From people to policy: integrating social sciences and design insights into renovation policies

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Abstract

France has ambitious, but yet unreached, goals for building refurbishment, and there is a consensus that existing policy measures will not be enough to meet objectives.

This article proposes a five-steps methodology to identify new policies in the field of renovation of private dwellings in France. Its general philosophy is to place the 'real life' individuals at the centre of policymaking so policy packages are tailored to their reality. The methodology relies on insights from complementary disciplines that have in common their ability to understand the 'real-life' individuals' point of view: social sciences and design.

This paper presents the results of Steps 1 to 3 that were implemented at ADEME in 2016. Step 1 aims at understanding the behavioural challenges that energy renovation policies need to meet. It relies on a multidisciplinary checklist derived from social sciences (economics, psychology, social psychology, sociology and anthropology). The checklist helps policy makers analysing the various facets of renovation behaviours and the associated policy challenges. Step 2 aims at identifying policy gaps in the existing policy framework and thus establishing priorities for action. In the field of renovation, these are, for example: credit and cash flow issues, the lack of policy to help households choose good quality workers, the lack of segmented communication, the lack of policy to activate social norms such as comfort.

Step 3 aims at filling in the policy gaps by generating ideas for new policies. It relies on an ideation methodology that is classically used in Design Thinking. 55 ideas for new services and policies were generated over a 3-day workshop held in 2016. An overview of Steps 4 (finalising the policy packages) and 5 (implementing and evaluating), that will take place in 2017 onwards, is provided in conclusion.

Introduction

France has set ambitious goals for the refurbishment of its residential sector. The 2015 Energy Transition Law (*Loi de transition énergétique pour la croissance verte*) sets the objective of 500,000 dwellings to be refurbished per year, out of which 380,000 should be private dwellings, and 120,000 social housing. In France, 288,000 households completed some good quality works from an energy point of view[1] related to heating, hot water, windows, walls or roofs/attics in their dwelling in 2014 (ADEME 2016a). However, these are only piecemeal works, not comprehensive renovations. This is below the objective of 380,000 fully renovated private dwellings. There is a consensus that existing policy measures will not be enough to meet objectives (Plan Bâtiment Durable 2016) and that the existing policy framework should be improved or complemented with new policies.

Any methodology designed to identify such new policies should take into account:

1. Works are considered of good quality from an energy point of view if they meet the minimal technical standard set as a threshold of eligibility to financial help. Note that this figure encompasses works that were carried out between 2012 and 2014, i.e. over a 2-year period.

- The multidimensionality of renovation. Over the last decade, an important body of work in social sciences has highlighted the need to *"move beyond the individual"* and to also take into account the social and material dimensions of behaviour (Darnton & Horne 2013). Such work has sought to capture the complexity of human action through the lense that the various social sciences provide (Chatterton 2011, The Scottish Government 2011, Schäpke & Rauschmayer 2011, European Commission 2012, Mayne, Darby & Hamilton 2012; Mourik and Rotman 2013, Martin & Gaspard 2016). Indeed, each science casts a complementary light on behaviour. As any human behaviour, renovation decisions are therefore intrinsically multi-faceted.
- The diversity of households. For example, households have varying levels of financial capacity, attitudes, skills, etc. This gives them varying degrees of capacity and willingness to act.

Working with such complexity can quickly become unworkable. It is therefore necessary both to embrace the complexity and to break the analysis into manageable parts.

This article proposes a methodology to identify new policies in the field of renovation of private dwellings in France. Its general philosophy is to place the "real life" individuals at the centre of policymaking so policy packages are tailored to their reality. Therefore, the methodology relies on insights from complementary disciplines that have in common their ability to understand the "real-life" individuals' point of view:

- Social sciences, as they help to explain the multidimensionality of behaviours,
- Design, as it provides a methodology to turn social sciences analysis into concrete ideas for new services or policies (FING 2014). Design Thinking was first conceptualised in the 1980's as a discipline that turns users' needs into new products and services (Rowe 1987). In recent years, it has been applied outside of its original realm (Vial 2015), for instance in the field of public policies, through Service Design. Service Design is the design of services "that first and foremost meet the needs of the users and stakeholders" (Design Flanders 2015) or "the activity of planning and organizing people, infrastructure, communication and material components of a service, in order to improve its quality" (Design Council 2013). The promise of such discipline is a "methodological translation of the diversity of publics to favour a better adaptation of services" (Grand Lyon 2014 – Translation by authors). Figure 1 provides an overview of the proposed methodology. It is inspired by the seven steps of a design process as defined by Simon (1969): define, research, ideate, prototype, choose, implement, and learn.

The methodology is structured as follows:

- Step 1 aims at understanding the behavioural challenges that energy renovation policies need to meet. It relies on a multidisciplinary checklist derived from social sciences (economics, psychology, social psychology, sociology and anthropology). The checklist helps policy makers to analyse the various facets of renovation behaviours and the associated policy challenges[2].
- Step 2 aims at identifying policy gaps in the existing policy framework. It consists in analysing if existing policies adequately meet the challenges identified in Step 1. When a gap is identified, existing data from academic and grey literature is used to assess its scope[3]. Gaps can be major (if more than 50 % of the population in affected[4]), moderate (less than 50 %, more than 10 %) or minor (less than 10 %). If there is no data available to assess the scope of the gap, it is marked as unknown.
- Step 3 aims at filling in the policy gaps by generating ideas for new policies. It relies on an ideation methodology that is classically used in Design Thinking.
- Step 4 aims at finalising new policy packages.
- Step 5 consists in implementing and evaluating the new ideas generated.

This methodology was implemented at ADEME as part of the Agency's mission to improve environmental policies. This paper presents the results of Steps 1 to 3, that were carried out in 2016. An overview of Steps 4 and 5, that will take place in 2017 onwards, will be provided in conclusion.

Step 3 was implemented through a three-day workshop held at ADEME late 2016. The workshop gathered 22 experts with diverse backgrounds: experts in social sciences and related disciplines (economists, psychology, sociology, marketing, communication, advertising, journalism, community management) and renovation experts (architects, technical advisors, representatives from home improvement superstores, technical experts from ADEME). The objective was to mix people with a diversity of backgrounds to confront expertise around real-life cases and to ensure that the ideas generated were immediately tested. The workshop relied on a series of creative exercises in a short time. Exercises included: "and if?" (to project oneself in a future with no constraint), a "ping pong" (to generate the most important number of ideas in a minimum amount of time), "360" (to go deeper in some ideas by attacking them through all angles). Such exercises were designed to trigger creativity.

Identifying policy challenges (step 1) and policy gaps (step 2)

As Step 1 (Identifying Policy Challenges) and Step 2 (Identifying and assessing the scale of policy gaps) both rely on a multidisciplinary checklist and a review of academic and grey

2. This work is inspired by that of SenterNovem (2016) that developed a 12-question checklist to identify new policies to be developed. However, because they aim at providing easy guidance, these questions elude the underlying concepts that have been used to formulate them, and therefore may prevent policy makers to understand the mechanisms they refer to. Moreover, they do not provide guidance on how to establish priorities among the diversity of households. For this reason, we chose to develop a different set of questions and a different methodology.

3. Depending on the level of resources available, this step could also be carried out through expert consultation or through a dedicated survey. Econometric analysis can be useful to differentiate households according to their objective characteristics or their declarations regarding opinions, motivations and contextual factors (Nauleau, 2017).

4. It would also be possible to assess the scope of the gap by calculating the GHG savings associated with filling it. However, due to data and time constraints, we chose to rely on the proportion of population affected.

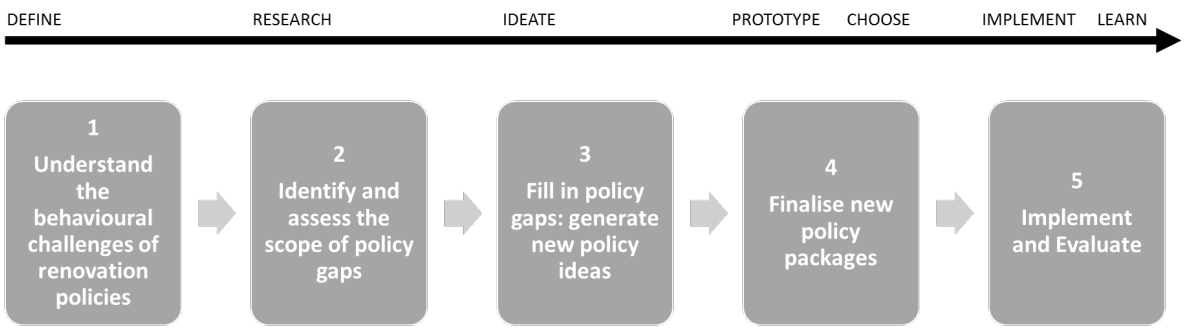

Figure 1. Overview of the methodology presented in this paper.

Table 1. Checklist overview.

N°	Question	Underlying Social science
1	To what extent are financial incentives needed for households to carry out energy-related works?	Economics
2	To what extent do rationality biases and bounded rationality prevent households to carry out energy-related works?	
3	To what extent does the rationality of energy-related works depend on the expected action of others?	
4	To what extent can supply meet the demand that households will create through carrying out energy-related works?	
5	To what extent is information asymmetry hindering energy-related works?	
6	To what extent do the attitudes of the household align with energy-related works?	Psychology
7	To what extent do households think they are able to carry out energy-related works?	
8	To what extent can peers and or/ opinion leaders be leveraged to support energy-related works?	Social Psychology
9	To what extent are the socio-demographics of the social category the household belongs to supportive of energy-related works?	Sociology
10	To what extent can energy-related works become a new social norm?	
11	To what extent are material and technical elements in the close environment of the individual, and, more widely, the socio-technical regime, supportive of energy-related works?	Anthropology (and Sociology of Sciences and Techniques)

literature, they are presented together in this section. Table 1 gives an overview of the checklist, with the social science each question relies on.

The rest of this section is structured as follows: for each question of the checklist, we provide a brief explanation of the underlying concepts in the (main) corresponding social science and how they highlight specific policy challenges in the field of renovation (Step 1). We then analyse whether the existing policy framework meets the identified challenges, and if not, the scope of the policy gap (Step 2).

QUESTION 1 – TO WHAT EXTENT ARE FINANCIAL INCENTIVES NEEDED FOR HOUSEHOLDS TO CARRY OUT ENERGY-RELATED WORKS?

Step 1 – Identifying policy challenges

Question 1 refers to a basic principle in economics, that of *homo oeconomicus* (Walras [1874] 1988, Jevons [1871] 1909, Menger [1871] 1976): individuals seek the maximum of satisfaction (utility) under budgetary constraints. Although economists have constantly refined this principle, it remains a basic assumption behind many policy tools that aim at increasing the cost of non-desired behaviour or decreasing the cost of desired behaviour.

In the context of renovation, it means that households will not carry out works if they cannot afford them or if they do not gain any utility (economic or other) from them. Indeed, economic motivations play an important role in renovation decisions. The four key motivations of early adopters of renovation works in France are to improve their dwelling's thermal comfort (63 %), to reduce their energy bill (55%), to replace a device that was too old or faulty (48 %) and to valorise one's patrimony (28 %) (ADEME 2016a). However, not all households are convinced that renovation makes financial sense: 10 % of the French population state that works are necessary at their home and that they are willing to do them, but they are not convinced that the energy savings achievable justify the investment. Changing the balance in favour of a global renovation is thus a policy challenge.

For households who would be willing to invest, there are further policy challenges. First, cash flow issues. Households need to pay in advance for the works before they receive the subsidies (sometimes up to a year later), and this prevents some of them from acting (although the exact proportion is unknown). Second, credit issues: 80 % of households who carried out works financed them out of their own savings (ADEME, 2016b). 23 % of the French population state that works are necessary at their home and that they are willing to do them, but they do not have the necessary money and are not willing to borrow it (mainly because the interest rate or the loan repayment period do not suit them), and 7 % because their situation does not allow them to access credit[5] (ADEME 2016b). Resolving cash flow and credit issues is thus a policy challenge.

Step 2 – Identifying and assessing the scale of the policy gaps

In France, financial incentives to renovate are: subsidies, an income tax credit, a zero-interest loan and a Low Value-Added Tax for renovation works. On average, existing financial support accounts for 17 % of the total costs of the works (ADEME 2016a). It can reach up to 80 % for low-income households (through the *Habiter Mieux* program – which covered 77,621 dwellings in 2015 – and a number of local programs). The level of support thus adapts well to the households' income. It does not however depend on the depth of the renovation. Therefore, there is no incentive to carry out comprehensive renovations. Given the importance of the economic factor in households' renovation decisions, the lack of strong economic incentives for comprehensive renovation is thus assessed as a major policy gap.

The zero-interest loan (*Eco-PTZ*) was developed to tackle credit and cash flows issues. However, banks have not fully implemented it. This is because it requires banks to have technical skills to assess the quality of works, and because the uncertainty of achievable savings makes it difficult to include them in the solvency calculations. As a result, only 30,000 households signed up for such loan in 2015 (Groupe de travail sur le financement des rénovations énergétiques dans le secteur résidentiel 2016). Alternative financial offers are developing, such as, for example, third party financing initiatives. However, they still cover a very small proportion of the French population. For instance, one of the most advanced schemes, the *Picardie Pass Rénovation*, has an objective to renovate 2,000 dwellings between 2014 and 2018, out of the 900,000 dwellings in the Picardie region (idem). The scope of the gap is unknown, although it is potentially a major policy gap.

QUESTION 2 – TO WHAT EXTENT DO RATIONALITY BIASES AND BOUNDED RATIONALITY PREVENT HOUSEHOLDS TO CARRY OUT ENERGY-RELATED WORKS?

Step 1 – Identifying policy challenges

Behavioural and experimental economists further refined initial neo-classical insights on human rationality to introduce psychological and moral dimensions in the analysis (Simon 1957, Kahneman & Tversky 1979). By doing so, they uncovered a number of biases in human decision making processes such as anchoring, loss aversion, the status quo bias, the preference for the present bias, the confirmation bias. In the field of renovation, these biases apply as in any other decision. For instance, the preference of the present bias: 89 % of French people state that a decrease in prices of equipment or works would encourage them to carry out works, but only 45 % of them stated that the increase in energy prices would do so (ADEME 2016b). These two factors (energy price and equipment price) should theoretically play the same role in the financial viability of works. However, a decrease in the price of devices would be immediately tangible, whereas the energy price rather has a long time impact. Some biases play against carrying out works, some play against making the most relevant technical choice during the decision-making process. The policy challenge is thus to help households overcome such biases.

Heterodox economists, on their side, questioned rationality and uncovered bounded rationality as well as the role of non-economic realities (such as routines, conventions or institutions) in economic activities. Households' ways of recruiting contractors are a great example in the field of renovation. Instead of undertaking a thorough tender process, households tend to ask a trusted member of their social network (Agence Parisienne du Climat & al 2016). The policy challenge is thus to help households (and especially those who cannot find quality workers through their social network) make the right choice.

Step 2 – Identifying and assessing the scale of the policy gaps

In order to counter rationality biases and bounded rationality, policies should ease the reflection process or outsource it. This means providing advice, from one-off advice to more personalised support programmes. One-off advice is provided in France through the *Points Info Rénovation Service,* which partly rely on *Espaces Info Energie* (EIE). Evaluation surveys show that a year after having contacted EIE, 61 % of households state that this advice has contributed to their decision around refurbishment. The advice enabled them to ask themselves the right questions about their project (78 % of respondent agree to this item), to ask good questions to the contractors (60 %), to go further than expected in the works (54 %), to improve their financial plan and access financial help (42 %). However, there is still room for going further as such services do not provide an audit of dwellings, and therefore cannot prescribe a thorough programme of works that will lead to comprehensive renovation. Some pioneering programmes are doing so. For instance, the *Effilogis* programme, developed by the Franche-Comté region, provides advice, financial help to carry out energy audits and technical support during the project, and shows very positive results in triggering comprehensive renovation, as an average of 20 % of the households who resorted to Effilogis over the 2012–2014 period carried out deep renovations (ADEME, Conseil regional de France-Comté 2015). However, to date, the provision of personalised support still remains an important policy gap as the overall scope of the 15 most promising initiatives (including the *Plateformes de Rénovation Energétique* and the *Picardie Pass Rénovation*) that provide such personalized support is estimated to be currently around 20,000 dwellings (against 28 million dwellings in France) (ADEME 2016c). This is thus assessed to be a major policy gap.

5. Please note that these numbers cannot be added up as households can given several answers.

QUESTION 3 – TO WHAT EXTENT DOES THE RATIONALITY OF ENERGY-RELATED WORKS DEPEND ON THE EXPECTED ACTION OF OTHERS?

Step 1 – Identifying policy challenges

A key finding of economics and game theory (Morgenstern & von Neumann 1944, Nash 1950) is that behaviour depend on assumptions about the expected behaviour of others, and that the action of an individual can be perfectly rational from an individual point of view, and yet, totally counter-productive for the group they belong to (and to themselves eventually). Key concepts include: the free-rider effect and the prisoner dilemma. In the field of renovation, key examples of split incentives are the owner-renter dilemma (in which owners have no incentive to renovate as they will not benefit from the works) and renovation in multi-owners' buildings (in which the repartition of such benefits are not clear (not all homeowners will benefit at the same level) and agents have heterogeneous preferences (Agence Parisienne du Climat & al 2016)). Multi-owners' buildings are greatly underrepresented in energy-related works: while 43 % of the French population live in apartment blocks, these only represent 12 % of energy-efficient works (ADEME 2016a).

Step 2 – Identifying and assessing the scale of the policy gaps

To enable optimal collective action, policies should change the way costs and benefits are spread across a group and provide the necessary support to improve coordination. No policy currently exists to tackle the owner-renter dilemma although 40 % of French households rent their dwelling (INSEE 2015). This is thus a moderate policy gap. Regarding multi-owner's dwellings (43 % of dwellings), few intensive support programs are being developed (such as *Energie Positif* in the Ile de France region), but they still cover a very small portion of this segment (cf. Question 2). This is thus a moderate policy gap.

QUESTION 4 – TO WHAT EXTENT CAN SUPPLY MEET THE DEMAND THAT HOUSEHOLDS WILL CREATE THROUGH CARRYING OUT ENERGY-RELATED WORKS?

Step 1 – Identifying policy challenges

A key joint insight from sociology and economics is that if consumers can influence producers, they do not have the power to produce or invest in the goods and services they would like to buy. When neo-classical economics postulate that demand shapes supply, further work in economics showed that supply also shapes demand (Galbraith 1958). In the field of refurbishment, the adequacy of supply can be analysed along two axes: that of equipment and that of builders. Regarding equipment, there is a general consensus among experts in France that no technological rupture will be necessary to achieve existing policy targets (Teissier 2015). This is therefore not a policy challenge. Regarding builders, the number of builders is not a problem, but their competencies are (Agence Parisienne du Climat & al 2016, CGEDD 2015, Barbat & al 2010). Ensuring that builders have the right competencies is a challenge for policies.

Emerging analysis also shows that a great amount of households carry out works (or part of the works) themselves. Although no data exists at the national level to quantify such phenomena, qualitative analysis shows that this consistently appears in case studies (PADES & al 2014). Such works fall below the radar of policies as they do not qualify for financial help. Therefore, ensuring the quality of the works carried out by households themselves and that the standard of the work meets the expected outcomes is a challenge for policies.

Step 2 – Identifying and assessing the scale of the policy gaps

In France, the main policy in the field of supply aims at improving workers' skills. In relies on the RGE sign (*Reconnu Garant de l'Environnement*). This quality sign is given to firms having applied to it and followed a specific training. However, existing analysis points to the limits of the training associated with this scheme, for instance, the fact that a company only needs to train one of its employee to be given the sign, or the misfit between the training provided and the actual needs of the workers (CGEDD 2015).

Given that for single home-owners, which represent 55 % of households, works are mainly done by craftsmen or very small firms which are struggling to adapt to the demand, the lack of workers with the right competencies is thus assessed to be a major policy gap.

Regarding households who carry out work themselves, there is currently no policy that seeks to ensure the quality of the works. Given the lack of data regarding this phenomenon, it is not possible to assess the scope of the gap.

QUESTION 5 – TO WHAT EXTENT IS INFORMATION ASYMMETRY HINDERING ENERGY-RELATED WORKS?

Step 1 – Identifying policy challenges

Economics have shown that the hypothesis that information between actors on a market is perfect does not stand in reality. Information asymmetry translates into moral hazard, adverse selection, and signal problems (Akerlof 1970, Spence 1973). Sometimes, economic exchanges between individuals need to rely on collective artefacts that organise information sharing, ensuring that information is accessible, legible and reliable (Jensen & Meckling 1976). Renovation works are a great example of information asymmetry as, when they contract with a builder, homeowners have little possibility to ensure that the builder will carry out quality work and for builders have it is difficult to visibly differentiate themselves from "bad" ones (Giraudet 2015). Overcoming information asymmetry is thus a policy challenge.

Step 2 – Identifying and assessing the scale of the policy gaps

Existing policies aiming at reinforcing trust between households and contractors, such as the quality sign RGE (that has a double objective of improving builders' competencies and sending a signal to households) have not produced the expected effects (CGEDD 2015). This leaves an important policy gap, namely the lack of policies to help those of the households who do not already know (or cannot be referred to) trustworthy workers. 78 % of the French population state that a certification of workers that would guarantee quality of equipment or works would constitute an incentive to invest in renewable energy or renovation works in their home (ADEME 2016b). This is thus assessed as a major policy gap.

QUESTION 6 – TO WHAT EXTENT DO THE ATTITUDES OF THE HOUSEHOLD ALIGN WITH ENERGY-RELATED WORKS?

Step 1 – Identifying policy challenges

Psychology and in particular cognitive approaches, posit that attitudes impact action. Attitudes involve cognitive, affective and conative components and translate into motivations or reasons to act. As presented in Question 1, the current motivations for renovation are thermal comfort, economic reasons (reducing the energy bill and valorise one's patrimony), and material reasons (replacing a device that was too old or faulty). Qualitative studies further highlight that comfort is a central motivation. They also show that early adopters often demonstrate a high level of environmental concern (Agence Parisienne du Climat & al 2016).

Step 2 – Identifying and assessing the scale of the policy gaps

Policies that aim at changing attitudes are communication or social marketing campaigns. Analysis of communication campaigns carried out by France's Energy Agency (ADEME) showed that, since the 1970's, campaigns focused on two types of arguments: the economic one and the ecological one ("Préservez votre argent, préservez votre planète", "Économies d'énergie, faisons vite, ça chauffe"), leaving comfort, for instance, behind. Moreover, communication campaigns were developed with an explicit view to talk to an "average person", without differentiating between social categories (Comby 2013) or segmenting based on the reasons for action. To date, a social marketing campaign still has to be developed in the field of renovation in France. Therefore, the development of segmented communication still remains a major policy gap.

QUESTION 7 – TO WHAT EXTENT DO HOUSEHOLDS THINK THEY ARE ABLE TO CARRY OUT ENERGY-RELATED WORKS?

Step 1 – Identifying policy challenges

Question 7 refers to a dimension that is central in both the theory of planned behaviour in psychology (Ajzen & Fishbein 1980) and the social practices theory in sociology (Spurling & al 2013), namely the skills needed to accomplish a specific action, i.e. self-efficacy or internal locus of control. In the field of renovation, skills needed are at least threefold: technical (to understand the energy consumption of one's dwelling, to choose the relevant technical devices), administrative (to navigate through financial support available) and managerial (to carry out all project-management related tasks such as hiring contractors and supervising their work) (Agence Parisienne du Climat & al 2016). 4 % of the French population state that works are necessary at their home and that they are willing to do them, but they do not because the whole process (finding a worker, managing the project …) is too complicated, 4 % because they do not know what works are needed[6] (ADEME 2016b). These figures are probably an underestimate as competencies issues consistently come out of qualitative studies with early adopters (Agence Parisienne du Climat & al 2016).

Step 2 – Identifying and assessing the scale of the policy gaps

Policies aiming at giving or supplementing skills to households span from one-off information to personalised support, to training. As discussed in Question 2, personalised support is still in its infancy in France. Therefore, ensuring that households who do not have the necessary skillset to renovate receive relevant support is assessed as a minor policy gap (potentially moderate, as existing figures could be an underestimate of the challenge).

QUESTION 8 – TO WHAT EXTENT CAN PEERS AND OR/ OPINION LEADERS BE LEVERAGED TO SUPPORT ENERGY-RELATED WORKS?

Step 1 – Identifying policy challenges

Social psychology has shown that individuals behave differently in a group that they would have done if isolated[7]. The group allows an individual appropriation of issues and solutions (Asch 1951). It is therefore a relevant scale for action to activate social norms (Lewin 1947). Social psychology and sociology of communication have also shown that not all individuals have the same status within a given group. There are opinion leaders that filter information and translate it (Katz & Lazarfeld 1955). These insights invite to rely on interpersonal relations, small groups and close social networks, as well as opinion leaders, to make social norms evolve. In the field of renovation, the policy challenge is to leverage opinion leaders or peers.

Step 2 – Identifying and assessing the scale of the policy gaps

Policy measures developed to meet this challenge cover communication by opinion leaders, exchanges, emulation or group support, or more widely "community-based" approaches (such as, for instance, grouped renovation, opens days and house visits …). For example, studies in the United Kingdom (Newbery & al 2014) or Canada (Rehkopf & al 2016) show that open days have positive results. There is no data on the number households who currently benefit from such actions in France. It is therefore not possible to assess the scope of the gap. Given that all households need, to some extent, some kind of support from the groups they belong to, this is potentially a major policy gap.

QUESTION 9 – TO WHAT EXTENT IS THE SOCIO-DEMOGRAPHICS OF THE SOCIAL CATEGORY THE HOUSEHOLD BELONGS TO SUPPORTIVE OF ENERGY-RELATED WORKS?

Step 1 – Identifying policy challenges

Sociology looks at the collective dimensions of individual actions. It apprehends individuals as members of distinct categories or groups. These differences arise from social characteristics (such as age, socio-professional categories, income repartition …), cultural ones (family models, religion …), or trajectories and life cycles. Indeed, both quantitative and qualitative studies show that the probability of undertaking refurbishment works is not equally spread amongst the French population. Early adopters of renovation share common traits. Works are more often carried out by households with 3 or more members (36 % vs. 31 % for the general population), with a job, belonging to upper socio-economic categories (38 % versus

6. Please note that these numbers cannot be added up as households can given several answers.

7. Insights from social psychology are different from that of game theory discussed in Question 3 as game theory only deals with the rationality of individuals.

33 % in the general population). Surveys also show that people who have just moved houses are over-represented (21 % versus 11 % for the general population) (ADEME 2016a). This echoes findings from qualitative studies that point out that renovation happens when it makes sense in the household's lifecycle (moving house, adapting the house to retirement …).

Step 2 – Identifying and assessing the scale of the policy gaps

Such insights invite to adapt policies according the socio-demographic characteristics of households. However, to date, in French renovation policies, the potential of such segmentation policies has not fully been explored. The only policies that have an explicit segmentation objective are those that target low-income households (see Question 1). Other characteristics, as such key moments of change (moving house, having a kid, preparing for one's retirement …), for instance, are not yet exploited. Therefore, this is found to be a major policy gap.

QUESTION 10 – TO WHAT EXTENT CAN ENERGY-RELATED WORKS BECOME A NEW OVERARCHING SOCIAL NORM?[8]

Step 1 – Identifying policy challenges

One key insight of sociology is that individual actions collectively produce systemic effects (rules, norms, institutions, whatever their degree of generality and formalism) that constraint or direct individual actions. Such norms can be non-written or written (laws, regulations …), with varying degrees of convergence between the two.

In the field of buildings, Shove (2003) states that the three overarching social norms in Western societies are: comfort, cleanliness and convenience. Comfort, in particular, stands out in surveys as a central motivation for refurbishment (cf Question 6): this social norm is therefore rather supportive of renovation (although it can lead to non-efficient choices, such as the installation of air conditioning). Cleanliness can be both rather supportive. Convenience, on the other hand, can be an obstacle, as it is far from convenient to carry out works. However, the idea that a dwelling is or has to be refurbished to be rented or sold is not commonplace.

Step 2 – Identifying and assessing the scale of the policy gaps

Policies that aim at activating non-written social norms include communication and community-based actions. These, and the associated policy gaps, have been discussed in Questions 6 and 8. It is assessed as a major policy gap.

Policies can also aim at formulating new written norms. In France, the Energy Transition Law (*Loi relative la transition énergétique pour la croissance verte*) makes it compulsory to undertake an energy audit in multi-owners' dwellings, and states that all private residential dwellings which consume over 330 kWhEP/sqm/year will have to be renovated by 2025. This is a first step to introduce coercive measures. More could be done: owners could also have a legal requirement to refurbish before renting or selling their dwellings. 66 % of French people are in favour of such measure, including 61 % of owners (ADEME 2016b). This is thus assessed as a major policy gap.

8. Overarching social norms apply to all individuals in a given society. They are therefore different from group-specific social norms, discussed in Question 8.

QUESTION 11 – TO WHAT EXTENT ARE MATERIAL AND TECHNICAL ELEMENTS IN THE CLOSE ENVIRONMENT OF THE INDIVIDUAL, AND, MORE WIDELY, THE SOCIO-TECHNICAL REGIME, SUPPORTIVE OF ENERGY-RELATED WORKS?

Step 1 – Identifying policy challenges

A key insight from the sociology of science and technologies is that material artefacts have an influence on behaviours. At the individual level, technologies can either act as constraints or catalysers (Beslay and Zélem 2015). At a more macro level, combinations of social and material elements combine into socio-technical regimes, which are "patterns of artefacts, institutions, rules and norms assembled and maintained to perform economic and social activities" (Berkhout & al 2003).

The "physical features of the house, its materials and the available products on the market for doing the renovations" (Bartiaux & al 2014) actually play a key role in triggering renovation decisions. In this area, the policy challenges are:

- Ensuring that works that are done when a problem arises in the dwelling are as energy-efficient as possible. For example, 48 % of households who carried out energy-related works between 2012 and 2014 did it prompted by a technical issue, to replace an aging or failing device.
- Targeting the less efficient dwellings. Households who carried out works are more likely to live in older dwellings (built before the first thermal regulation in 1975) that are less efficient (they represent 37 % of the households who carried out work, but only 27 % of the general population) (ADEME 2016a).
- Ensuring that technologies are available to meet the demand (this has been discussed in Question 4). This is not found to be a policy challenge.

Step 2 – Identifying and assessing the scale of the policy gaps

Existing policies are rather successful at ensuring that failing devices are replaced by highly efficient ones as households need to buy equipment with a minimal technical standard if they want to receive financial help. This is therefore not a policy gap. However, to date, no policy has been designed to target dwellings that have a high potential for energy savings: this can be considered as a moderate policy gap.

Filling policy gaps: generating new policy ideas (step 3)

This section presents Step 3 of the methodology, that aims at filling policy gaps identified in Step 2 by generating ideas for new policies through an ideation workshop.

PREPARING THE WORKSHOP: TURNING IDENTIFIED BARRIERS INTO REAL-LIFE CASES

To prepare the workshop, the facilitators carried out 10 semi-structured interviews with households representing a diversity of situations[9]. The interview guide included questions about

9. Diversity in the sample was sought along two axes. First, the fact of having carried out works or not. 2 households had carried out energy-efficiency works, 5 had carried out works in their home although those works were unrelated to energy-efficiency and 3 had not carried out any works. Second, occupation status: 5 households were private owners, 2 were renting their home, 3 lived in multi-owners' dwellings.

the reasons why they had (or had not) carried out works, the barriers they had faced, and the process they had follow to do the works. The objective of these interviews was to capture the experience and representations households had of renovation. Short videos of the interviews were created and verbatims were extracted as inputs into the workshop. At the beginning of the workshop, participants were asked to select, amongst verbatims and other elements (visuals, statistics…), the ones that made more sense to them according to their expertise.

GENERATING NEW IDEAS

Table 2 shows a summary of the main policy gaps that were identified in Step 2 and the ones on which experts chose to address during the workshop. In total, 55 ideas of services were generated (ADEME, 2017). Figure 2 presents six examples of these ideas.

WORKING IN MORE DETAILS ON SELECTED IDEAS

The remaining time of the workshop was dedicated to go into some ideas in more depth. 15 ideas were selected thanks to a vote for further work. The methodology consisted, for each idea, in creating a persona (i.e. an household the idea was targeted to) with as many details as possible, in order to put oneself as much as possible into the shoes of that household, mapping the customer journey of that household through the service, and identifying actors to mobilise in order to create the service.

Conclusion and next steps

This article has proposed a methodology to identify new policies to be developed in order to increase the uptake of renovation works in the residential sector. The general philosophy of the methodology is that policy packages have to be tailored to 'real-life' households, first, by embracing the intrinsically multifaceted nature of renovation using social sciences, and second, using design methods help generate new ideas of services that fit households' needs.

Following the design workshop carried out in 2016, these ideas now need to be further investigated to be prototyped, knowing that not all 55 ideas produced will lead to concrete services. Next steps include the finalisation of policy packages and the implementation/evaluation of these policies. Finalisation will need to:

- Validate the relevance of the ideas, identify which actors should be involved in their implementation and their (economic, political, legal) feasibility. For instance, is it relevant and feasible to develop a "Buy an old house, move in a renovated one" scheme?
- Integrate these ideas into new policy packages that address the multidimensionality of behaviour. Indeed, the ideas generated only address one (or two at most) dimension of behaviour, but it would not make sense to implement them if the other barriers are not tackled as well. For instance, it will not make sense to develop a "Buy an old house, move in a renovated one" scheme if the target group does not have the financial capacity to finance works nor a willingness to do so.

This methodology can also be used as a general evaluation and action framework for renovation policies as the multidisciplinary checklist helps to uncover the main policy challenges and gaps, and thus to establish priorities for action. Taking into account the multidimensionality of behaviour could also be useful in other policy fields that aim at behaviour change, and more widely, social change.

Table 2. Overview of identified policy gaps.

Question number	Policy Gap	Size of the Gap	Addressed during the workshop
1	Cash flow and credit issues	Unknown, potentially major	
	Lack of strong economic incentives for comprehensive renovation	Major	
2	Lack of personalised information and support	Major	
3	Owner-renter dilemma	Moderate	
	Renovation in multi-owners buildings	Moderate	
4	Lack of workers with the right competencies	Major	
	Lack of policies to ensure quality when households carry out works themselves	Unknown, potentially major	
5	Lack of policies to help households choose good quality workers	Major	
6	Lack of segmented communication	Major	
7	Lack of support for households who do not have the necessary skillset to renovate	Minor	
8	Lack of actions to leverage opinion leaders or peers	Unknown, potentially major	
9	Lack of policies to target specific social groups	Major	
10	Lack of policy that activate non-written social norms that are supportive of renovation	Major	
	Lack of written social norm of renovation	Major	
11	Lack of policy to target less efficient dwellings	Moderate	

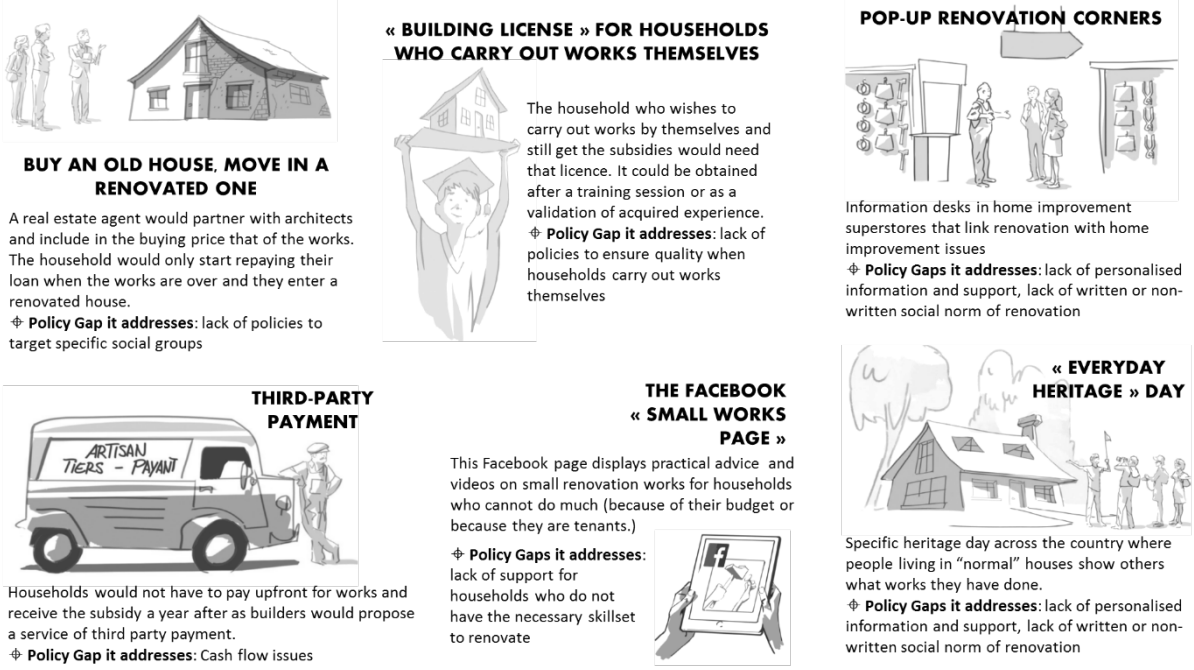

Figure 2. Six examples of ideas generated during the workshop (illustrations: Marc Riou).

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