifestyles, demand-side management, motivation, multi-stakeholder cooperation, citizen involvement and consultation (GDI);
- socio-cultural, political and spatial aspects of (un)sustainable consumption, especially regarding energy, transport and food; sustainable regional development, governance of sustainability transitions (LMU);
- energy and environmental issues in consumer and organisation studies, sustainable energy transitions, electricity market and energy efficiency; sustainable consumption, transformation of routines and social innovation (UH);
- innovation policy and the promotion of the knowledge-based economy; sustainable innovation and social innovation; foresight and public engagement; capacity building, training, public policy support, applied research and analyses in thematic fields like energy, environment, food quality, responsible research and innovation, and ICT (ARC Fund); and
- energy policy and energy transition, energy poverty, community management of resources, impacts of development finance and international financial institutions and the role of the latter in designing domestic policies (FOCUS).

4.5.1 EXPERIENCE OF SSH RESEARCHERS[26] WITH POLICY IMPACT

It is widely understood that researchers are experiencing increasing pressure to produce practical, as well as politically and socially acceptable solutions for addressing complex societal challenges, such as the 'energy turn'. The members of the consortium have had extensive experience of conducting SSH sustainability- and/or energy-related research with a policy dimension, which in some cases were part of inter-disciplinary research programmes (with STEM) or part of large research projects that brought together partners from different countries (mainly from Europe). The policy relevance of research varies but researchers in each of the eight partners consulted were able to provide examples of research projects where interactions with policy and practice have resulted in some kind of policy impact. This impact includes examples of less direct influence on policy (i.e. to provide a better understanding of a phenomenon, e.g. the meaning of community energy, factors affecting the roll-out of smart meters, or the feasibility of developing eco-neighbourhoods). It also includes examples of more pronounced impact on specific national sectoral policies, responding to direct concerns of policy-makers (e.g. recommendations for national energy policies, references and citations of research findings in policy documents). Some reflections on researchers' experience of SSH integration with policy-making, as well as the research and engagement challenges faced by the consortium researchers in this area, are discussed in published research outputs authored by ENERGISE researchers (Genus 2014; Genus and Theobald 2015; Genus and Theobald 2015; Heiskanen et al. 2014; Rau and Edmondson 2012; Fahy and Rau 2013; Rau et al. 2018).

Policy relevance of research was often demonstrated as part of broader social and policy impact statements (i.e. different from academic impact). Overall, societal and policy impact achieved as a result of research projects undertaken by partners took various forms: direct policy engagement (factsheets and reports for governments, recommendations for policy makers, participation in policy events), developing governing tools (e.g. catalogues of best practice), dissemination of research results for a wider audience and involvement of different groups of stakeholders using different networks and communication channels. Although, it is acknowledged that for some projects the integration of research findings with policy and generation of policy impact was very limited.

For social scientists, integration of SSH research with policy can mean both: a) the shaping of policies, e.g. in terms of instrument mixes; and b) the shaping of policy-making processes (e.g. towards a more participatory approach). One of the strengths of SSH research lies in the practice of participatory approaches to knowledge creation, which makes SSH research, potentially including living labs approaches, to be perceived to be more 'useful' by policy actors. The co-production of knowledge capable of informing policy-making is probably the most popular form of SSH integration with policy and practice. There are examples where researchers, local policy actors and citizens working together

[26] The experience discussed here that of the personal experience of researchers from eight of the partner organisations (NUIG, AAU, KUL, UM, UNIGE, GDI, LMU, UH), including research conducted in or with other institututions.

co-produce research knowledge, within the conduct of qualitative social science (e.g. the Newcastle Low Carbon Neighbourhoods project in the UK, undertaken by members of the KUL ENERGISE team). The engagement process for promoting sustainable consumption practices can bring together actors, who normally operate in rather contained spheres, with the common purpose of imagining alternative and more sustainable ways of doing things (e.g. CONSENSUS project, Ireland).

The need to interact with decision makers and to produce research with some policy- and practice-oriented outputs is recognised by researchers, users of research and funders. In research projects undertaken by ENERGISE consortium researchers such interactions take the form of involvement of policy-makers in research projects (e.g. in 'policy panels', advisory boards, steering groups, or workshops). One instance is of the Transition Arena, which involved decision makers as part of the Smart Energy Transition project undertaken by Aalto University, Finland. Other examples include direct contact between researchers and government bodies, and researcher participation in policy events and committees (e.g. the medium-term climate plan committee in Finland), or liaison with political parties (e.g. 'green' parties such as Alternativet, Denmark). Working closely with local authorities has proved to be an effective strategy for translating research findings on sustainable energy use (such as for the save@work Horizon 2020 project, which involved GDI as a partner), and on low carbon living (Newcastle Low Carbon Neighbourhoods, partly undertaken by researchers at University of Newcastle upon Tyne in the UK) for decision makers at the local and regional levels. Setting up an action research project with practice partners (e.g. the Changing Behaviour project, FP7, coordinated by researchers at University of Helsinki) is a way to influence practice, even if policy impact seems elusive.

SSH-policy integration in research projects undertaken by consortium members also means presenting content in particular ways that appeal to policy officials and decision makers (e.g. 'the shorter the better'). As there is often an over-emphasis on quantitative results among funders and other policy actors, outputs provided in more conventional, quantitative formats (such as survey data) have gained the most traction within policy circles (e.g. CONSENSUS project, Ireland).

Although ENERGISE consortium members have extensive experience of research that brings change and demonstrates value for policy and practice, there are many challenges reported in relation to research projects' implementation and further dissemination and impact: the problem of continuity and funding cuts; limited/patchy utilisation of research results by policy; problems of effective communication with policy/decision makers and timely dissemination of results, which is partly due to the nature of research findings ('inconclusiveness'); an impact assessment of research; the status of social science within policy/political arenas; and the politicisation of research.

The ENERGISE consortium researchers share a common view regarding the lack of understanding of the nature of SSH in policy and practice, what kind of knowledge and evidence SSH research can produce, how to evaluate this knowledge, and the validity and generalisability of findings. Some researchers felt that practitioners were not always

persuaded of the authority of qualitative research methods, nor of the value of 'bottom up' approaches to research design. The dominance of quantitative approaches to data collection and analysis in the field of energy consumption and mainstream economic understandings underpin most policy-making processes, leaving little space for SSH research to challenge structural aspects of policy practices. Addressing instrumental and pressing policy requirements can also be a challenge for SSH researchers. While policy-makers need to seek solutions to particular issues (solutions that fit into problem-centred 'policy narratives'), Rau et al (2018) show how researchers strive for scientific excellence in ways that are not necessarily measured by real-world impact. The problems related to administrative fragmentation and to the status of social science in policy-making were identified in Heiskanen et al. (2014), including the linear model of knowledge use in policy-making in which administrators are forced to serve as knowledge brokers between researchers and policy makers.

The effective communication of research to policy and practice is another challenge faced commonly by the research community. In several cases, researchers are expected to present findings in ways that would appeal to policy officials and decision makers, which means to grapple with complexity while offering short, 'silver bullet' solutions. The standards of this type of outputs (e.g. short, 'to the point', visual) do not necessarily match the requirements of scientific output, such as academic publications in peer reviewed journals, but policy makers have very little time to use and absorb research findings. Although care is always taken to develop concrete, jargon-free advice for policy and practice, some admitted that policy recommendations and policy briefs do not appear to have much of an impact.

Although research[27] demonstrates that policy makers have a wide range of knowledge needs (from instrumental to very fundamental ones about escalating consumption) (Heiskanen et al. 2014), policy makers face rapidly evolving challenges that often require prompt responses and tend to prefer research projects with a short time span that promise quick delivery of results. This emphasis on a rapid turnaround frequently clashes with institutional time cultures within academia that involve multi-year research cycles, and does not require results with an immediate impact on society or policy-making (Rau et al. 2018). This in turn produces different sets of ideas regarding the nature, quality and timeframe of impact. It was also noted that conventional forms of impact assessment and academic reward structures often do not adequately capture the time-consuming and labour-intensive nature of policy-relevant research, including efforts to translate findings into policy. Multi-disciplinarity can also be problematic if the team comprises researchers from different disciplinary backgrounds who are not always familiar with concepts or approaches advanced by others.

Overall, the challenges reported by the ENERGISE researchers reflect in large the discussions in the literature on integration of SSH research for policy-making (see, e.g. Castree and Waitt 2017; Cooper 2017; Rochlin 2014; Russell-Smith et al. 2015; Sedlacko

[27] This research project conducted by partners from the University of Helsinki involved 22 interviews with policy makers from five Nordic countries.

et al. 2013; Stern 2017). In response to the challenges, the consortium members have made some suggestions for better integration of SSH research with policy and practice. Mobilising a large number of researchers promoting similar or compatible agendas would potentially make SSH research more 'influential'. Whilst it may provoke conflict among researchers and policy makers/practitioners, and possibly detract from impacting policy, social sciences should enjoy its 'public' and political role and not be afraid to advocate their research agenda, mindful of the duty to help produce the best 'evidence' possible in relation to fundamental questions and challenges society faces. On the other hand, promoting practical and proven solutions demonstrating utility of SSH research rather than 'just' problematising issues without solving them would make SSH research more 'appealing' and useful for policy makers and practitioners. New forms of knowledge co-production are needed, where researchers, administrators, politicians and other stakeholders work together to solve real-life problems and build up a shared knowledge community or epistemic culture. Multi-stakeholder events with a dedicated interactive element (forums, workshops, etc.) are very useful for sharing and discussing SSH research and evidence. A tradition of public engagement in research (e.g. public hearings for research on urban planning, energy systems in Denmark) can enhance the transformative potential of research, although not building direct relations between research projects and specific policies. Besides, new and innovative forms of impact assessment are needed that can capture the complexity of the short-, medium- and long-term effects of research, including its actual impact on the policy realm.

5 CONCLUSION

This report has covered a number of areas relevant to understanding the state of the art regarding the integration of social science and humanities with EU energy consumption-related policy-making in particular, as well as EU energy policy integration more generally. The report suggests that a focus on imaginaries can provide a framework for better understanding challenges of energy research and policy integration. Such a framework, if applied, may also help to identify possibilities for future SSH practice and policy impact. The paragraphs below reflect on what has been learned from reviewing literature and practice from application of the concept of socio-technical imaginaries. This exercise in reflection takes in a reconsideration of the data collected from eight national partners to the ENERGISE project on energy policy and research.

The report began by providing some background on developments in EU energy policy, noting the challenge of tackling the fragmentation of the European energy system and the need for integration. This has been couched in terms of the need for collective action at the EU level on the international stage as well as better coordination of the energy policies of individual member states. However, 'stronger' forms of integration are possible which emphasise common 'trans-domain' energy policies and prioritisation of – rather than merely taking into account - energy and environmental concerns. The Energy Union could be viewed from this perspective, though its foundation is more accurately to be described in relation to sustainable development, being rooted in the pursuit of economic, social and sustainable goals.

There is a contribution to be made by social science research to informing the EU Energy Union. However, this remains unfulfilled for a number of reasons, which, it is argued, are rooted in the imaginaries employed by policy-makers, funders and others, regarding the nature, role and potential of SSH. This contention is supported by data collected from researchers with experience of conducting qualitative SSH research funded at the EU level or by national-level funders.

To start with, take the dimension of imaginaries concerned with the **framing of risks and opportunities**. Overall, there remains a tendency to frame EU energy challenges and research as primarily technical in character (see related work by ENERGISE on problem framings, reported in Jensen et al. 2017). Thus, European Commission support for social sciences energy research remains relatively low compared with STEM (e.g. in terms of European Research Council and Horizon 2020 funding granted and numbers of projects funded), though there have been some signs of recognition of the potential contribution of a range of SSH disciplines and/or approaches. Further, the contribution of SSH is typically framed in relation to risks concerning the need for 'social acceptability of the many changes that the energy transition implies, as well as to better understand why citizens may resist these changes'.

The dominant **policy focus** represents an imaginary, which emphasises the role of energy efficiency in EU and national states' policy development, and market uptake of renewable energy technologies. EU funding for SSH energy research is relatively poor, and worse for qualitative SSH energy research. At the national level funding for energy research and also for SSH energy research is uneven; some countries in which ENERGISE consortium partners are based have (or have had) established funding streams and processes for both elements whereas for certain others funding in both areas is very limited.

In general, national research funding tends to be awarded to studies of individual behaviour and technical aspects of energy efficiency and not to practice theoretic research or studies of energy use cultures. The data collected confirms the emergence of inter-disciplinary energy research in national member states, though SSH is not typically the dominant partner in projects compared with STEM. There also tends to be a minor role for social scientists in national energy research centres. SSH is represented most by Economics-related disciplines, whereas qualitative approaches and other disciplines are less prevalent in national energy research funding.

Data from consortium researchers confirms that in terms of disciplinary range SSH energy research is eclectic and that it is seen as capable of contributing both to informing policy options and to opening up policy processes through public engagement and co-production of knowledge. ENERGISE researchers point to the over-emphasis on quantitative approaches to data collection or analysis and problems of cross-disciplinarity, such as failure to recognise when different approaches with incompatible epistemological or ontological assumptions cannot be reconciled or integrated. Further, the need for very short briefing-style outputs, produced to the short-time frames required by policy actors, creates difficulties for qualitative SSH researchers who need time to collect and systematically analyse data (e.g. from detailed interviews or documentary sources).

There appears to be greater institutionalisation of evidence-based policy, the discursive setting in which SSH is being invited to participate. This constitutes the context in which **controversies** or challenges relating energy demand reduction are constructed, i.e. those of ensuring behavioural change and improved consumer choices, e.g. achieved through the implementation of 'ICT-based solutions'. There has been a tendency to ignore differences between the social sciences and the variety of insights which could be generated from different disciplines and approaches (indeed 'epistemic cultures' might be a term which better captures the approaches shared across SSH disciplinary boundaries). Qualitative social sciences or epistemic cultures have not enjoyed the status of more positivist approaches associated with economics and psychology; they have tended to be seen as complementary to science and engineering, even as the clamour for inter- or trans- and post-disciplinary research to tackle 'wicked' energy/climate change-related challenges has grown. Yet energy policy-makers and 'hard science' alike also over-estimate or are unaware of what SSH can best contribute and how. For these and other reasons some fundamental questions and insights pertinent to reducing energy demand are neglected, which might otherwise draw attention to why people consume as they do and what they 'really need' to sufficiently live good lives.

At **stake** are the achievement of EU climate change targets, the competitiveness of the EU within the global renewable energy sector, and, increasingly, how to ensure the buy-in of citizens/consumers across the EU within processes of responsible innovation, which has become a working principle underpinning EU research and innovation. **Closures** are framed in terms of contributions that funded research can make to developing and realising the Energy Union, the Energy Union Action Plan, the Innovation Union and SET plan, as well as policy-making in member states. Prevailing framings emphasise technical innovations relating to improving energy efficiency or policy measures to 'nudge' individual choices and behaviour in the 'right' direction, rather than policies and interventions predicated upon changing practice cultures.

Finally, in relation to **civic epistemologies**, there is currently an emphasis on the production of knowledge capable of shedding light on factors enabling individual consumers or households to make better energy choices. Such knowledge may involve or require the particular expertise of social scientists, working with local communities. However, both in the EU and within national energy research, the tendency is to contract SSH to conduct research which may inform policy – as distinct from enriching energy governance (i.e. enhancing the public role of SSH in connection with the politics of energy and the role therein of active energy citizens). This would require greater engagement with the imaginaries of citizens that are 'lived' in everyday practice cultures (Smith and Tidwell 2016). Citizen imaginaries may not fit and may contradict visions of policy-makers (e.g. of smart energy or smart cities, see Groves et al. 2016).

To improve the future integration of qualitative SSH within energy research and policy-making in the EU, new imaginaries need to be practised. It is proposed that European energy researchers, policy-makers and other actors devise fora which articulate the definition and implementation of new imaginaries of enhanced energy-related research-policy linkages. These should infuse work programmes and research cultures over the

next decade. They should inform the Energy Union but less instrumentally inhabit a discursive space in which the nature and foci of energy demand reduction policies and the options, assessment and processes of effective action are debated and decided upon by the widest, practicable range of likely affected actors. As this deliverable suggests, starting points in such deliberations are the benefit of diagnosing and transforming energy-related social practices, the contribution of better funded qualitative social sciences and co-productive epistemic cultures, and new framings of the energy challenge and policy 'impact' in the context of national policies, the EU Energy Union and the UN Sustainable Development Goals.

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APPENDIX 1

Table A1: Main national public[28] funders of environmental, sustainability and energy SSH research

Country	Funding bodies and programmes
Denmark	Innovationsfonden[29] - Innovation Fund Denmark invests in cultivating and translating ideas, knowledge and technology for the benefit of Danish Society. Provides investments and long-term projects/partnerships where the focus is on research, technology, experimental development and market development; investments for small enterprises and entrepreneurs with sound development plans; funding for individual researchers aiming to become entrepreneurs or to secure a research career in the private sector. Danish Energy Agency (resides under the Ministry of Energy, Utilities and Climate) funds Energiteknologisk udvikling & demonstration (EUDP) - Energy Technology Development and Demonstration Program[30] which is a public grant scheme that funds the development of new climate-friendly energy technologies. The aim is to promote energy efficiency and help make Denmark independent of fossil energy by 2050; projects supported by EDDP must also aim to develop Danish commercial potential, so as to promote growth and employment. ELFORSK[31] is the Danish Energy Research and Development Program that supports research and development in the field of efficient use of energy. Ministry of Climate, Energy and Building managed ForskEL programme to support the development and integration of environmentally friendly power generation technologies for grid connection which was shut down in 2017.
Finland	Academy of Finland[32] is the main funder which grants competition-based funding for scientific research, researcher training and the development of framework conditions for research; comprised of four research councils; Culture and Society RC funds social science research. Strategic Research Council (SRC)[33] hosted by the Academy of Finland formulates key strategic research themes and priorities approved by the government into research programmes and

[28] We do not analyse private funding or third-party funding streams (e.g. industry grants) in detail in this report, although in some countries they can make a significant contribution to research funding.
[29] https://innovationsfonden.dk/en
[30] https://ens.dk/ansvarsomraader/forskning-udvikling/eudp
[31] http://www.elforsk.dk/
[32] http://www.aka.fi/en/research-and-science-policy/
[33] http://www.aka.fi/en/strategic-research-funding/src-in-brief/

	funding calls. Sitra, Finnish Innovation Fund[34] reports directly to the Finnish Parliament. Sitra investigates, explores and develops operating models for sustainable well-being based on a One-Planet approach.
Germany	Deutsche Forschungsgemeinschaft (DFG, German Research Foundation)[35] is the central, independent research funding organisation; funds research projects at universities and other research institutions; funding is provided by the German federal government (67%) and the states (33%), but also including EU funds and private donations. Federal ministries: ▪ The Federal Ministry of Education and Research (BMBF)[36] supports scientific institutions and enterprises; funds individual researchers via special funding institutions (main funder) ▪ Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMUB) ▪ Federal Ministry for Economic Affairs and Energy (BMWi) ▪ Federal Ministry of Food and Agriculture (BMEL) ▪ Federal Ministry of Transport and Digital Infrastructure (BMVI) ▪ Deutscher Akademischer Austauschdienst (DAAD) - German Academic Exchange Service ▪ Umweltbundesamt - Federal Environment Agency
Hungary	Hungarian Scientific Research Fund (OTKA)[37] is an independent national institution which has been supporting internationally excellent discovery research (i.e. basic research) at Hungarian institutions; primarily financed from the state budget National Research, Development and Innovation Fund (NKFIA) is managed by the National Research, Development and Innovation Office (NRDIO)[38] and is open not only to the academia, but also to NGOs and enterprises. Green (NGO) Fund, managed by the Ministry of Rural Development[39] and open to environmental NGOs with the main objective of supporting the implementation of the National Environmental Programme (NEP), also has been providing funding for research, or at least research-related activities Cohesion funding (co-financed by EU): Operational Programmes (OP) of the EU Structural Funds (2007-2013 and 2014-2020)[40] ▪ Economic Development and Innovation OP (GINOP) ▪ Competitive Central Hungary OP (VEKOP) ▪ Environment and Energy Efficiency (earlier only Energy) and the

[34] https://www.sitra.fi/en/
[35] http://www.dfg.de/en/
[36] https://www.bmbf.de/en/index.html
[37] https://nkfih.gov.hu/funding/otka
[38] https://nkfih.gov.hu/english
[39] http://2010-2014.kormany.hu/en/ministry-of-rural-development
[40] For the period between 2007-2013 see: https://www.palyazat.gov.hu/new_hungary_development_plan
For the period between 2014-2020 see: http://www.kormany.hu/en/ministry-of-national-development/news/eu-funding-of-huf-2-000-billion-for-transport-environmental-and-energy-efficiency-developments

	Social Renewal Ops
Ireland	Irish Research Council[41] is the key national funder of basic research across all disciplines, and the only funder that supports basic research in the arts, humanities and social sciences Environmental Protection Agency[42] funds largely STEM research, but there is scope for SSH under the sustainability banner (although the focus is on resource efficiency and 'hard' SSH, e.g. socio-economics) Sustainable Energy Authority of Ireland[43] funds a range of research, development & demonstration activities relating to the production, supply & use of energy; primarily fund STEM research, but also focus on "market uptake" and "support for policy makers"
Netherlands	Netherlands Organisation for Scientific Research (NWO)[44] is an independent directive body that falls under the responsibility of the Ministry of Education, Culture and Science. It funds scientific research at public research institutions, especially universities; focuses on all scientific disciplines and fields of research. Netherlands Enterprise Agency (RVO)[45] aims to improve opportunities for entrepreneurs, is part of the Ministry of Economic Affairs and Climate Policy and works at the instigation of ministries and the European Union. Some activities of the Commodities Boards are also included. The Agency works in The Netherlands and abroad with governments, knowledge centres, international organisations and countless other partners. The Dutch Ministry of Economic Affairs and Climate Policy[46] is the main public funder of energy and sustainability research. Funding calls and programme selection is organized via NWO and RVO – see above.
Switzerland	Swiss National Science Foundation (SNSF)[47] is Switzerland's foremost research funding organisation mandated by the federal government; supports basic science in all academic disciplines, including National Research Programmes – NRP70 (Energy Turnaround) and NRP71 (Managing Energy Consumption), the latter is solely for SSH, both are geared to the targets of the 'Energy Strategy 2050' of the Federal Council. State Secretariat for Education, Research and Innovation (SERI) is the federal government's specialised agency for national and international matters concerning education, research and innovation policy. Commission for Technology and Innovation CTI[48] is the Confederation's innovation promotion agency. It lends support to R&D projects, to entrepreneurship as well as to the development

[41] http://research.ie/
[42] http://epa.ie/
[43] https://www.seai.ie/
[44] https://www.nwo.nl/en
[45] https://www.rvo.nl/
[46] https://www.rijksoverheid.nl/ministeries/ministerie-van-economische-zaken-en-klimaat
[47] http://www.snf.ch/en/Pages/default.aspx
[48] https://setis.ec.europa.eu/energy-research/country/switzerland

	of start-up companies. CTI helps to optimise knowledge and technology transfer through the use of national thematic networks. Swiss Network for International Studies (SNIS)[49] supports international research; the University of Geneva and the Graduate Institute of International and Development Studies are the founding institutions. Swiss Academy of Humanities and Social Sciences[50] unites 61 scientific societies and is a network for the humanities and social sciences; provides support to priority projects like sustainable development (prizes, financial contributions and contributions to travel expenses). Swiss Federal Office of Energy (SFOE) funds a programme 'Energy – Economy – Society'[51] that promotes application-oriented research in the field of energy policy Federal Office for the environment (FOEN)[52] funds programmes on environmental issues. Volteface[53] is a research platform focused on social aspects of the energy transition; represents a partnership between the University of Lausanne and Romande energy, an energy provider, and co-funded by the State of Vaud (a Swiss canton).
UK	Government departments: *Department for Business, Energy & Industrial Strategy (BEIS)[54], former Department of Energy & Climate Change* Global Challenges Research Fund[55] is an initiative led by BEIS; among challenge areas - Affordable, reliable, sustainable energy; Sustainable cities and communities. The GCRF supports UK universities and research organisations in undertaking challenge-led research where it can add greatest value and has the greatest potential for impact. The UK Government's Energy Innovation programme[56] aims to accelerate the commercialisation of innovative clean energy technologies. *Department for Environment Food & Rural Affairs (DEFRA)* The National Academies (funded by the Government) – The Royal Society, The British Academy The British Academy[57] is the UK's national body for the humanities and social sciences. Three principal roles: as an independent fellowship of world-leading scholars and researchers; a funding body that supports new research, nationally and internationally;

[49] https://snis.ch
[50] http://www.sagw.ch/en/sagw/die-akademie.html
[51] http://www.bfe.admin.ch/themen/00519/00636/06887/index.html?lang=en
[52] https://www.bafu.admin.ch/bafu/en/home.html
[53] https://www.volteface.ch/contenu/propos
[54] https://www.gov.uk/government/organisations/department-for-business-energy-and-industrial-strategy
[55] http://www.rcuk.ac.uk/funding/gcrf/
[56] https://www.gov.uk/guidance/energy-innovation
[57] https://www.britac.ac.uk/

	and a forum for debate and engagement. UK Research and Innovation[58] is bringing together the seven Research Councils, Innovate UK and a new organisation, Research England. Research Councils UK Energy Programme (cross-council research) coordinates the delivery of multi-disciplinary research in the six priority areas including Energy Programme and Living with Environmental Change Programme. It supports a full spectrum of energy research. The programme claims significant policy impact. *Economic and Social Research Council (ESRC)* funds research in seven national priority areas including climate change. Research under this priority addresses issues relating to climate governance, risk and communications, as well as research on related topics such as the food-energy-water-environment nexus and air quality.[59] Also funds joint programmes, e.g. NERC[60] and ESRC's research programme on Unconventional Hydrocarbons in the UK Energy System: Environmental & socio-economic impacts & processes.

[58] https://www.ukri.org/
[59] http://www.esrc.ac.uk/about-us/strategy-and-priorities/research-priorities/
[60] Natural Environment Research Council http://www.nerc.ac.uk/

APPENDIX 2

Table A2: National energy projects

Country	Title	Funder(s); budget	Year(s)	Lead, partners, collaborations	SSH or inter-disciplinary	Short description
Denmark	SusTrans- Governing and Enablimg Sustainable Transitions towards a low carbon economy	Danish Council for Strategic Research; €4m	2010-2013	Technical University of Denmark, Aalborg University, Aarhus University, Copenhagen University	SSH	The overall strategy of the research alliance is to work with cross-cutting issues of transition at four key transition arenas in society: policy, households, companies and cities.
Denmark	UserTech - User Practices, Technologies and Residential energy consumption	Danish Council for Strategic Research; Innovation Fund Denmark	2013-2018	Aalborg University, University of Cambridge, University of Oxford, Linköping University, Delft University of Technology and Technical University of Denmark, in cooperation with major Danish and international companies within the building and energy sector	SSH	The aim of the project is to use unique data to analyse in detail the everyday life practices of households in relation to energy consumption. Furthermore, the aim is to use these insights to enhance communication on energy consumption between actors as well as to develop energy efficient building technologies and renovation processes that better respond to the way ordinary people actually live in their homes.
Denmark	ESCO for Real - Innovative and attractive energy services for realising energy savings in homes	ELFORSK; €125,000	2008-2010	EA Energianalyse, Energi Horsens, LokalEnergi, Teknologisk Institut	Inter-disciplinary	The project tested whether traditional types of ESCO implementation could realise technical and economic potentials in energy savings. The project found that these approaches did not obtain the same (positive) response from the involved households as ESCO projects that draw on a closer relationship to local and climate-adaptation projects.

Denmark	Heatpumps and electricity consumption - the role of changing comfort temperatures	ELFORSK; €125,000	2009-2011	Danish Building Research Insitutute (SBi), energy agencies AURA Rådgivning A/S, SEAS-NVE Strømmen A/S, and a company IT Energy ApS.	Inter-disciplinary	The project explores why theoretically possible energy reductions are not reached in a number of summer residents, as the actual reduction is smaller than the anticipated, because residents maintain high room temperatures as more efficient/cheaper technologies for heating has come available.
Denmark	SAVE-E Energy Saving: how to reduce behavioural, economic and structural barriers to attractive energy savings and reductions	Partially funded by Innovation Fund; co-funders: universities, energy agencies, municipalities; €2.3m	2015-2019	Technical University of Denmark, Copenhagen University, Aalborg University, Roskilde University, several energy companies, municipalities, NGOs	Inter-disciplinary	The project aims to: (i) identify and quantify technical, economic and social barriers for potential energy savings; (ii) analyse implementation strategies, evaluate incentives schemes, and find optimal trade-offs between efficiency improvements and additional renewable energy supply; (iii) evaluate macro-economic effects of efficiency improvements and alternative incentive schemes.
Denmark	The climate friendly family	ELFORSK; €250,000	2009-2010	SBI, Danish National Radio, energy company AURA Rådgivning A/S, Teknologisk Institut	Inter-disciplinary	The project tested how TV shows and webpages may influence climate related behaviours. It found that TV and radios shows are more likely to influence people's behaviours, rather than webpages and (written) information.
Denmark	Behaviours and consumption patterns in energy renovations of homes	ELFORSK; €170,000	2015-2018	Technical University of Denmark, consultancies ALECTIA A/S, Dominia	Inter-disciplinary	The project focuses on the role of (quantifying) the role of behaviours in energy renovations

Finland	Smart Energy Transition	Strategic Research Council, €8m	2015-2020	Aalto University School of Business, Aalto University School of Art & Design, University of Lappeenranta, University of Helsinki, Finnish Environment Institute, VATT Institute for Economic Research, VTT, Sussex University SPRU, Motiva, Heureka, City of Lappeenranta	Inter-disciplinary	The project studies the global energy turmoil and its impact on the Finnish economy - focusing on new technologies, business models, experiments and support for decision-making.
Finland	Intermediaries in the energy transition: The invisible work of creating markets for sustainable energy solutions (TRIPOD)	Academy of Finland; €1.1m	2015-2018	Aalto University School of Art & Design, Finnish Environment Institute, Aalto University School of Business, University of Helsinki	SSH	The project analyses the role of intermediaries in creating, channelling and coordinating market and broader societal demand for new low carbon technologies and services and in adapting these technologies to local contexts.
Finland	LAICA (Local adaptation and innovation-in-practice in energy efficiency and carbon neutrality)	Academy of Finland; €1m	2011-2014	Aalto University School of Business; Aalto University School of Art & Design, Finnish Environment Institute	Inter-disciplinary	LAICA studied the sources and diffusion patterns of citizen-driven local energy innovations-in-practice.
Finland	Decentralizing Finland's energy regime: The triggers and dynamics of transition (DEFEND)	Academy of Finland, New Energy programme	2015-2018	University of Helsinki, Aalto University	SSH	The project investigates the energy transition from the perspective of socio-technical sustainability transitions, enriching framework with new knowledge on the socio-cognitive processes that trigger transitions within specific niches.

Finland	Change in Business Ecosystems for Local Renewable Energy and Energy Efficiency – Better Energy Services for Customers (USE) (VTT & Finnish Environment Institute)	Academy of Finland, New Energy programme	2015-2018	VTT, Finnish Environment Institute	Inter-disciplinary	USE investigates the sustainable energy transition in the intersection of renewable energy and energy efficiency. The focus is on local service ecosystems influencing consumer energy use and production through energy-efficiency and renewable energy solutions, and the emergence and diffusion of service-based innovations for integrated energy services in the context of buildings and districts, as well as the policy implications.
Finland	Evaluating Smart Incentives in Social Formation of Energy Choices	Academy of Finland, New Energy programme	2015-2019	University of Helsinki, VTT, Aalto University	Inter-disciplinary	EVIDENCE aims at (i) understanding how energy choices are socially formed and shaped by the technological environment, (ii) how incentives and energy choice support systems (such as residential energy feedback systems) could be integrated in such context, (iii) how the social formation of choice can be supported, and (iv) how to evaluate incentives and measures.
Finland	Harnessing consumer for a flexible energy system architecture	Academy of Finland, New Energy programme	2015-2019	Aalto University	Inter-disciplinary	The objective of the research consortium is to bring the consumer to the centre of the new power system designs by combining a rich set of high-quality Finnish register data on consumer technologies, characteristics, and behaviour with the traditional power system analysis. The ultimate goal is to develop “energy lab of Finland” where socio-economic databases for consumer behaviour are utilized in a power system context to experiment with architectures for market interactions, incentive schemes, power balancing, and drastic changes in the capacity portfolios.
Finland	Tackling the Challenges of a Solar Community Concept in High Latitudes	Academy of Finland	2015-2020	Aalto University, Swedish School of Economics, University of Helsinki	Inter-disciplinary	The main objective of this research is to find scientifically based methodologies and solutions for the major challenges and obstacles in the implementation of a solar community concept in the Finnish environment. Research includes simulations, empirical measurements and interviews.

Finland	Household of the future	Sitra	2014-2015	Sitra, D-mat, Big Plans Bakery, City of Jyväskylä	Inter-disciplinary	The project is seeking and testing new ways of reducing material footprints – in practice, this means reduced consumption of natural resources. In this project families and households get to experience what a resource-wise, more sustainable lifestyle would be like.
Germany	TRANSPOSE - Transfer analysis of policy instruments for developing fitting strategies	BMBF, Socia-ecological reserach (SÖF): From knowledge to action – new paths to sustainable consumption	2008-2011	Institute of Political Sciences at the Westfälische Wilhelms Universtiy Münster; Reserach for Environmental Policy at FU Berlin. Others: Öko-Institut e.V.; University Kassel; University Konstanz. Practice partners: Consumer association NRW; the Northern Alliance for Sustainability (ANPED); Wittenberg Zentrum für Global Ethic	Inter-disciplinary	The research project (i) identifies electricity saving potentials in households and (ii) develops an integrated psycho-sociological action model conducting a quantitative policy-analysis by means of country comparison. The aim is to (iii) conduct qualitative case studies and (iv) transfer policy innovations.
Germany	Intelliekon (Sustainable energy consumption in households through intelligent metering, communication and tariff systems)	BMBF, Socia-ecological reserach (SÖF): From knowledge to action – new paths to sustainable consumption; €1,423,564	2008-2011	Fraunhofer-Institute für solar energy system (ISE); Institut for Socia-Ecological Research (ISOE); Fraunhofer-Institut for research on systems and innovations (ISI); EVB Energie	Inter-disciplinary	The project offers insights into needs and preferences concerning household energy consumption and energy behaviour while using feedback information based on smart metering.

Germany	Seco @ home (Social, ecological and economic dimensions of sustainable energy consumption in residential buildings)	BMBF, Socio-Ecological Research (SÖF): From knowledge to action – new paths to sustainable consumption	2008-2010	Centre for European Economic Reserach (ZEW); Fraunhofer-Institut for research on systems and innovations (ISI); Öko-Institut e.V.; German Institut for Economic Research (DIW Berlin); University St. Gallen	Inter-disciplinary	The project aimed to make a substantial contribution to research on consumer behaviour in energy consumption in residential buildings, decisions and preferences. Sub-projects examined the role of gender relations in such decisions, as well as the effectiveness of measures that can increase the share of green forms of energy in private households.
Germany	REBOUND (Social dimension of the Rebound Effect)	BMBF, Socia-ecological reserach (SÖF); €875,632	2010-2013	Centre for European Economic Reserach (ZEW); Rheinisch-Westfälisches Institut für Wirtschaftsforschung e. V. (RWI); Fraunhofer-Institut for research on systems and innovations (ISI); Centre for inter-disciplinary risk- and innovation research at the Univerity Stuttgart	Inter-disciplinary	The aim of the project was to develop a better understanding of rebound-effects, to empirically quantify them and to identify appropriate counter-measures. The social dimension of the rebound-effect was particularly taking into account.
Germany	Energiesuffizenz (Energy sufficiency)	BMBF focal area: 'Environmentally and socially compatible transformation of the energy system', provides around €1m per project	2013-2016	Wuppertal Institute for climate, environment and energy (WI) and 17 other project partners	Inter-disciplinary	This project examined how low-energy day-to-day routines, social practices and lifestyle aspects go along with the requirements of strong sustainability, and how policy measures should be structured to make everyday energy sufficiency more acceptable. Three principle energy sufficiency approaches reduction, substitution and adaptation were developed.
Germany	Lokale Passung (Lokal fit)	BMBF focal area: "Environmentally and socially compatible transformation	2013-2016	Ludwig-Maximilan University Munich (Institute of Sociology); bifa (Environmental institute Augsburg); City of Munich	SSH	The aim of the research project is to support the energy transition in different small-scale social and infrastructural environments. The project collaborates with selected municipalities and supports the implementation of solutions. The mixed-methods based research approach focuses

		of the energy system", €1m per project				on the relationship of social structures, lifestyles and environmental consumption; theorising that awareness of these relationships helps to identify and evaluate energy savings opportunities.
Germany	Power efficiency classes for households. Supporting power-saving innovations in households, market and appliance technology	BMBF focal area: "Environmentally and socially compatible transformation of the energy system", €1m per project	2013-2016	Institute for Social-Ecological Research (ISOE); Öko-Institute e.V. Corporate partners: BSH Housing products GmbH; ENTEGA Privatkunden GmbH & Co.; KG – a company belonging to HEAG; Südhessische Energie AG (HSE); Badenova AG & Co. KG; Consumer association NRW e.V.; co2online gGmbH; OSRAM GmbH	Inter-disciplinary	The aim is to assess the technical and user-related potential for saving power in households. In addition to the number of people living in a household, expected socio-demographic developments are factored into the calculations, i.e. the trend towards smaller households. Technical innovations – e.g. integrated appliances that replace several old appliances – and changing user behaviour, for example due to increased electronic control and automation of building technology, are also taken into account. On this basis, a "power efficiency class" label is developed that pools the total power consumption of a household and assigns it a consumption class.
Germany	ENERGY TRANS - research alliance including 17 projects	Half of the funds provided by the Initiative and Networking Fund of the Helmholtz Association, the other half by each partner of the Alliance; €16.5m	2011-2016	Karlsruhe Insitute of Technology; DLR; Helholtz Centre for Environmental Research (UFZ) Jülich research institute; Otto von Guericke University Magdeburg; Centre for European Economic Reserach (ZEW); University Berlin; University of Stuttgart; Westfälische Wilhelms-University Münster	Inter-disciplinary	The main focus lies on the interplay between technical potentials, innovation processes, user behaviour, political and economic conditions (incentives and disincentives), conflicts and management processes. Research fields include: "Technical-Societal Development"; "Innovation Processes and the Transformation of the Energy System"; "Risks and Regulation"; "User Behaviour and Demand Management"; "Planning and Governance".

Hungary	Complex study and modelling of enterprise competitiveness, urban and regional impacts of energy production, energy consumption and waste management technologies	EU&HU, Social Renewal Operational Programme 2007-2013 (TÁMOP-4.2.2.A-11/1/KONV); HUF 349,453,428 (€1,264,074.62)	2012-2015	Pécs University Faculty of Business and Economics, Blue Economy Innovation Cluster member companies	SSH	The aim was to expand the R&D infrastructure and create the necessary human resources for the basic research of the environmental sciences, environmental protection, geothermal, renewable energy and complex systems research of the PTE Faculty of Economics. Part of the project the public acceptance of renewable energy resources was examined both by a comprehensive literature review and a representative survey recorded on a larger sample.
Hungary	Capacity and methodology development, public awareness raising in relation to climate change adaption strategies	EU&HU, Environment and Energy Efficiency Operational Programme (KEHOP-1.2.0-15); HUF 399,326,140 (€1,285,660.47)	2016-2018	Alliance of Climate-friendly Municipalities	SSH	In the project framework a national representative survey was carried out in order to scrutinise knowledge, attitudes and willingness of action of Hungarian citizens to protect their climate. The survey was supplemented by a survey of 161 reviewers.

Hungary	Sustainable consumption, production and communication	Norway, Iceland, Lichtenstein - EEA-Norway Grants; €890,243	2009-2012	Budapest Corvinus University; Hungarian Academy of Sciences - ELTE Communication Theory Research Group, Association of Conscious Consumers, Norwegian University of Science and Technology Department of Industrial Economics and Technology Management, Protect the Future, Hungarian Academy of Sciences Institute for Sociology, ELTE Faculty of Social Sciences Centre for Urban and Regional Research	Inter-disciplinary	The aim of the project was to realise the first comprehensive multi-disciplinary research in the field of "sustainable consumption and production" in Hungary (including sustainable energy consumption and energy efficiency), and establish an effective and fair economic, social and urban policy that serves to sustainably improve lifestyles so that it fully takes into account the conditions of ecological sustainability.
Hungary	Capacity building for local adaptation work	Norway, Iceland, Lichtenstein - EEA-Norway Grants, HU04 Adaptation to Climate Change Programme; €575,416	2015-2016	Energiaklub Climate Policy Institute and Applied Communications Association; Nordland Research Institute, Hungarian National Association of Local Authorities (TÖOSZ), GHG Analytics Kutató és Tanácsadó Kft., ESSRG Kft., Hungarian Academy of Sciences Centre for Social Sciences	SSH	Though the call and the project aimed at capacity building of local decision makers and other local stakeholders (to create a better understanding of climate change impacts) and to strengthen climate resilience by learning about local impacts and assessing community vulnerabilities, a national representative survey was also realised on the attitudes and opinion of climate change among citizens and municipality leaders.
Ireland	CONSENSUS - sustainable consumption	EPA Strive programme; €1.5m	2009-2015	Trinity College Dublin; National University of Ireland Galway	SSH	CONSENSUS uses innovative social science and collaborative research methods to explore trends and solutions for sustainable household consumption in Ireland (North & South). Research cetres on six themes: Governance; Lifestyle survey; Mobility; Water; Energy; and Food.

Ireland	Carbon taxes: Which households win or lose?	EPA; < €100k	2004	Economic and Social Research Institute	SSH	This project analyses the effects of the introduction of a carbon tax in order to see how it would affect different households. The report focuses especially on vulnerable households.
Ireland	Local Community Ownership And Investment In Re Infrastructure	SEAI	2016	Tipperary Energy Agency	SSH	This research investigates the potential for local investment in renewable energy projects for both rural and urban communities and seeks to enhance the capacity for community ownership and investment in renewable energy through mechanisms underpinned by legislative provisions.
Ireland	Social / Community Acceptance Of High Voltage Transmission Lines And Community Gain Messaging	SEAI	2016	National University of Ireland Galway	SSH	This research aims were to determine how and to what degree host communities are influenced by community gain messaging, with the ultimate aim of developing innovative community gain solutions to assist in the successful deployment of future energy infrastructure projects.
Netherlands	Energy measures at home: affecting family decision-making	RVO; €149,957	2017-2019	Alliander, Fudura, Hoom, Nyenrode Services, Wageningen University & Research	SSH	The aim of this project is to provide insight into the living experience of families in general, women in particular and the decision-making dynamics within families with regard to domestic retrofit measures.
Netherlands	The strength of the neighbourhood: the success and the spreading of bottom-up initiatives in the energy market	RVO; €340,938	2014-2016	Fudura B.V. (ENERGISE Expert Panel Member), Hanzehogeschool Groningen, University of Groningen	SSH	This study aims to better understand the success factors and spread of local energy initiatives, to develop tools to increase participation by learning from existing initiatives what factors determine whether people join. Outcomes include tools for practice to increase the success of bottom-up initiatives.
Netherlands	Upscaling of energy efficiency	RVO; €406,775	2016-2018	Consortium of academic partners, foundations and practice partner	SSH	The design tool ‘customer journey’ is used to identify measures that fit best with people's lifeworld.
Netherlands	Effective interventions to increase energy efficiency and decrease energy poverty	Association of Dutch municipalities, Province of Groningen, RVO; €215,387	2015-2018	consortium of research institute, grid operators, foundations and advisory offices	SSH	This project aimed to tackle energy efficiency and energy poverty by monitoring and evaluating four pilot projects. Monitoring tools will be made available as online tools for organisations planning similar interventions.

Netherlands	Saving energy when others pay the bill	RVO	2014-	Wageningen University & Research, installation company and advisory office, The Student Hotel	SSH	The goal of this project was to find ways to stimulate energy efficient behaviours when the individual does not pay the bill in a Living Lab approach. Outcomes include a manual for hotels, schools, companies, etc. that would like to stimulate energy efficiency with social rather than financial stimuli.
Netherlands	Financing and realising the energy transition in young neighbourhoods (built after 1980)	RVO; €65,249	2013-2016	10 partners including academic, public and private	Inter-disciplinary	The goal of this project was to develop collaborative financing models in an exemplary neighbourhood in the city of Breda (Living lab approach). The main finding is that the energy transition difficult to realise 'on the ground' within the framework of such a project as it takes more time and money. However, a realisation concept for solar PV has been developed.
Netherlands	The Neighbourhood Transformer	RVO; €196,814	2013	Brainport Development N.V., Duneworks B.V., Ecovat Energy Storage System, Endinet B.V., GPX, Gemeente Eindhoven, Ibuildgreen BV, Novesco B.V., Stichting Woonbedrijf SWS.Hhvl, Technische Universiteit Eindhoven	Inter-disciplinary	The goal of this project was to engage social housing tenants in a participatory process that seeks to address home renovation, sustainable, local energy provision and other local, context-specific problems. The outcome is a toolkit including monitoring and evaluation tools to approach neighbourhoods in a context-sensitive manner and to develop tailor-made strategies for more sustainable neighbourhoods.
Netherlands	Green and Convenient	RVO	2018-2019	6 partners: academic, practice and public	SSH	The project aims to stimulate energy efficiency renovations by 'reducing the hassle'. Methods used include a survey and testing concepts developed in a randomised control trial. Project outputs include a Handbook and workshops for organisations interested in working with the 'green and convenient' concepts.
Netherlands	Unanimously energy neutral	RVO; €246,930	2015-2018	Dutch, Grunneger Power, Heijmans Utiliteit B.V., Rijksuniversiteit Groningen, Samen Energie Neutraal (SEN)	Inter-disciplinary	This project aims to support citizens, local companies and governments to feel like a community that collectively realises the energy transition. It involved the testing of an existing 10-setp approach in two local communities (in Groningen and Eindhoven) for the energy transition.

Netherlands	Schools as energy ambassadors in the neighbourhood	RVO	2018-2019	16 partners, mix of academic, foundations and practice partners	Inter-disciplinary	This project systematically studies the potential role schools can play in changing local energy practices. It followed an action research approach and combined literature research and quantitative research/surveys to study the potential role of schools in the energy transition. An important part was the use of 'energy challenges' as teaching and intervention method.
Switzerland	Understanding household energy consumption: social practices, norms and learning how to change	SNSF NRP71; CHF 309,240	2015-2017	Universtiy of Lausanne, University of Geneva; in collaboration with researchers (Switzerland and UK), NGOs (Terragir and Fédération romande des consommateurs) and utility companies in Switzerland (SIL and SIG).	SSH	The aim of this project is to discover how electricity consumption can become more meaningful to people when it is tied up with everyday social practices, and in which way such an approach would lead to more efficient consumption. It also sets out to understand how people learn to change their everyday practices relating to electricity consumption.
Switzerland	The role of social information, incentives, and habits in household electricity consumption	SNSF NRP71; CHF 228,560	2014-2017	University of Lausanne; in collaboration with RWE Deutschland AG and Rheinisch-Westphälisches Institut für Wirtschaftsforschung (Germany)	SSH	A better understanding of how incentives, information and behavioural habits can be used to conserve energy is of vital interest to policy and academic research alike. This project focuses on behavioural interventions using innovative ways to communicate with electricity consumers: smart metering and social information; and energy-saving bonuses and habit formation. The project proposes a comprehensive, systematic, and rigorous evaluation of these mechanisms.
Switzerland	Reducing Energy Consumption and Promoting Green Electricity. The Role of Soft Incentives	SNSF NRP71; CHF 349,792	2015-2019	Univ. of Bern, ETH Zurich; in collaborations with researchers from Germany, Netherlands, UK, and utility companies in Switzerland (Energie Thun AG, BKW, Energie Wasser Bern)	SSH	Focusing on economic, sociological and social psychological approaches, the project examines how soft incentives such as social norms, symbolic rewards and changing default options encourage energy saving and the use of green power in households.

Switzerland	The lifestyle approach as basis for interventions and campaigns to promote climate-conscious consumption, sustainable mobility and energy conservation in private households	SNSF NRP71; CHF 299,048	2014-2018	Hochschule Luzern, Institut für Marktangebote und Konsumentsche Hochschule für Angewandte Psychologie Fachhochschule Nordwestschweiz; in collaboration with the cities of Biel and Lucerne	SSH	The aim of this project is to identify energy consumption lifestyle groups in the city of Lucerne's population. As a result, environmental agencies will have access to a tool that has already been successfully used in marketing and prevention campaigns. The project intends to reveal potentials and needs relating to more sustainable behaviour in Lucerne's population, and to develop innovative communication strategies to stimulate more climate-conscious consumption, sustainable mobility and energy efficiency. After it has been tested and evaluated in the pilot region (city of Lucerne), the tool can be transferred to other stakeholders (e.g. municipal authorities, Energy City Switzerland) with the aid of an action plan including a toolbox and a manual, thus supporting the overall goals of "Energy Strategy 2050".
Switzerland	Effect of tariff structure on mobilization of energy savings in households	SNSF NRP71; CHF 324,956	2015-2018	Université de Genève	Inter-disciplinary	Focusing on households, this project investigates whether two hitherto barely studied electricity tariff structures – feed-in tariffs and progressive tariffs – can mobilise substantial electricity savings and if so, how this can best be achieved.
Switzerland	Residential energy efficiency and sufficiency potentials of elderly households (REPELD)	SNSF PNR71 ; CHF 394,890	2014-2018	Rütter Soceco AG, Hässig Sustech gmbh	Inter-disciplinary	The goal of this project is to provide an in-depth understanding of the housing conditions of the elderly and their residential energy consumption. It will also analyse their attitudes and age-specific obstacles to energy efficiency and sufficiency measures. The main focus is on reducing living space requirements by promoting a voluntary move to smaller homes, structural densification measures and energy-efficient renovation.

Switzerland	Determinants of individual energy-relevant decisions and behaviours: A multiple systems approach	SNSF AP Energy Grants; CHF 1,198,950	2015-2019	Université de Genève, Universität St.Gallen,	Inter-disciplinary	The first aim of the research project is to develop a comprehensive model of the determinants of individual energy-related decision-making that integrates both explicit and implicit factors. Experimental research investigates the joint impact of these factors in several kinds of energy-relevant decision domains: (i) frequently repeating decisions related to one's habitual energy use (i.e., consumption habits), (ii) one-shot decisions to invest in energy-efficient technologies (i.e., purchase decisions), and (iii) voter decisions relating to legislation in an energy context (i.e., citizen decisions). The second aim of the research project is the development and empirical testing of a series of model-based interventions to promote energy efficiency and conservation in the different decision domains.

Switzerland	Using formal social groups to promote energy sufficient behaviour in cities	SNSF PNR71; CHF 448,111	2014-2018	Institut für Nachhaltige Entwicklung Zürcher Hochschule Winterthur ZHAW, Transdisciplinarity Lab - USYS TdLab Departement Umweltsystemwissenschaften ETH Zürich, Institut für Robotik und Intelligente Systeme ETH Zürich, Center for Innovation & Entrepreneurship ZHAW Zürcher Hochschule für angewandte Wissenschaften, Institut für Nachhaltige Entwicklung Zürcher Hochschule Winterthur ZHAW, Zürcher Hochschule Winterthur, Institut für Umweltentscheidungen D-USYS ETH Zürich, Institut für nachhaltige Entwicklung ZHAW, Cities of Baden, Zug, and Winterthur, Regionalwerke Baden AG; SCCER5 CREST (research center, Switzerland)	Inter-disciplinary	In order to guarantee reduced consumption, efficiency measures should be combined with sufficiency-oriented forms of behaviour. The project aims to identify activities that cities can promote to reduce private energy consumption (including campaigns, promotion of specific technologies, incentives), as well as to better understand and test the role of formal social groups in addressing private consumers.

Switzerland	Hype or Promise? The Contribution of Collaborative Consumption to Saving Energy	SNSF PNR71 ; CHF 378, 534	2014-2018	Universität Zürich, Politikstudien Forschung Beratung, EAWAG, Comuto SA, BlaBlaCar, ZHAW, ETH Zürich, IVT, E-Covoiturage, Universität Magdeburg, INTERFACE Politikstudien Forschung Beratung, Airbnb, Karzoo, Postauto AG, Publiride	SSH	One of the goals of "Energy Strategy 2050" is to reduce final energy consumption. The research project aims to analyse the potential of collaborative consumption, examine the involved drivers and obstacles and identify practical measures for promoting it.
Switzerland	Towards societal consensus - Influencing the perception and evaluation of energy policy measures by means of self-reflection and information	SNSF PNR71; CHF 266, 000	2015-2018	Universität Basel, SwissEnergy	SSH	Individual energy consumption behaviour is an important determinant of the energy future. It is crucial that individuals, both as citizens and consumers, agree on policy measures aimed at steering energy consumption. The aim of the project is to contribute towards a society-wide consensus on such measures.
UK	Domestic energy feedback	ESRC; £255,437 EPSRC (co-funder)	2007-2010	University of Oxford	SSH	The project combined qualitative research into how people use feedback (displays and informative bills, with or without 'smart meters') with quantification of outcomes and participation in the design and testing of feedback systems. The research analysed what is technically possible, economically feasible, effective for energy users and good for the environment, with the emphasis on householder understanding and behaviour.

UK	Energy Biographies: Understanding the Dynamics of Energy Use for Energy Demand Reduction	ESRC; £699,910	2010-2015	Cardiff University; Government of Wales	SSH	The aim was to produce more complex and realistic understandings of how and why individuals' energy biographies develop as they do, and the unintended and intended consequences of energy demand reduction interventions, in particular how energy consuming practices can be illuminated through use of the conceptual themes of biography and lifecourse.
UK	The role of community-based initiatives in energy saving (I) The role of community-based initiatives in energy saving (II)	ESRC; £789,357 EPSRC (co-funder) ESRC; £295,725	2010-2012 2012-2014	University of Southampton University of Westminster	Inter-disciplinary	A longitudinal experimental analysis of the impact of community initiatives aimed at reducing domestic energy use, i.e. on a roll out program insulation upgrades in privately owned housing.
UK	Heat and the City: Comparing the trajectory of sustainable heat and energy conservation in the municipal communities of Glasgow and Edinburgh	ESRC; £824,076 EPSRC (co-funder)	2010-2014	University of Edinburgh; The Scottish Government, CASCADE Project, City of Edinburgh Council	SSH	This research examines the challenge of establishing sustainable heating in Northern European cities. It looks at city-scale communities, and argues that problems of rising energy demand and carbon emissions might best be tackled at this level.
UK	Sustainability invention and energy demand reduction: co-designing communities and practice	ESRC; £795,639	2011-2013	Goldsmiths College	Inter-disciplinary	The project investigated the co-design of energy demand reduction technologies and communities of practice. Using methods from design, sociology and science and technology studies that enable play, exploration and ambivalence, the research explored how affect, ambiguity and aesthetics as well as functionality might enable communities to take innovative 'ownership' of technologies and systems of energy demand reduction.

UK	Reducing Energy Consumption Through Community Knowledge Networks (RECCKN)	ESRC; £370,882	2011-2014	Keele University; Marches Energy Agency	SSH	The focus was on knowledge networks in two types of community with contrasting track records of energy-use engagement. The aim was to compare and contrast the energy-related knowledge circulation flows in these two types of community and to see which strategies work best in each of them. Among RQs - In what ways can legislation and planning policy be adjusted to promote more energy efficient practices appropriate to different types of community?
UK	Evaluating the impacts, effectiveness and success of DECC-funded low carbon communities on localised energy behaviours (EVALOC)	ESRC; £1,144,509; EPSRC (co-funder)	2011-2015	Oxford Brookes University (Faculty of Tech, Dsign and Environment); in collaboration with Middlesbrough Environment City, Blacon Community Trust, Low Carbon West Oxford, Kirklees Council, Hook Norton Low Carbon, Awel Aman Tawe	Inter-disciplinary	The project brought together an inter-disciplinary team of social science and building science-based researchers to assess and explain the changes in energy use due to community activities within six selected case study projects under the Department of Energy and Climate Change's (DECC) Low Carbon Communities Challenge (LCCC) initiative.
UK	Smart Communities: shaping new low carbon community norms and practices	ESRC; £574,357 EPSRC (co-funder)	2011-2014	Kingston University	SSH	Aimed to bring together members of a community to discuss, develop and adopt new energy-saving ways of doing everyday practices. The project draws on practice theory, the social norm approach and community action best practice. Led by researchers at Kingston University, the project is a partnership between the community itself, Fern Hill primary school, Kingston Council's sustainability team, Transition Town Kingston, Tudor Drive library and the Energy Savings Trust.

UK	'Smarter' homes?: a netnographic exploration of low carbon living	ESRC; £126,615	2013-2017	University of St Andrews; National Energy Action, Tilburg University, Umea University, Delft University of Technology, University of Sheffield, Lancaster University, University of Stirling	Inter-disciplinary	The project used a mixed method research design, incorporating online methods, to explore the experiences of occupants of low carbon/energy efficient housing to better understand the way in which energy demand is created and, critically, assess how such technology may influence energy use.
UK	Resilience and vulnerability at the urban Nexus of food, water, energy and the environment	ESRC; £192,085	2015-2018	University of Sussex	SSH	Focussing on access to infrastructures and resource flows by the urban poor in three mid-sized cities in East Africa, Brazil and Eastern Europe, the project engages with the two policy areas of 'poverty, inequality and vulnerability' and 'infrastructure and the built environment'. The 'ecology of practice' approach will contribute new insights into the deepening of democracy in urban governance.