JPI Urban Europe Urban Transitions Pathways Symposium
SHAPING COMMON GROUND IN URBAN SUSTAINABILITY
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JPI Project: CODALoop (Community Data-Loops for energy efficient urban lifestyles)
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The following paper shows the current status of our project. The content of the paper provides an extensive answer to the first orientation question around which the symposium will gravitate. The second question has not yet been fully addressed at this stage of the project. However, by the time of the symposium inputs for the discussion will be provided.

1) *What is your contribution towards the issue outlined by 'Shaping common ground in urban sustainability'? What are your (new) insights? And what would you propose as the common case?*

This research project goes beyond debates about how technology can improve energy efficiency to look at behavioural change in order to tackle the increasing energy consumption at the household level, which efficiency improvement have shown not to be able to affect. The main purpose of this research is to acquire insights on how to contribute to a paradigm shift that challenges current energy use patterns, a shift that implies focusing not only on reducing energy consumption but also on reducing energy needs. This is done through three innovations that are explained in detail in this paper.

The 'common case' for this research consists of developing a framework to enable radical, long-lasting behavioural change that can be applied not only to energy but also to other important aspects in sustainability transitions, such as demands of water, food, etc.

Changing Energy Needs
Pursuing 'energy conscious lifestyles' through data-driven social learning and individual behaviour adaptation feedback loops

1. Brief description of the research project

Despite the increase of energy efficient technologies and appliances, energy consumption at the household level is still increasing. The main reason for it is that households' energy behavior has not changed radically. Previous research and energy policies have focused, although not yet very successfully, on 1) changing behavior at the individual level, 2) utilitarian approaches to energy data/information use, which assumes that by providing energy related data/information to individuals they will change their behavior accordingly; and 3) targeting individual behavioral change in only one specific household domain, the dwelling. In contrast, this research aims to enable long lasting behavioral change and to inform policy innovation at the level of the community, which is where social norms are constructed, 1) by exploring how social interaction in different spaces (both physical and virtual) can contribute to learning from different types of energy data/information, ultimately leading to energy behavior adaptation; and 2) by aiming at a more comprehensive change of energy

use, introducing the concept of 'energy conscious lifestyles'. In this research, 'energy conscious lifestyles' encompass four different household domains: dwelling, mobility, food consumption and leisure.

In order to achieve these aims, this research addresses the main research question: ***How can different types of energy-related data be used in different types of spatial social interactions to enable 'energy conscious lifestyles' at the individual and community levels and policy innovation at the urban level?***

In order to answer this question, this research explores different types of spatial social interactions and how they moderate the relationship between the use of energy data/information and the development of 'energy conscious lifestyles' and policy innovation. This research operationalizes social interaction using the, defined in this research as, 'data-driven learning and behavior adaptation feedback loops' (see Figure 1: Analytical model). The main two feedback loops that this research focuses on are 1) Feedback Loop 1 'individual to community' and 2) Feedback Loop 2 'community (and individuals) to policy' (see Figure 2: conceptual model). As mentioned before, the 'data to individual' feedback loop has been already explored both in research and policy, therefore it is not the focus of this research.

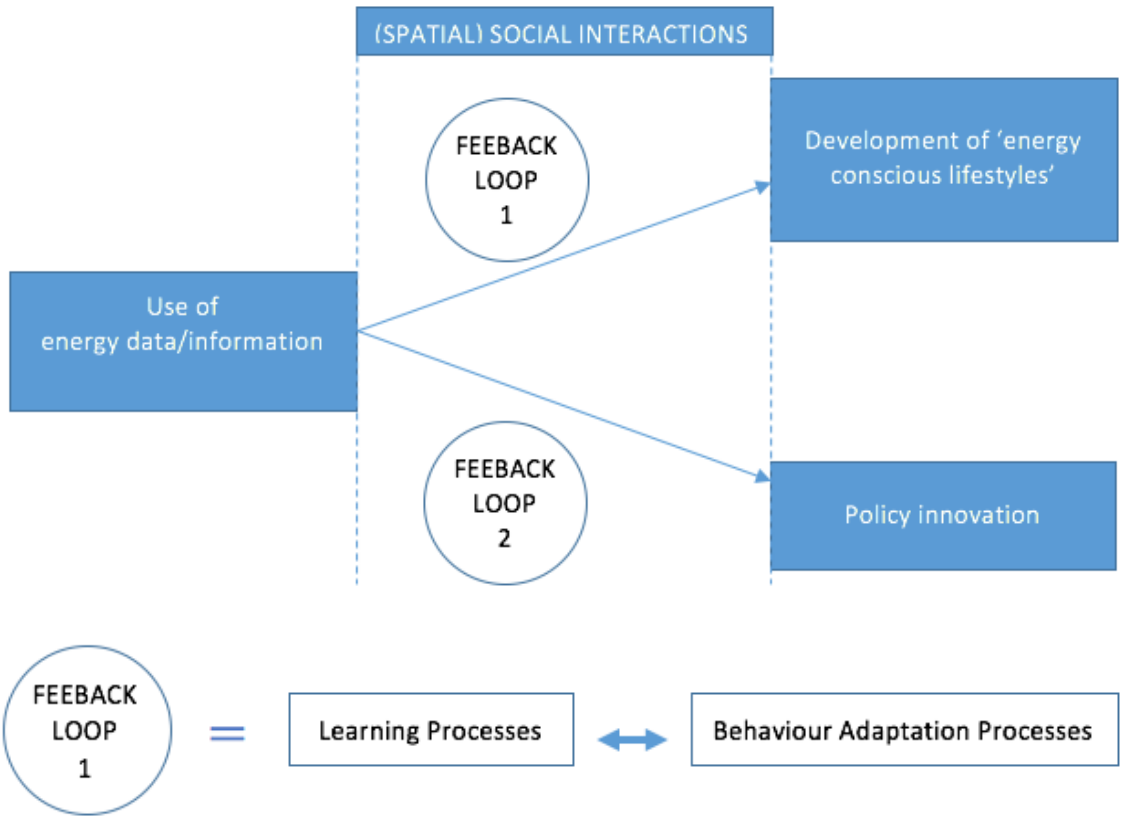

Figure 1: Analytical model

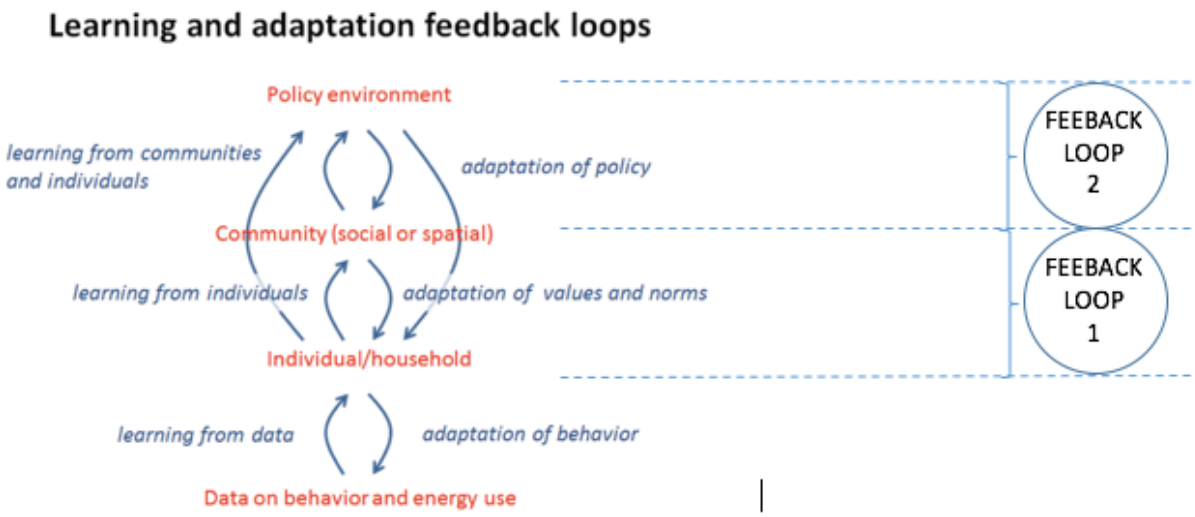

Figure 2: Conceptual model

2. Problem statement and urgency

Since the Rio Declaration on Environment and Development in 1992, which built on the Declaration of the United Nations Conference on the Human Environment held in Stockholm in 1972, the international community has identified the environmental challenges that our current production and consumption patterns entail. A transition towards more sustainable ways of living is crucial to guaranty quality of life to the future generations. This transition towards sustainability has received increasing attention both at the policy level (OCDE 2011) (UNEP 2011) and in social-science research (Markard et al. 2012), (Frantzeskaki & Loorbach 2010) (Grin et al. 2010) (Smith et al. 2005). The role that technology and access to (big) data and information could play in this sustainability transition is increasingly being discussed by socio-technical studies (Kitchin 2014a) (Boyd & Crawford 2012). Recently, the relationship between technology and cities has started to be discussed by literature that falls under the umbrella notion of the 'smart city' (Dassen & Hajer 2014). This field is still in its infancy and more empirical research is needed to analyze the opportunities, challenges and implications that the smart city entails (Luque-Ayala & Marvin 2015; (Caragliu et al. 2011) (Luque et al. 2014)(Luque 2014) (Kitchin 2015) (Kitchin 2014b) (Söderström 2015).

This research focuses on one of the challenges that this sustainability transition entails, how to halt and reverse the continuous increase of energy consumption, taking into account the potential role of social interaction, technology and data/information in facilitating this transition. Existing studies foresee a global increase of 48%[1] in the energy demand between 2010 and 2040 (U.S Energy Information Administration 2016: 1). The urgency to reduce energy consumption is clear but the task is not an easy one. Numerous interests are at stake since energy is currently one of the most lucrative businesses and multiple actors need to act synergistically to reduce global energy consumption. As Raskin and his colleagues (Raskin et al. 2002) state, not only global actors such as intergovernmental organizations, transnational corporations and civic society need to come together for this transition to happen, there is a fourth agent of change that is crucial, a "wide public awareness of the need for

[1] "Most of the world's energy growth will occur in the non-OECD nations, where relatively strong, long- term economic growth drives increasing demand for energy. Non-OECD energy consumption increases by 71% between 2012 and 2040 compared with an increase of 18% in OECD nations. Energy" (U.S Energy Information Administration 2016: 1)

change and the spread of values that underscore quality of life, human solidarity and environmental sustainability" (Ibid, 2002: x). This research focuses specifically on enabling this 'fourth agent', and it does so by looking at cities because they are home to more than half of the world's population, assuming that the aggregated effect of individual change in urban contexts can tilt the balance towards a more sustainable energy future for all.

When considering sustainability issues such as the increasing levels of energy consumption, existing research (Uzzell 2000) shows that, on the one hand, people perceive that environmental problems are more serious at the global level than those at other lower spatial scales. On the other hand, the same research shows that responsibility for the environment is greater at the neighborhood level and decreases as the geographical scale becomes bigger (urban, regional, national scale). Therefore, opportunities to intervene at the neighborhood scale, where civic responsibility is bigger, are undermined by the feeling that sustainability problems are minimal at that level (Uzzell 2008). This research, although framed within an urban context, aims to tackle this paradox by focusing on enabling this energy transition at the scale of the neighborhood, using the household as the unit of analysis. As Hajer and Dassen (2014) have stated, enhancing energy transitions at the household level is one of the key challenges of smart urbanism. By focusing on households in certain urban neighborhoods, this research aims to build upon expected higher levels of environmental responsibility in order to explore different ways on how social interaction, communication technologies and energy-related data could contribute to raise awareness of the need for change of current energy usage. This research does so by exploring the effect different types of spaces (physical, virtual, etc.) have in the aforementioned social interactions.

When looking at energy through the eyes of an average citizen, it is important to acknowledge that energy, unlike water or waste, is intangible (Shove 1997; Gronow & Warde 2001; Gram-Hanssen 2010). This 'invisibility' (Shove 1997) makes it more challenging for citizens to realize how much energy is needed for their daily activities. Consuming energy is not an activity in itself, it is an outcome of the performance of different activities that require energy, such as washing clothes, watching TV, or driving a car. Besides, current energy consumption is based on established infrastructures of taken-for-granted technological systems (Shove & Warde 1998), which makes energy to be seen as a "generic resource, the need for which is as self-evident as it is taken for granted" (Shove & Walker 2014: 45). This inertia and familiarity also constrain potential opportunities for individual change. In addition to this, citizens are somehow 'addicted' (Klare 2016) to their energy intensive lifestyles, which provide them with social status (Lehmann & Rajan 2015) (Axsen et al. 2012; Backhaus et al. 2011; Mont 2007), and a sense of 'cleanliness, comfort and convenience' (Shove 2003) that is not easy to give up. This coincides with narratives that frame energy within societal progress, feeding the idea that energy accessibility enables societies to develop further and faster (White 1943; Lutzenhiser 1993).

3. Positioning of the research (gaps)

In practice, one way to cope with the increasing energy consumption has been to invest in energy efficient technologies and appliances. At the same time, due to the so-called 'rebound effect', technological innovations by making energy cheaper may encourage greater energy use, undoing many efficiency gains (European Environment Agency 2015). An illustration of this rebound effect is the expenditure of the expected savings in higher comfort (Morton et al. 2013; Gram-Hanssen 2014), the growing number of electricity consuming appliances, the increasing size and number of individual

dwellings (Backhaus et al. 2011: 54) and the rapid growth in car ownership and distance travelled (EEA 2015: 25) resulting in an overall increase, rather than decrease, of energy consumption. As a result, despite the increase of energy efficient technologies and appliances, energy consumption at the household level is still increasing. To illustrate this point, between 1990 and 2009, households in the 28 EU Member States became more energy efficient, but in this period their energy consumption increased 8% (European Environmental Agency, 2015).

The main reason for this continuous increase of energy consumption is that households' energy behavior has not radically changed. In order to reduce energy consumption, it is necessary to go beyond the technological debate around energy efficiency and to focus on the behavioral dimension of energy consumption. Research and policy addressing the behavioral dimension of energy consumption has a long history (Stern 1992; Lutzenhiser 1993; Morton et al. 2013; Darby 2006). This research departs from and builds upon the following three existing bodies of research:

First, previous research and energy policies have focused on changing consumers' behavior at the individual level. This approach to behavior change is known as 'internalist' (Jackson 2005) since it focuses on processes and characteristics conceived as internal to the individual, such as attitudes, values, habits and personal norms, to explain individual behavior. One of the most well-known 'internalist' approaches is the Rational Choice model (Elster 1986)(Homans 1961) which states that individuals make choices by calculating the costs and benefits of their actions and choose the option that maximizes their benefits. An example of an energy policy that follows this utilitarian approach is to offer tax benefits or financial incentives to individuals to influence their energy behavior. The expected outcome, according to this model, is that the more financial benefits are provided, the better the behavioral outcomes will be. This focus on price derives from traditional economic models which presume that what matters is the amount (Allcott & Mullainathan 2010: 1204). However, research that analyzes the psychological factors behind those decisions shows that money is not the only motive that individuals take into account when making energy decisions. Some nonfinancial motives that might make these policy interventions ineffective are individuals' values and attitudes or the lack of knowledge of these incentive programs, among others (Stern 1992: 1226). This illustrates the volatility of individual behavior and the challenging task of enabling long lasting behavior change at that level. Moving beyond an 'internalist' approach opens up new avenues to explore 'externalist' approaches, whose focus is on characteristics external to the individual, such as social norms, institutional constrains and incentives or to explore approaches that combine 'internalist' and 'externalist' characteristics. This move beyond the individual level requires addressing individuals as part of a community, which is where social norms are constructed. Also it requires to situate individuals and communities within an institutional context, which is where policies and official laws are enacted.

Second, another avenue to change individuals' energy behavior has been to rely on 'top-down' approaches of data and information provision, expecting that by providing energy-related information to individuals, they will change their attitudes and will accordingly modify their behavior. Again, the rational choice model approach assumes that if individuals have access to sufficient information they will make informed choices, and the more information is provided, the better the behavior outcomes will be. However, as Stern (Stern 1992: 1227) states "with information, what matters is not only how much is made available, but how it is conveyed". Existing research (Borgida & Nisbett 1977) (Taylor & Fiske 1978) (Taylor & Thompson 1982) shows that information has a bigger impact in behavior change when it is 'specific, vivid and personalized' (Stern 1992: 1227). Also, the source of information and how trustworthy the information appears to influence the effect of the information

(McGuire 1985). Besides, many scholars have analyzed the effect of data and information in behavior, in the form of energy feedback (Fischer 2008)(Buchanan et al. 2015)(Darby 2006) (Stromback et al. 2011). In order to optimize the feedback effects studies have experimented with group segmentation (Breukers & Mourik 2013), the use of energy coaches (add ref.), etc. Despite all these efforts, energy consumption continues to increase. This indicates that there are other intricacies associated with the way individuals assimilate energy data and information. One of the intricacies is that this not only an individual practice. There is a 'rich mixture of cultural practices, social interactions, and human feelings that influence the behavior of individuals, social groups and institutions' (Stern & Aronson 1984). Therefore, there is a need for other more integrated approaches to energy data (both 'hard' as in footprint calculations and 'soft' as in the sharing of experiences) that explore the role of social interaction (both web mediated, face-to-face, etc.) between the data, the individuals, the community and the policy level and its potential impacts on energy behavior. This also implies a move from top-down approaches to information provision to more community-based, 'bottom-up' approaches to data sharing and data production, at the same time opening up more innovative and experimental policy approaches.

Third, building upon the previous point in which the use of data and information has been used to influence energy behavior, an extensive body of work has focused on changing individual behavior mainly in one specific household domain, the dwelling (Yohanis 2012) (Stern 1992) (add more). This has been mainly driven by the increasing use of technologies such as smart meters installed inside the house to monitor energy consumption. Recent energy policies have strongly promoted the installation of smart meters with the aim, and hope, to actively engage individuals in the self-regulation of their home energy consumption (Breukers & Mourik 2013) (Morton et al. 2013). The assumption, again following an utilitarian approach, is that individuals by having access to more detailed information about their energy usage are going to change their energy behavior and reduce their energy consumption (Buchanan et al. 2015) (Darby 2006) (Strengers 2013)(Mckenzie-Mohr 2000), for example shifting away from periods of peak demand and/or responding flexibly to periods of 'over' supply. However, smart meters also contribute to feed the narrative of achieving energy efficiency, with the risk of falling back into the aforementioned 'rebound effect'. Some studies (Klopfert & Wallenborn 2011) have shown that a combination of smart meters and feedback has a quite limited positive impact in reducing household's energy consumption (2-4% reduction in electricity consumption, in the case of the previous study), and only when the household has opted for its use. Furthermore and crucially, dwelling is only one of energy intensive household activities. And these different activities are highly interrelated (e.g. the choice of a suburban dwelling and the need to drive a car). This implies that a move beyond the analysis of energy consumption at the dwelling level is needed. A more integrated approach that focuses on changing individuals' lifestyles can shed some light on how the different energy consuming practices that conform a lifestyle interact among each other. This can allow finding synergies and innovative ways to change the bundle of practices in order to consume less energy, both at the community and at the policy levels.

4. Aims and Research questions

The three bodies of research in section 3 situate the individual in the center of the process of energy behavior change, delegating all responsibilities to the individual to deal with the available data and information to make informed energy choices, following a well established utilitarian fashion. The impact of these approaches on energy consumption has been, as we have seen, at best marginal. In contrast, this research builds upon recent research efforts (Backhaus et al. 2012) (Breukers et al. 2009)

(Jackson 2005) (Mont & Power 2009) (Power & Mont 2010) that are pointing towards a paradigm shift that challenges the way individuals consume in general. Backhaus and her colleagues (2012: 17) state:

> *"Research on the sociology of consumption indicates the need for a paradigm shift in thinking about how to foster changes towards more sustainable lifestyles; from a focus on individuals, to a focus on wider communities and social norms and practices; from a focus on changing discrete behaviors to a focus on changing entire lifestyles, cultures and values; from a focus on top-down approaches and information provision to shared community approaches and leading by example".*

Therefore, the main aim of this research is to contribute to this paradigm shift within the field of energy consumption, focusing not only on reducing energy consumption but also on reducing energy needs. This research builds on this innovative body of literature and is innovative in three ways:

First, it focuses on reducing energy needs not at the individual level, but at the level of the community and at the policy level. In order to do that, this research aims at combining the previously called 'internalist' and 'externalist' (Jackson 2005) approaches. This allows the research to focus not only on individuals' characteristics such as attitudes, values, habits and personal norms, but also on external characteristics such as social norms, institutional constrains and incentives, resulting on an integral overview of energy behavioral shaping factors. This variety of tools equips the research to first analyze and then challenge the current unsustainable energy socio-technical systems (or regimes). As Evans and his colleagues (2016: 5) state "incumbent socio-technical systems are stabilized through the rigorous alignment of routines, institutions, infrastructures and networks that constitute the provision of societal needs such as energy, mobility and food". Having an integrative approach that combines agency and structure, will contribute to destabilize current incumbent energy socio-technical regimes and to propose more sustainable alternatives.

Second, this research leaves behind ineffective individualistic approaches to data and aims to explore the role that interaction between the data, the individuals, the community and the policy level can play in shaping and reducing future energy needs. This research aims to look at a broad spectrum of 'data', from 'hard' data, as used in footprint calculations, to 'soft' data, such as energy related information and personal experiences. At the same time, this research also aims to explore different types of communities, offline or online communities in which social interaction happens in different types of space, face-to-face physical space and virtual space, respectively. This focus on social interaction leads the research to explore community approaches to data sharing and data co-production, as well as innovative modes of governance and experimental policy approaches, along the lines of the so-called 'living labs'. Loorbach (2013) states that living lab projects can have direct, indirect and diffuse impacts, when considering sustainable transitions and the creation of new sustainable structures. The diffuse impacts are the most important outcome for a successful transition process (Schiwa and McCormick, 2016) and these are the ones this research is interested in pursuing. These diffuse impacts refer to the change of cultural norms and normative values within a society. These changes may influence the way people perceive sustainability problems, such as energy consumption, and may lead to reframe the established discourse, shifting the focus from reducing energy consumption into reducing energy needs.

Third, the research broadens the limited focus of changing energy behavior within the private sphere of the dwelling, to expand the scope of action and to focus on changing the energy footprint of entire

lifestyles. For this purpose, this research introduces the notion of 'energy conscious lifestyles', which is the ideal lifestyle this research aims at enabling. A 'conscious energy lifestyle' is made of practices that bundle together in a way that requires the least amount of energy possible. This definition is embedded in broader definitions of sustainable lifestyles, such as the one by Backhaus and colleagues (2011: 22): "ways of living that allow people to meet their personal needs and aspirations, while allowing current and future generations to do the same" or the one by Gram-Hanssen (2012: 17): "bundles of practices that are tied together by attitudes related to sustainable development". Therefore, the complete (working) definition of 'energy conscious lifestyles' can read like: 'a set of practices that bundle together in a way that requires the least amount of energy possible and that, at the same time, allows current and future generations to meet their personal needs and aspirations'. Based on insights from the literature (Mont, 2007: 10) (Tukker et al. 2006) (Backhaus et al., 2011: 10), this research focuses on four energy lifestyle domains: dwelling, mobility, food consumption and leisure. With this more encompassing approach to household energy usage, the research expects to achieve a more complete understanding of the energy use practices (and potential conflicts and synergies among them) that conform different energy lifestyles.

As a brief summary of the three aforementioned innovative goals, this research moves beyond individual energy behavior change approaches and aims at exploring how social interactions, in which energy data and information are exchanged, can enable 'energy conscious lifestyles'. In other words, how data driven social interactions can shape individuals' and communities' new ways of fulfilling their personal needs and aspirations with different bundles of practices. Ultimately, the research aims to explore to which extent individuals and communities are able to change, not so much or only their current bundles of practices but rather and also their personal needs and aspirations, to need less energy, based on the social interactions mediated by energy related data and information. Some studies (Sukhdev 2009; UNEP 2009) (SPREAD consortium 2011) are already looking into this transition from consumption to value-based societies (Backhaus et al. 2012: 17).

To reach these aims the research addresses the main following research question:

How can different types of energy data be used in different types of spatial social interactions to enable 'energy conscious lifestyles' at the individual and community levels and policy innovation at the urban level?

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