



HOUSEFUL

D3.2. Social perceptions and beliefs in circular economy at building scale (version I)

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Abstract

A new circular thinking approach is required to enable better decision-making on the selection of circular solutions at different levels for all different stages of a building's life-cycle. This new approach needs to promote the participation and interaction among stakeholders at each stage of the building to ensure optimal functionality and use of resources (water, waste, material and energy). In this sense, co-creation is an essential and transversal action for HOUSEFUL leading to effective engagement of the stakeholders. The co-creation process aims to create a path to overcoming the cultural and social barriers associated with the paradigm shift towards a circular building. This report aims at doing an initial analysis of the specific factors influencing behaviour and the choice making structures of people and the potential social risks and the barriers affecting the successful demonstration of the proposed HOUSEFUL solutions as new services.

For that, this report provides the conceptualisation of this activity based on a literature review that support us the establishment of an analytical model based on the social variables organised per 4 dimensions of analysis:

1. perceived risks and benefits
2. governance factors,
3. behavioural factors,
4. other factors: socioeconomic, semantical factors, and considerations of the environmental parameters.

The methodology implemented was shared with the purpose of the project *Work Package (WP) 3-Cocreation activities and engagement*, for the purpose of this report the evidence used came out from mostly the results of the in-depth exploratory phase based on interviews to stakeholders. The analysis of the evidence gathered through consultation and the initiation of the co-creation process allowed us to provide results organised in the previous four dimensions of analysis.

This has resulting in an overview of the initial identified factors that are shaping the behavioural intentions towards the use of HOUSEFUL solutions from the governance structures that could be achieved to the perception that influence these decisions.

From this first analysis it is evident that circular economy solutions in the housing sector are not only essential but as of yet have been poorly evidenced from social sciences point of view. Houseful is showing that through detailed demonstration and enhanced targeted knowledge, circular solutions in the housing sector wont only be a reality but will be something desired by building inhabitants, by the nearby communities and neighbourhoods as well as for the related municipalities and regional experts' community.

1 Why HOUSEFUL: The Objective of this report

The housing sector is a major contributor to the current global problems of resource depletion and climate change (EC, 2017). It represents one of the most significant consuming sectors at EU level responsible for: 50% of all extracted materials, 40% of the final energy consumption, 33% of the water consumption and 33% of all the produced waste. The reluctance to change from the linear business models of today is causing many environmental problems and is one of the major barriers in the transition towards a circular economy.

The negative environmental impacts resulting from the dominant linear economic model of: 'take, make, dispose' is traditionally adopted by the decision-making stakeholders in the housing sector. Add to this that the lifetime of buildings in the housing sector lasts a minimum of between 40 to 60 years. This means that the decisions and choices taken by stakeholders today severely affect the current and future characteristics of buildings in the housing sector. These decisions impact the environmental performance of these buildings including the water, waste, energy, materials and GHG emissions. Thus, these decisions affect the functionality of the whole system, the related housing practices and the lifestyles of the dwellers throughout several generations. A large number of referenced case studies and innovative projects are focused on the new design of products, smart production in industries and energy efficiency processes. However, this transition has not yet taken place at all levels (energy, water, waste and materials) in the housing sector. Indeed, most of the innovative projects on circularity has only focused on one of these levels (e.g. BAMB project focused on materials, 4RINEU focused on energy efficiency and renewable energy, etc).

Therefore, a new circular thinking approach is required to enable better decision-making on the selection of circular solutions at different levels for all different stages of a building's life-cycle. This new approach needs to promote the participation and interaction among stakeholders at each stage of the building to ensure optimal functionality and use of resources (water, waste, material and energy) in a co-creation process. The transition from linear to circular business models in the housing sector will massively contribute to a low-carbon urban economy in future green cities as well as to the reduction of waste and GHG emissions, contributing to COP21 objectives and the achievement of goals proposed by the 2030 Agenda for Sustainable Development (United Nations, 2015).

The HOUSEFUL project is implementing that innovative paradigm shift towards a circular economy for the housing sector. The main goal is to develop and demonstrate an integrated systemic service composed of 11 circular solutions co-created by stakeholders in the current housing value chain. The HOUSEFUL Service aims for circular management and efficient use of water, waste, energy and material resources at all stages of a building's life-cycle in Europe.

In this sense, **co-creation** is an essential and transversal action for HOUSEFUL leading to effective engagement of the stakeholders. The co-creation process aims to create a path to overcoming the cultural and social barriers associated with the paradigm shift.

This report is part of Work Package (WP) 3: **Co-creation of HOUSEFUL services** and more specifically Task 3.2 *Engagement and co-creation activities*. This task aims at analysing the specific factors influencing behaviour and the choice making structures of people and the potential social risks and the barriers affecting the successful demonstration of the proposed HOUSEFUL solutions as new services (identification of the individual and collective needs, definition of common goals and best consensus scenario). This task should lead to the engagement with local and regional stakeholders from the "FrontRunner" Buildings (demo-sites).

Aim of this report: To analyse the specific factors influencing behaviour and the choice making structures of people and the potential social risks and the barriers affecting the successful demonstration of the proposed HOUSEFUL solutions as new services

Previous to the development of this report, *Deliverable_3.1* and *Deliverable_3.4_Social engagement strategy for the co-creation of HOUSEFUL solutions as new services* provided a detailed review of the stakeholders from their identification to the analysis process for the different HOUSEFUL solutions and demo-site locations. This already included the analysis of factors influencing effective engagement in the HOUSEFUL co-creation process.

This report addresses the initial results on social perceptions and beliefs in circular economy at the building scale from the stakeholders consulted. A final version of this report (*Deliverable_3.5* version II) is planned for the end of the project (2022) in order to provide the following envisaged outcomes from this analysis:

- Detailed insights on the knowledge needs from the solutions proposed by HOUSEFUL - as perceived by the participants of the co-creation process.
- Detailed insights on the barriers, enablers and needs of the implementation of the HOUSEFUL solutions.

The intended readers of this document are the stakeholders related to each of the demo-sites and the stakeholders from the housing value chain that can (and should) include circularity in their developments.

The structure of this document is based on the methodology developed and its results. Section 2 of this document describes the conceptualisation of this report including a literature review of the social variables for analysis and describes the resultant analytical framework that has been developed.

Section 3 provides an overview of the common methodology implemented to complete this report. This section also provides an overview of the four demo-sites in the project to help the reader to contextualise the report.

Section 4 provides the main results after integrating the evidence generated in the consultation process. The results have been organised on the basis of the analytical dimensions as provided in Section 2.2:

5. perceived risks and benefits (perceptual study) ,
6. governance factors,
7. behavioural factors,

8. other factors: socioeconomic, semantical factors, and considerations of the environmental parameters.

Section 5 of this document provides an overview of the initial identified factors that are shaping the behavioural intentions towards the use of HOUSEFUL solutions from the governance structures that could be achieved to the perception that influence these decisions.

2 Conceptualisation of this report

The implementation of circular solutions implies that changes would be required in the daily behaviour of the inhabitants. In fact, it is in behaviour that new forms new forms of collaboration between agencies, acquiring and incorporating new knowledge, and establishing some changes at the cultural level on the use of resources should be established.

The research questions below are aimed at observing what factors can condition these elements described above:

- *Who are the relevant stakeholders?* (addressed in Deliverable_3.1 and Deliverable_3.4)
- *What changes in behaviour are foreseeable? What changes in behaviour will be more difficult to acquire over time?*
- *How are these solutions perceived: beneficial or detrimental?*
- *What structures in the decision-making process in the housing sector would be influenced or mobilised?*
- *Do socio-economic levels and social inequalities matter in the implementation of these solutions?*

We therefore looked at various areas of social research in order to answer these questions. Given that the process of co-creation, at the time of writing (2020) is ongoing, it is hoped that this process will contribute to a much richer final version of this document at the end of the HOUSEFUL project. Therefore, in this report we will look into the initial insights in order to answer those questions.

This section of the report is framed to configure our analytical model. Therefore, first we addressed results from an extensive analysis of the available literature (section 2.1) in terms of the state of the art of the circular economy and the housing sector. This review allowed us to identify and extract the study variables that would shape our analysis model, which is described in section 2.2

2.1 Literature review

Circular approaches in the housing sector described in the literature can guide and increase the efficiency and sustainability of future actions such as those promoted within the HOUSEFUL activities. The literature review process is set out in Annex 1 of Deliverable_3.1 and _3.4: *Social engagement strategy for the co-creation of HOUSEFUL solutions as new services*. The dimensions that emerge in the literature and which are of relevance to behavioural research on circularity can be framed in several dimensions. The main conceptual dimensions that framed the research are related to: governance, risk/benefit perception, behaviour, cultural conditions, and socio-economic factors.

In the governance dimension, governmental organisations and public agencies have an important role to play in order to foster sustainability in the housing sector. They have the power to implement specific policies for the sustainability of the housing sector (Olanipekun et al. 2017). The policies that governments implement in this respect, should take into account the characteristics of each geographical region and include geographical and social heterogeneity of the household needs (Caeiro and Ramos, 2015). European policies on circular economy should connect specific

dimensions of the circular economy with social topics of congruence between citizen and policy understandings to raise public acceptance for the concept (Hernández-Sancho et al. 2015). This is why it is important to integrate into policies the lessons learned from pilot studies and to incorporate new policy objectives into adaptive policy instruments (Frantzeskaki and Tilie 2014; Hamann and April 2013).

To achieve **effective governance** for circular housing solutions, information management for all stakeholders is a crucial aspect if commitment and interest of stakeholders is to be ensured. Without effective communication and information management it is difficult to implement a fair and sound decision-making process in which outcomes are generated and trust is built in its governance structure and its mechanisms (Hartley 2006). Genuine deliberation is even more relevant in the context of high social inequality and when stakeholders with different interests are involved (Frantzeskaki and Tilie 2014; Hamann and April 2013)

Several examples exist of the successful involvement of improved governance to ensure sustainability in the housing sector. For example, environmental initiatives can be a way to incentivise community building that can achieve a revitalisation of neighbourhoods. This can be achieved without gentrification and displacement while providing a space for learning that strengthens democracy and planning practices for the neighbourhood and the city (Anguelovski 2013). However, it is clear that neither bottom-up nor top-down approaches in isolation will achieve an effective and sustainable governance approach for circular solutions. Thus, it is evidenced that there is the need to integrate both bottom-up and top-down approaches that stimulate social learning and allow trust to be built among the governance networks (Domenech and Saurí 2010).

It is not only a matter of stakeholder being directly involved. For those stakeholders which do not want to participate directly in the governance structures of circular solutions, information transfer and uptake can be sufficient. Being informed can be an incentive to change behaviours and create the institutional capacity towards the required change that the circular economy paradigm shift requires. A way to address this is described by Vassileva and Campillo (2014) who evidenced that stakeholders that do not want to be involved in the governance structures preferred to receive feedback through letters and in-home displays.

The models of circular consumption require consumer acceptance, however there is currently a lack of knowledge and familiarity with these models, which is preventing the development and adoption of a Circular Economy (Muranko et al. 2018). There is little research on behaviour change with specific regard to the Circular Economy (Muranko et al. 2018 and Ellen MacArthur Foundation, 2013). Data collection on this is still in its infancy due to its challenging (Atherton, 2015) and multi-disciplinary scope. Consequently, organisations such as the World Bank and the European Commission are calling for further research into the influencers of psychological change in resource consumption and circular economy.

Governance, knowledge and learning also have to be accompanied with an assessment of the **social risk and benefit perceptions**. In this regard, it is important to note that risks are often related to perception regarding the housing market and the need to change behaviours (Poortvliet et al. 2018). In the same sense, the lack of awareness can become a problem as it can constitute a barrier for the adoption of new technologies (Barnicoat and Danson 2015).

Pro-environmental subjective norms and **risk and benefit perceptions** influence consumers' willingness to accept circular solutions. In that sense, consumer acceptance can be driven by perceived risks and the need to change behaviour, but also by environmental benefits (Poortvliet et al. 2018) (Espluga Trenc et al. 2017). For instance, one example of a circular approach - water reuse systems - the acceptance can depend on the risk perception, water culture, and threat (water quality) perception of stakeholders (Mankad and Tapsuwan 2011). Indeed, there are examples of high levels of support for the water reuse (Bakare, Mtsweni, and Rathilal 2016; Hurlimann & Dolnicar, 2016; Fielding et al., 2018). Another example can be found on the measures to increase energy efficiency. Here a combination of economic, socio-cultural and environmental motivations is seen as important. These motivations will be affected by a number of interrelated internal and external factors and mediated by the emotions of the individual (Organ, Proverbs, and Squires 2013).

Motivations and stakeholders' belief structures are strongly connected to specific **cultural conditions**. Culture generates a set of norms and values and these at individual level can play an important role for pro-environmental behaviour (Horne and Kennedy 2017). In this sense, household's propensity to invest in building-scale renewable energy solutions is influenced by the cultural expectations of that household (Domènech and Saurí 2010). In that same study it identified that economic, social and cultural factors play different roles at different stages of the diffusion process of a technology.

Creating a culture of awareness and of educating people on circularity is relevant to increase the acceptance of circular solutions, thus it depends on some socioeconomic profiles. A concrete case is how increased knowledge and education can reduce the risk of social refusal of proposed solutions (Domènech and Saurí 2010) while increasing the likelihood of adoption of new technologies (Hamilton-MaClaren 2013). In this sense, (Pelău and Chinie 2018) indicates how lower secondary education, influence negatively the recycling rate of waste in an economy and tertiary education has a positive influence on the level of recycled waste.

Considering certain socio-economic factors such as procurement attitudes, household dynamics, behaviour and awareness are of relevance to explore stakeholders' belief structures, many aspects should be addressed within this context. For instance when considering procurement and dynamics at the household level Meehan and Bryde (2015) identified that commitment to sustainable procurement activities exist at the individual, organisational and sectoral level. However, when taking a closer look, it becomes evident that tenants, who represent a critical part in the value chain, often do not prioritise sustainable procurement. Further up the value chain, regulators also tend to have a low level of knowledge of sustainable procurement. Contrary to that, consortia¹ of stakeholders do have a higher perceived knowledge on sustainable procurement (Meehan and Bryde 2015).

¹ The author describes *consortia* as network of organisations working together

Further important factors that influence **behaviour** at household level are: ownership, access to capital, educational level, age and sex (Heiskanen, 2016; Luo, 2017). Looking specifically at the case of energy technology procurement at the household level, according to Heiskanen and Matschoss (2017) access to capital and home ownership are two significant factors that explain the investment in building-scale renewable energy technologies. Also, the type of physical building stock (share of single-family homes) and the nature of tenure (share of owner-occupancy) play an important role as factors influencing decision-making structures. It is likely that building-scale renewable energy technologies are diffused more rapidly in countries with a sufficient population of economically comfortable, relatively well-educated single-family homeowners (Domnech and Saurí 2010). Luo, Kanzaki, and Matsushita (2017) indicate that different consumer segments have different preferences for green building attributes, evidencing that green energy is the preferred attribute of younger consumers and people with higher levels of education and thus are willing to pay more to support green buildings.

Finally, awareness and behaviour can have important impacts on the environment. For example, in the water sector, high levels of acceptance for the reuse of grey water can be a key issue for the success of water conservation (Bakare, Mtsweni, and Rathilal 2016). Hence awareness and acceptance make solutions such as grey water reuse possible in practice. Likewise, perceived risks for the implementation and operation of circular solutions can be related to the use of organic fertilizers (Case et al., 2017).

2.2 The Analytical model

Based on the findings from the literature review, several research variables have been extracted in order to build a robust analytical framework that adequately addresses the research questions.

The table below provides an overview of the areas of the analysis, the identified variables, their description and relevant references in the literature.

Analytical Variables	Variable description	Reference in the Literature
Area of Analysis 1: Perception (risks/benefits) Risks perceived by the stakeholders over the proposed solutions. They all are subjective notions upon circularity expressed by stakeholders. They can be broadly grouped into two categories: risk and benefits.		
Perceived risks/benefits for environmental/health related issues	Perceived risks with regards to: environment/nature and health, governance, socio-cultural and technological issues	Espluga (2018); Harclerode et al (2016); Olanipekun et al (2017); Jung et al (2016); Graham (2012); Bakare et. al (2016); Tsoka (2018)

Area of Analysis 2: Governance		
Organisational – related to aspects about how different management systems, and/or governance of Housing and Circular Economy can condition the engagement procedures		
Governance structure	Political system and participation in decision making. Focusing on organisational level and levels of coordination between different departments, divisions, in public or private organisations	Tsoka (2018); Olanipekun et al (2017); Meehan (2015)
Municipalities (role)	Policy planning at local level, role of municipalities in the decision-making process of housing and circular economy.	Frantzeskaki (2014); Hamann and April (2013)
Future trends	Future development of circular economy in the region. Issues about engaging with other organisations, initiatives, etc.	Smol et al (2018); Repo et al (2018)
Institutional Knowledge	Knowledge about circular economy – Awareness raising, at institutional level, on the importance to acquire new knowledge on circular economy	Smol et al (2018); McCabe et al (2018)
Capacity to adapt/political	Capacity to adapt to circular economy models. Exploring the stakeholders' resources to adapt to circular models (it is not about willingness or attitudes but resources).	Smol et al (2018)
Area of Analysis 3: Cultural aspects/Behaviour		
Behavioural aspects related to experience and daily life of the stakeholders. Behaviour attitudes and subjective norms towards reuse and reuse schemes, perceived behavioural control over knowledge, perception of presence or absence of capacity, resources and opportunities to adopt reuse schemes, perceived attitudes towards new technologies in circular economy and refurbishment. The work in this area of analysis is based on the Theory of Planned Behaviour (TPB), proposed by Ajzen in 1985. It is one of the most extensively used behaviour theories and one of the most popular theories to analyse individuals' intention and the related behaviour (Zhang et al. 2018).		
Subjective behavioural norms (cultural aspects)	The way of living, cultural beliefs related to the context of the building. Cultural and community stability and cohesion, with regards to the building as a community	Jiang et al (2013); Tsoka (2018)
Subjective behavioural norms (economical aspects)	Beliefs related to market appeal of green building projects. Perceived financial incentives or monetary gains provided by the government.	Olanipekun et al (2017)
Attitude towards behaviour	Approaches to encourage a behavioural change (as needed for new reuse systems). Motivation or attitudes that can encourage the behavioural change	Graham (2012); Olanipekun et al (2017); Breuste and Artmann (2015); Tsoka (2018)

Perceived behavioural control	Awareness of the existence of solutions in circular economy. Perceived capacity towards recycling, sustainable behaviour, reuse practices. Perceived knowledge and capacity towards the implementation of HOUSEFUL solutions.	jiang et al (2013); Prouty et al (2018)
Area of Analysis 4: Other Socio-economic factors		
Age, Gender, education, etc.	Correlation of socioeconomic and demographics variables with the factors already identified (if any).	Graham 2012; Prouty et al (2018)

Table 2: Variables used within the analysis of the present report.

In order to identify factors conditioning attitudes and behaviour towards the use of circular solutions in the housing sector, we have focussed on 3 areas for social analysis.

- I. Individual risk and benefit perception;
- II. Organisational and governance aspects;
- III. Behaviour and the capacity to generate change

Within the area of risk and benefit perception, the focus will be on the perception in 4 levels: (i) Governance, (ii) technological, (iii) socio-cultural and (iv) environment and health. These four levels will be assessed from a point of view of the identification of individual perceived risks/benefits. As the first area of analysis introduces the next two areas, the related aspects will be strongly interrelated.

In the organisational and governance (of the institutions involved) focus area, we will delve deeper into the governance of a circular housing to find out which are the existing and desired models in each HOUSEFUL case study. Additionally, we will look at what the current situations are and how the future of the governance model is to be implemented within the framework of the circular economy. Knowledge and institutional capacity issues will also be included in this area of analysis. Finally, we will work at the local level with municipalities on the case studies to better understand how they may implement mechanisms of circular economy in the housing sector.

We will use the Theory of Planned Behaviour (TPB)² to evaluate the intentions of change of the interviewees. We will also assess their capacity to influence, the subjective norms that condition the decisions they make, as well as adjacent cultural and economic aspects that condition the capacity to generate the necessary change for a circular economy. Throughout the process, we will keep a correlational look at socioeconomic aspects. However, as this is a qualitative study, we will not have representative samples to support the findings. We will rather stick to the induction description of this dimension.

² The Theory of Planned Behaviour (TPB) links one's beliefs and behaviour. The theory states that attitude, subject norms, and perceived behavioural control, together shape an individual's behavioural intentions and behaviours.

For each variable, we have also distinguished among environmental parameters: water, energy, materials and air, in order to highlight possible differences in approach.

The figure below describes the process analysing the dimensions and variables throughout the HOUSEFUL project timeline.

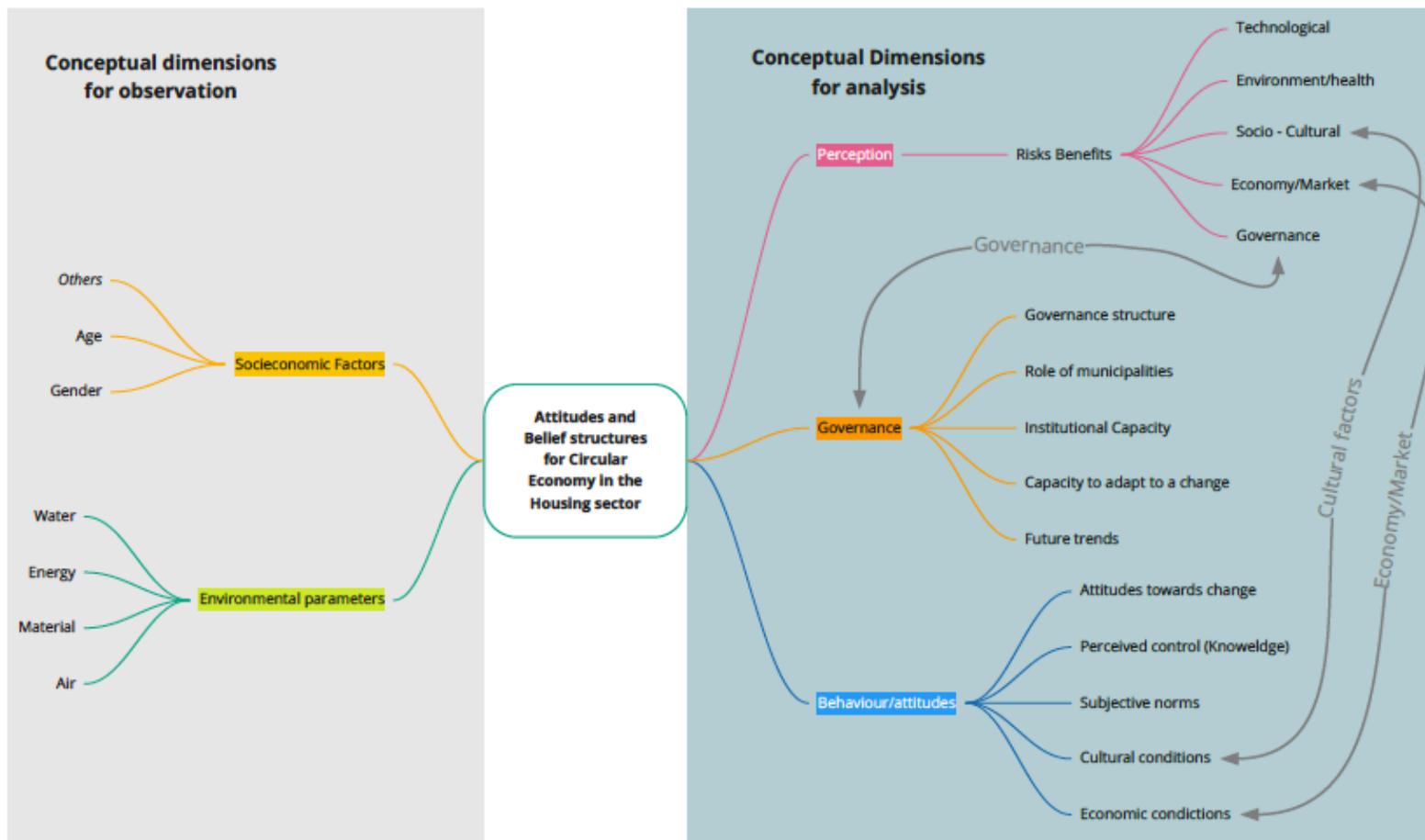


Figure 1. Analytical model for the socio-analysis of social perceptions and beliefs of HOUSEFUL solutions.



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3 Methodology

3.1 The methodological steps

The methodology used to collect the results of this study is also shared with the other tasks of WP3. This methodology is further detailed in Section 2 of Deliverables 3.4 and 3.1. This section provides a summary that helps the reader to contextualise the methodology.

The methodological objectives that relate to this report are the following:

- Evidence gathering through stakeholders’ consultations regarding factors shaping opinions and behaviour towards the use of solutions in a circular housing model
- To develop an understanding of why stakeholders would support or reject the HOUSEFUL solutions and the reasons behind that.

The planned methodology was built around this aim, together with the objective from Task 3.1, at setting the basis for the implementation of the co-creation process. Figure 2 details this procedure and the plan for the consultation actions in terms of the tasks, resources and documents in this report and their timing for the purpose of this report.

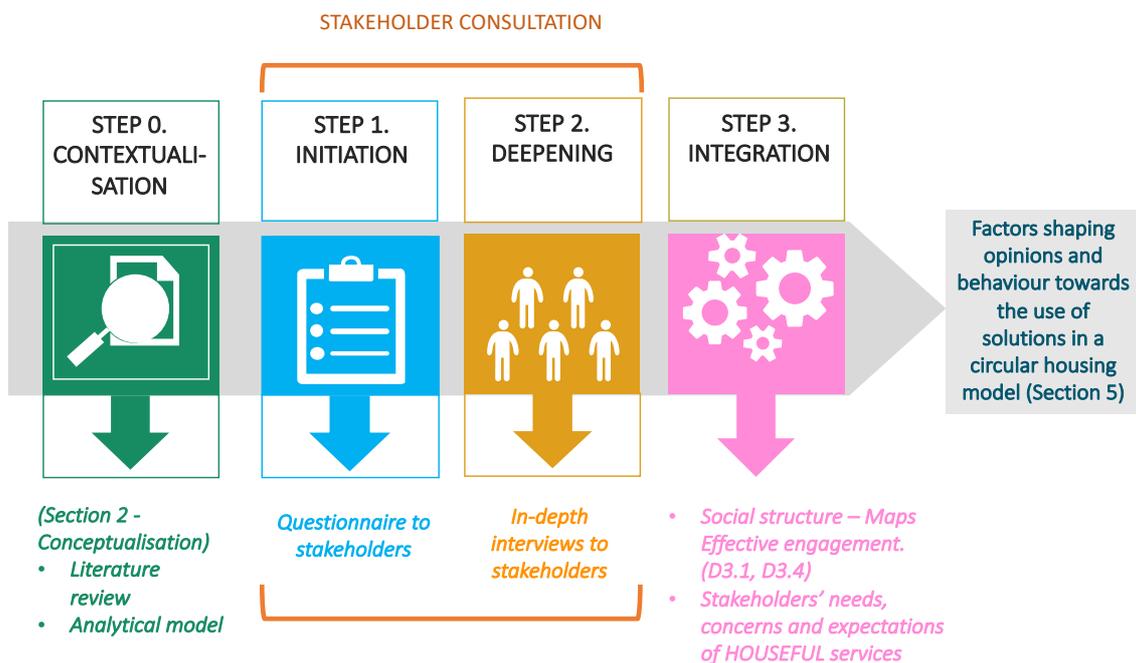


Figure 2 Methodology to achieve the objectives of this report.

- **STEP 0. Contextualisation:** the literature review and the contextualisation (already addressed in Section 2) allowed to identify the analytical variables and

dimensions of the analysis and to set up a consultation framework for Steps 1 to 3, as well as to create a social profile for each of the demo-sites and thus a contextualisation for each of the demo-sites.

- **STEP 1 Initiation**- This step is related to undertaking an exploratory questionnaire to a selection of the key stakeholders (some of them aware of the existence of the project HOUSEFUL, and/or involved in related initiatives in the sector, and/or related to the demo-sites, and/or unrelated actors which have shown interest in the project). Further to this, we initiated contact with key stakeholders which were unaware of the project but could add value to WP3.
- **STEP 2 – Deepening**. During this step we deepened the social analysis, based on in-depth interviews and focus groups with the aim of gathering qualitative evidence. The results from Step 1 were used to frame the protocols for the interview and focus group guides. Finally, all the results will be integrated into Step 3.
- **STEP 3 – Integration of results**. This was done based on two approaches:
 - **STEP 3.1. The quantitative approach:** Stakeholder mapping was undertaken through the process of Social Network Analysis. This step is addressed fully in Deliverable 3.1 and 3.4 and not here.
 - **STEP 3.2. A qualitative approach:** Analysis of the stakeholders' needs, concerns and expectations of the HOUSEFUL services in order to gather insights of stakeholder's behavioural decisions for building circularity through a stakeholder engagement process based on a co-creation process.

For the purpose of this report, the Deepening step (Step 2) has been the most important source of evidence to build the analysis in Step 3. Mostly the results from Step 1 have been integrated as a support for the evidence gathered through interviews and focus groups in Step 2. For further information on the questionnaire undertaken, Deliverable.3.1. Annex 2 provides the template for the interview and the report of the interview.

To consult with the stakeholders, interviews and focus groups were based on a list of semi-structured questions (see Annex 1). The selection of stakeholders for interviews and focus groups was established from the outputs of the questionnaire implemented in Step 1 and the willingness of stakeholders to participate in the consultation processes. The expected duration of each interview lasted around 1 hour, and in the case of the focus groups, they lasted around 1,5 hours.

In order to increase the effectiveness of the interview process, consortium partners were assigned stakeholders that had a willingness to participate in the HOUSEFUL services and with whom they had contact. Each partner, based on a pre-established protocol (for further information see Deliverable.3.4.), interviewed stakeholders



with whom they were familiar. Therefore, interviews were undertaken by the following partners: AHC, Aiguasol, ALCN, WE&B, Housing Europe, Homebiogas, ITEC, Neues Leben, Reinberg and Turntoo. Interviews were preferentially done in the mother tongue of the interviewed stakeholder or, if that was not possible, in English. After the interview, they were transcribed verbatim (with some limitations, see Annex 1) and translated into English. This process aided in the interview transcripts to be coded as outlined in Section 3.3.

The stakeholder groups that were targeted for the consultation phase were: researchers, suppliers, designers, public agencies, inhabitants, policy makers, municipalities and any other type of stakeholder relevant to the housing sector (academia, civil associations). As another group listed as stakeholder categories are those related initiatives in the sector, such as: Housing observatories, other research projects, policy initiatives, etc. Key facts of this consultation process are included in Deliverable 3.4. (number of consultations, type of respondents, etc.).

3.2 The Co-creation workshops

The results of the interview and focus group analysis served as baseline to design the **co-creation roadmap** based in a series of co-creation workshops³ (CWS). This entire process is further described in Deliverables 3.1 and 3.4. For the design of these workshops ideas that could be co-created had to be selected for each demo-site to further map out the stakeholder's belief structures underlying their behaviour, attitudes, and societal concerns related to the HOUSEFUL services. The activities for the co-creation roadmap follow a backcasting process⁴ with the selected stakeholders. Due to the problem-solving character of this methodology. Backcasting workshops are intended to get the participants to evaluate the future and to justify their reasons during the ongoing facilitated deliberation. The structure of co-creation roadmap consists of a series of three workshops that will take place at each of the demo-sites with the local stakeholders.

- *CWS series 1 –Desired Futures -*
- *CWS series 2 – Ideas Generation*
- *CWS series 3 – Materialising the futures*

Through the process of observation, the results from these workshops are further integrated into the discussion of the overall results. However, the aim of this report is not to provide the results and to explain the steps of this process (this will be

³ Co-creation workshops are an open space for open deliberation and knowledge generation between diverse stakeholders. In this way co-creation workshops of HOUSEFUL are not only a data collection method to identify practices and belief structures, but also to elaborate contents on circular solutions in the housing sector.

⁴ Backcasting is a method for planning the actions necessary to reach desired future goals



further addressed in Deliverable 3.3. *Social conditions for the co-creation of all HOUSEFUL services and co-created materials*), but rather to collect and summarise the process of co-creation and its related results.

The output of this activity is being used as the basis for the co-creation of socially validated HOUSEFUL services and to provide further considerations towards behavioural changes after effective engagement (HOUSEFUL Solution number 2).

Regarding the implementation of the co-creation workshops, at present and due to the extraordinary circumstances triggered by the COVID-19 pandemic, a reorganisation of activities has taken place in order to adapt these workshops to an online environment and interactions. Taking this into account, for demo-site 1 the first series of CWS could take place in March 2020 in a face-to-face environment. For all other demo-sites, the first workshops were implemented in an online format since June 2020 using a combination of software (Microsoft Teams, Zoom and Miro APP).

In the first series of the co-creation workshops, the stakeholders identified ideas to be implemented within the HOUSEFUL project. In total 15 co-creation ideas have been identified amongst all demo-sites. Based on these co-creation ideas the HOUSEFUL team developed the **co-creation factsheets** (see Annex 2). These co-creation factsheets have the purpose of facilitating the integration of the co-creation ideas within the HOUSEFUL project. The co-creation factsheets are short documents (1-3 pages in length) including the key aspects for the implementation of the ideas.

The second series of CWS are currently underway with the following already implemented:

- Demo-site 1 in July 2020.
- Demo-site 3 in December 2020.
- Demo-site 4 in November of 2020.

The objective of this second series of CWS is to identify for each of the 15 co-creation ideas the list of assumptions and responsibilities for the implementation of the HOUSEFUL solutions. Thus, they are based on the information gathered by the HOUSEFUL consortium in the co-creation factsheets for each co-creation idea. A summary of the current status of the activities can be found in the figure bellow. They are source of evidence for this report, but mostly they are the vehicular evidence evolving from the co-creation process, updated after each step took place. They are evolving from the title of initial ideas to their implementation through actions plans that are developed together with the stakeholders.



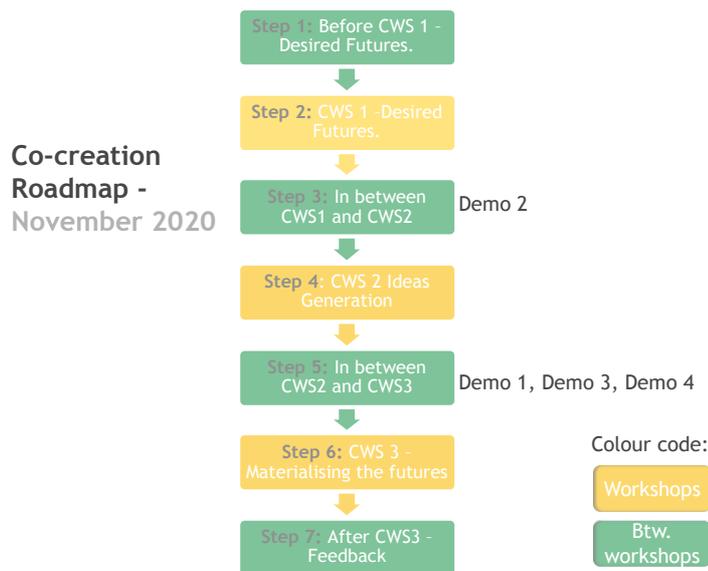


Figure 3. Current status⁵ of progress on CWS implementation highlighting the state of each demo-site with regards to the co-creation Roadmap (further elaborated in Deliverable 3.4).

The HOUSEFUL CWS has been able to engage a broad and diverse range of stakeholder groups involving the entire housing value chain (including municipalities and public housing and financing institutions, etc.). Through observation and an inductive process, the results coming out from the discussions are also addressed in this report. This is an ongoing activity and thus updates on this process will be reported on throughout the life of the project.

3.3 Data analysis

To analyse the gathered data MaxQDA - a software program designed for computer-assisted qualitative and mixed methods data, text and multimedia analysis – was used. With MaxQDA a qualitative analysis was performed in order to analyse the stakeholder’s belief structures underlying their behaviour, attitudes, and societal concerns with regards to HOUSEFUL services. This analysis also allowed the creation of a strategy for the development of solutions based on a co-creation approach. The interview transcriptions were coded using MaxQDA according to the variables described in the literature review and contextualisation (Section 3). This process allowed for topics to be identified, and their subsequent relevance assessed. The deductive analysis was treated equally for all variables,

⁵ Step 1 “before WS” refers to the steps taken in section 3.1 (consultation process)

however in this report we only addressed the issues of belief structures underlying their behaviour, attitudes, and societal concerns of the HOUSEFUL services. Deliverables 3.1 and 3.4 have already addressed the variables related to Social Network Analysis and effective engagement.

Information gathered through the interviews were also complemented together with the outputs from the questionnaires that were implemented (Step 1).

From this analysis, co-creation ideas were collected for the workshops using deductive reasoning. In addition, ideas for co-creation were also identified through an internal brainstorming process based on a questionnaire to the HOUSEFUL consortium partners.

According to the analytical model described in Section 3.2 of this report, the results from this step are discussed in Section 4 of this document and are based on the analysis from the table below which summarizes the coded dimensions and the associated variables.

Coding dimension	Codified Variables	
Risk perception	<ul style="list-style-type: none"> Health/Environment Technology Socio-Cultural 	<ul style="list-style-type: none"> Policy/Governance Economic/Market
Benefit perception	<ul style="list-style-type: none"> Health/Environment Technology Socio-Cultural 	<ul style="list-style-type: none"> Policy/Governance Economic/Market
Governance/organisational	<ul style="list-style-type: none"> Municipalities Future 	<ul style="list-style-type: none"> Institutional Knowledge Capacity to adapt
Cultural	<ul style="list-style-type: none"> Awareness Economy Market Property 	<ul style="list-style-type: none"> Community cohesion Beliefs Barriers
Behaviour	<ul style="list-style-type: none"> Satisfaction Performance Power influence 	<ul style="list-style-type: none"> Change Ecologic behaviour
Personal attitudes	<ul style="list-style-type: none"> Ownership Motivation 	<ul style="list-style-type: none"> Awareness Nature
Socio-economic factors	<ul style="list-style-type: none"> Social and economic drivers 	

Table 1 Codified dimensions and variables.

3.4 The context of the analysis: overview of the 4 demo-sites

The following section provides an overview of the 4 demo-sites of the project from the social, political and the context of understanding of the circular economy.

Demo-site 1 - Sabadell



Activities in Demo-site 1 will be carried out near the public primary-school *Joan Sallares i Pla*, in a building called "The teacher's block", located at Calle Campoamor 98, which is currently being renovated to be use for social housing. The building was built in the early sixties consisting of eight residential floors with two flats per floor. The building has become increasingly disused over recent years and for that reason, all 16 flats need significant refurbishment. The building is owned by the Catalan Housing Agency (a partner within the HOUSEFUL project) who has issued a refurbishment contract in which HOUSEFUL solutions are foreseen. As of November 2020, inhabitants have not yet been selected by the Council of Sabadell and as such are not yet inhabiting the building. Flats will be assigned to people from the emergency housing list and mixed together with regular social renting to work as a pilot case. The aim of this mixture is to increase the social diversity within the building. The district of Campoamor in Sabadell is located in the south of the city and is characterised as a working-class neighbourhood with substantial challenges including high rates of immigration, squatters, etc.

Demo-site 2 – Sant Quirze del Vallès

Activities in Demo-site 2 will be carried out at Ronda d'Arraona 29, which is currently dedicated to social housing. The building is owned by the Catalan Housing Agency and INCASOL, both public agencies of the regional Catalan Government. On the ground floor of the building a social space is available in which community activities take place. In this demo-site a large proportion of the flats are provided to young people as social housing. A significant challenge related to this demo-site is that the progress monitoring of the socio-economic background over time of the inhabitants has proven to be difficult. A second challenge is that at present the communication and coordination between the owners and the city council has been contentious. The city of Sant Quirze del Vallès is located between Sabadell and Terrasa, the two major towns in the Vallès Occidental region. Sant Quirze has an average socio-economic characterisation within the metropolitan region of Barcelona.

Demo-site 3 – Cambium

Activities in Demo-site 3 take place in the former military barracks (Hadik Kaserne), built in 1960, which is a considerable brick construction. As it was used for military education, the building can be compared with a school building, with long corridors, big community bathrooms and kitchens. Other than the building itself, which measure 5.882 m², the property includes a forest, grassland and an agricultural area. Since 2017 the property has been adapted for living and working purposes for 75 people, at present. The residents' community was founded in 2014 with the aim to build an economic, social and ecologically sustainable village. In 2017 the Cambium Community Project rented the former military barrack and began to transform the main building into a suitable living and working area with residential units, co-working spaces, studios and a seminar facility. Furthermore,



there are two more buildings, used for events and workshops. In May 2019, Cambium bought the property with an "asset pool", a direct credit campaign, with over 250 investors. The Cambium Community is organized in a horizontal way through a so called "sociocracy", based on consent decision making processes. All inhabitants can participate in working groups, which are coordinated in higher working circles containing of 2 representatives of each working group. These working circles (in total four) are again represented in a higher leading circle. Each working group and circle has autonomy in execution decision making but they are all coordinated by the next higher circle in terms of policy decisions.

Demo-site 4 – Donaufelder Straße 115

Activities in Demo-site 4 will be implemented at Donaufelder Strasse 115, which is a residential building consisting of 54 apartments, one-day care centre and one supervised flat-sharing community for young people. The living area is around 4,626 m² which makes an average size of 85.66m²/unit. From a technical point of view, this building is comparable to approximately 70% of residential buildings in Austria. This building is owned and managed by Neues Leben and the cost structure is based on social housing, which means that the rents are more affordable. The building was finished in 2017 and the inhabitants were (based on an initial survey) on average 27 years old which leads to lots of single households or two people. There are some common rooms which the inhabitants take care of together like for example the rooftop garden.



4 Results: The attitudes, behaviour and perceptions fostering circularity in the building sector

The attitudes, behaviour and perceptions towards circularity in the building sector are presented in this section and classified according to the approach described in section 3.2. The texts interpreting the results are on occasion accompanied by quotations taken from the transcriptions of the stakeholder consultations that were held and that may help to understand or support the statements given. In addition, a mind-map concept is presented at the beginning of each section, which outlines the aspects and factors dealt with in each of the respective sections.

4.1 What are the perceived risks and benefits with regards to Circular Solutions in the Housing sector?

The question addressed in this section is: What are the issues of concern and alternatively the issues that can support the HOUSEFUL technologies? This area of analysis is used as introduction for the two others (governance and behaviour/Culture) with the perspective of risks benefits perceived by the stakeholder groups.

We have used an integrated framework of theories of social perception of risks and benefits based on Espluga 2017. The basis for this was to understand that the different actors interviewed and consulted interpret the risks and benefits of implementing circular solutions in the housing sector differently, in addition to the different contexts of 4 demo-buildings. This text, however, attempts to give an initial approximation to answer the question: how the implementation of circular solutions in the housing sector is perceived as a risk and/or a benefit?

In this integrated framework we have grouped and identified the following relevant aspects and areas which help us to gather the results in each of the respective subsections:

- **Economic/ Market and cost categories:** This category refers to the perception of factors related to economic aspects, both positive and negative. Issues such as potential new businesses related to the development of new circular services, increase or the improvement of costs, the needs for new public or private investments, housing prices and the daily consumption, etc.
- **Health and environmental categories:** This category include perceptions of positive and/or negative effects related to human health, at the individual level (feeling of comfort, health improvements, toxicity, etc.) and the environmental aspects, at a more collective level (such as improving



sustainability, facing up to climate change, etc.), as well as concerns raised regarding measures that encompass these two aspects.

- **Technological category:** this category includes the positive and negative aspects mentioned with regards to the use and maintenance of the solutions proposed at a circular economy and housing level (aspects of efficiency, adaptation and flexibility to changes, maintenance, quality, aesthetics, etc.)
- **Governance Category:** The political-institutional issues were grouped together that considered aspects such as: the credibility of the entities or institutions that manage it; the trust they deserve; the trust of the actors involved in the value chain; the perception of justice or injustice in their actions; the perception of equity or inequity; the taking into account of the common good; political issues, etc.⁶
- **Socio-cultural category:** This category refers to aspects related to the cognitive level (individual and collective knowledge, awareness, etc.) In this sense it refers to factors such as control or familiarity with risk or benefit which from the Cultural Theory of Risk explains how concerns or fears in the face of a risk can contribute (intentionally or unintentionally) to the cohesion of a given social group, generating a certain degree of social identity. This socio-cultural dimension includes impacts such as the perception of threats to networks of social relations, territorial identities, certain lifestyles, cultural traditions, values and beliefs, etc.

The table in Annex 2 breaks down all these categories into subcategories according to the perceived risks or benefits by groups of actors and by context (demonstrating). Annex 2 gathers quotations from the interviews. Moreover, in this Annex a graphical overview is provided of the risks and benefits perception per country and per sector according to the results from the questionnaires in the Step 1 of section 3.

Each subsection below is introduced by a mind-map figure that summarises the factors addressed over the analytical variable tackled in the sub-section. The main benefits are presented on the left of the mind map while the risks are highlighted on the right.

⁶ From this perspective, it is not easy to separate risk perceptions from the social, economic or political context in which they occur (Irwin, Simmons and Walker 1999; Van Loon 2000). Therefore, it is necessary to consider that when a person makes a judgment about a risk, he is implicitly also making an evaluation about the institutions that promote and manage it and making a judgment about the credibility or confidence that they deserve.



4.1.1 Overview of Economic and Market category

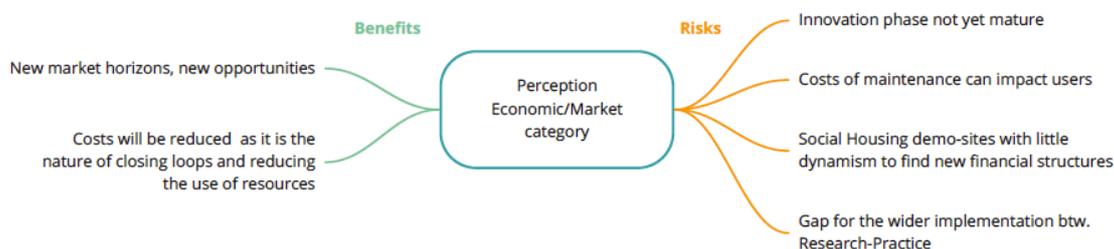


Figure 4. Factors under Economic and Market category of Perception.

In the category of economic and market aspects, the perceived risk has to do with the capacity to implement circular solutions to a greater or lesser extent. This is related to the innovation phase in which the circular economy process is at present, however, this requires a financing impulse that is not certain to be achieved. Furthermore, especially for those actors who are not so closely related to the value chain (for e.g., inhabitants, citizens associations, etc.) they understand that there would be costs that would directly impact on the consumption from the users and/or the maintenance of the solutions. In particular, the cases associated with social housing are perceived as a sector of little dynamism to create new financial structures that requires the implementation of circular solutions. At the market level, although there are already relevant pilot activities that are known to the users, it is evident that these activities have not taken a qualitative leap to a developed circular market.

"These solutions usually have associated an extra cost and costs of construction as well, these solutions make the product more expensive, make the houses more expensive. No legislator would dare to apply stricter demands to buildings"
"Financing is very low. It's ridiculous the financing they can give you. If you go for a private investor, then, they make you drop the project, and it's too costly. And if you go for bank financing, then, in the end, yes, you can get financing, but it's expensive. And in the end, these are projects that after 5 years you end up paying 35%, 40% more of its cost "

In terms of the perceived benefits in the economic and market category, it is clear that this is a growing and necessary sector that opens up new horizons and new markets. This is mainly observed by those stakeholders seen as "experts", integrated in circular housing value chain. The generation of new market opportunities required by the housing sector is valued as something positive. Contrary to the perceived risks, those stakeholders in the value chain do perceive that there will be a reduction in costs in the daily use and maintenance of materials and resources since circular solutions aim a precisely this aspect of reducing the use of resources.



"As an environmental services company, we are going to get into markets that did not exist before. First, in the integral management services in residential building, we find it for us is a very interesting market niche as the rehabilitation and renovation of existing buildings as well as the construction of new housing is of equal importance right now"

4.1.2 Overview of the Environmental and Health category



Figure 5. Factors under Technology category of Perception.

There were no risk concerns perceived for environmental issues, it seems that it is understood that circular solutions intend to work under the sustainability approach. Therefore, the only concerns that arose were related to the safety of the materials used and their comfort, as well as aspects related to the use of certain resources such as water. Concretely, there was some concern expressed for the safety of the recycled products in terms of human health and toxicity. In addition, there was a subtle mention as to whether circular solutions include aspects such as user comfort. As for the benefits that have been identified, the use of healthy construction materials and solutions that solve health problems derived from excessive humidity in buildings, were valued very positively. Within this category remarkably the main considerations are for favouring healthiness and sustainability in a sector that has difficulty moving in that direction.

"Considering the climate change, the water supply will get critical, therefore resource saving handling is very positive"

4.1.3 Overview of Technology category



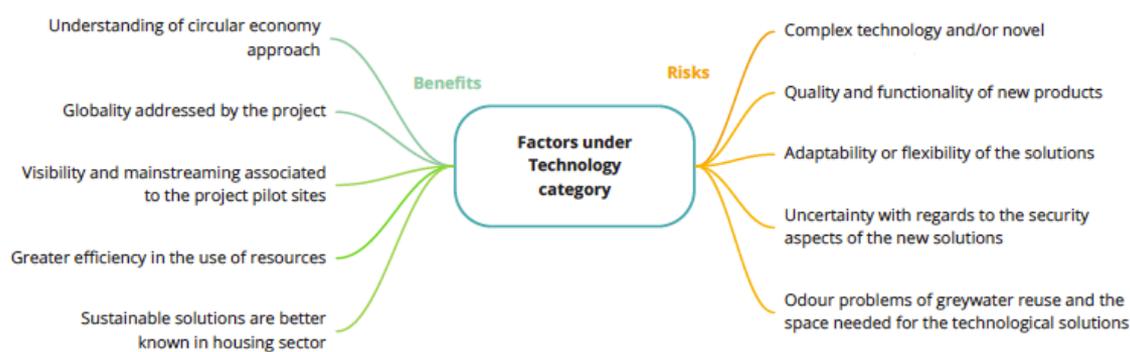


Figure 6. Factors under Technology category of Perception.

Considering that a large majority of the interviewed actors came from the value chain of circular services, it stands to reason that many aspects have been mentioned in relation to risks and benefits within the technology category. The largest number of mentions with regards to risks refers to the need for maintenance of the new services, both for the level of training that may be required by the users as well as the maintenance staff. Inhabitants perceive the risk that they won't be able to maintain the complex technologies and that it could imply future maintenance costs. Policy makers also state that trust in the operation and hence maintenance of solutions could be a problem

Concern was expressed regarding the quality and functionality of circular products, which really has more to do with the issue of "market uptake" than with the fact that they are circular solutions. Questions of adaptability and flexibility of the solutions are mentioned about what they are meant to replace, this adaptability/flexibility is a risk factor that can undermine their implementation. In this sense, it is perceived as a risk that the new equipment, or solutions may have security failures, or uncertainty regarding this aspect, which is derived from the perception of the unknown. The reuse of grey water is mentioned as a factor which generates a certain reproach, both because of its potential odour and because of the space the technology may require in the buildings.

"Maintenance is a very important issue. This should be easy and cheap, if we add difficulty and it is more expensive than a conventional system (in a way that in the final balance we have no savings), it is not worth it."

As the benefits perceived in this category, the approach of the circular economy is totally understood as something positive and necessary, the project is working in this field and its global approach is remarkable. One of the perceived benefits in terms of technology is the visibility and mainstreaming that can be given to the project pilot sites that can be seen in normal neighbourhoods of the citizens. Furthermore, it is perceived that circular solutions in the housing sector will provide greater efficiency in the use of resources. It was also stressed that society in general is becoming more visually accustomed to having sustainable solutions in



the field of housing, aesthetically they are increasingly approved. In this sense, it is worth highlighting the importance given to aesthetic issues in the housing sector, as a reflection of the identity of the building and the inhabitants living within.

"Regarding the passive measures, they should not be a problem with users. The active measures, depending on the users, it could be an issue to use recycled resources, nevertheless, the ones that are being proposed in the project, should not affect to the everyday of the users, meaning that they do not have to be aware of them".

4.1.4 Overview of Governance and Political category

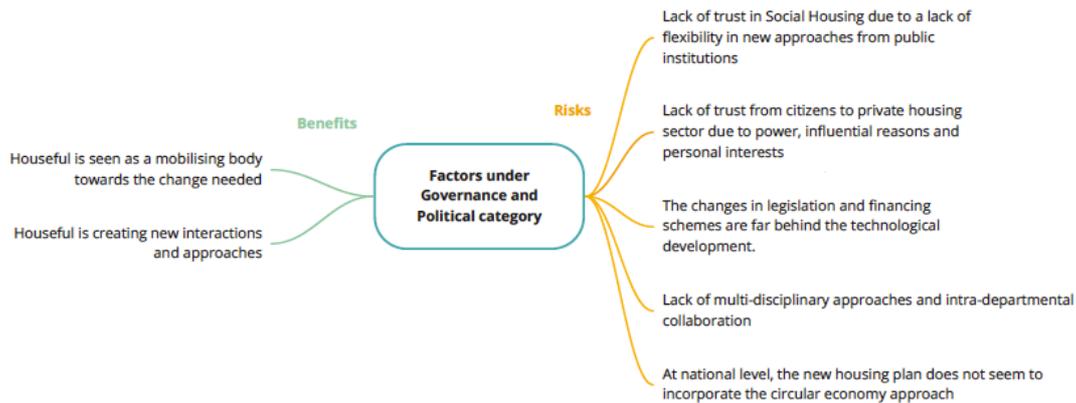


Figure 7. Factors under Governance and Political category of Perception.

In the governance category, certain general distrust is shown between society in general and the institutions dealing in the housing sector. Generally, the lack of trust in the housing sector can hinder the deployment of new circular solutions in this sector. It is perceived that there are certain barriers to implementing new processes because the housing sector and in particular the architects' community do not generate confidence within society. It is believed that there are economic interests behind the actions and not collective ones. Furthermore, as regards the issue of trust, within the public institutions themselves, there is a certain reluctance to trust that everything will go well, that the technologies will work and that there will be no problems. In the public housing sector, this is more pronounced, for two main reasons, they do not have as much flexibility of resources if the technology does not work and they need to have higher levels of confidence in it that it will work. On the other hand, legislative barriers and the need for changes in regulatory structures slow down the increase in confidence in technology. The possibility of trust generation in managers is seen as a critical point for long term applicability.

"If any European project of these ends up arriving at people who make decisions or policy makers, that even at a European level the policy makers then these decisions are subsidiary to the rest of administrations or there are lead users. There are municipalities or regions that want to imitate these policies, this then yes they are powerful initiatives"



Legislation and financing as the two most important risks for the implementation of circular economy solutions highlighted in questionnaires in confirmed by interviews.

At the governance level, more multi-disciplinary and holistic approaches are also required, and interviewees are reluctant to see this happen in the short term, especially in the area of public policy. Stakeholders from the EU level expressed also concerns in having low acceptance of the required new housing plans that circular economy would require among national planners.

The more optimistic stakeholders see a project like HOUSEFUL as a mobilising body for new interactions and new perspectives for generating engagement at the organisational level.

This category is further elaborated in the section 4.2 of this report which is entirely dedicated to the organisational and governance issues.

4.1.5 Overview of the Socio-cultural category

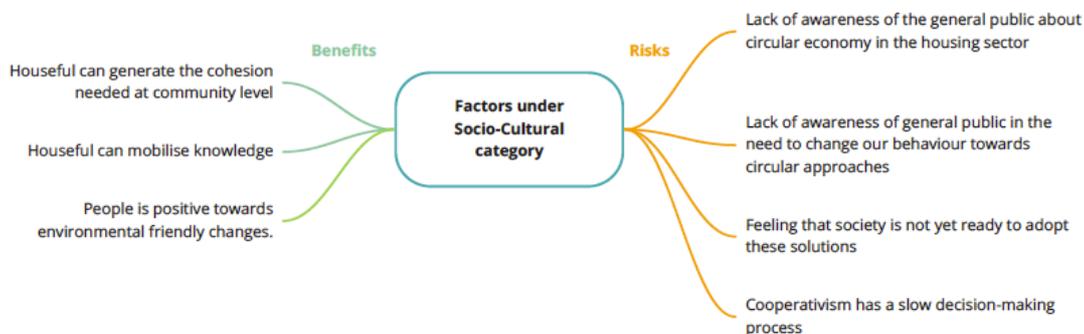


Figure 8. Factors under Socio-Cultural category of Perception.

The cultural issues have been discussed in much greater depth in chapters 4.3.2 of this document, however, certain hints in terms of perceived risk and benefit can be drawn, especially in relation to the question of the knowledge required by the different actors involved and the degree of awareness to relate to a change. It is precisely on this issue that it is perceived that the general public is not aware of the need for a change of paradigm and therefore will not show interest. This issue usually remains in the list of assumptions of the co-creation workshops series 2 where the co-creation ideas are further materialised. It is also mentioned whether this risk of having a population with little awareness is related to the feeling that society is not yet ready to adopt these solutions.

At a more specific level, in Cambium's demo-site 3 some concern is expressed about the slow machinery that their organisational level may imply, which makes having quickly implementable solutions easier for them to adopt. Here the complexity of different collective decision processes is highlighted. Following the line of argument of the perceived risks, this project is seen as a key opportunity to reduce them, since with its activities of involving society it can be possible to



generate benefits such as awareness rising on the need to implement circular solutions, mainstreaming and showcasing circular economy solutions implemented in pilot buildings, community feeling through effective engagement as well as putting society in the driving seat of the housing sector.

4.2 Issues related with Governance (organisational)

Through the consultation process issues concerning how decisions are taken in the involved organisations in each of the demo-buildings have been addressed with the aim at analysing how governance of circular economy in the housing sector is shaped.

4.2.1 What is Governance in the context of HOUSEFUL?

"I have the feeling that big organisations are difficult to be changed, they move slowly, and changes take a lot of effort to be implemented, however this needs to happen somehow."

From the above quotation from one of the consulted stakeholders we could frame Governance as the approach that is needed to be taken. Including to make decisions and to implement them in the context of the housing sector and the circular economy in the 4 demo-buildings. Consequently, three levels of governance analysis have been identified, which have been organised from a larger geographical scale to the demo site building:

- *Demo-building scale.* This level refers to how the building is managed, organised at inhabitants' level and how this concerned community interacts with the nearby community.
- *Neighbourhood and municipality of the building.* Each of the buildings are located in urban areas, close to other buildings and in a neighbourhood that can see daily the changes taking place in the building. Also, the city where it is located is showing interest in these pilot actions. In HOUSEFUL, we analyse how these interactions take place, and how this affects other decision-making process at this local level.
- *Regional scale.* Co-creation activities are carried out at regional level so that not only the most direct participants from municipalities and buildings are involved but also the focus is broadened to the region, county or area where it is located. Therefore, governance issues at regional level are often referred to. Demo-buildings 1 and 2 are located in the large metropolitan area of Barcelona and the Vallès Occidental region, as well as in the Autonomous Community of Catalonia. In demos 3 and 4 the discussions are often framed in the Austrian context.



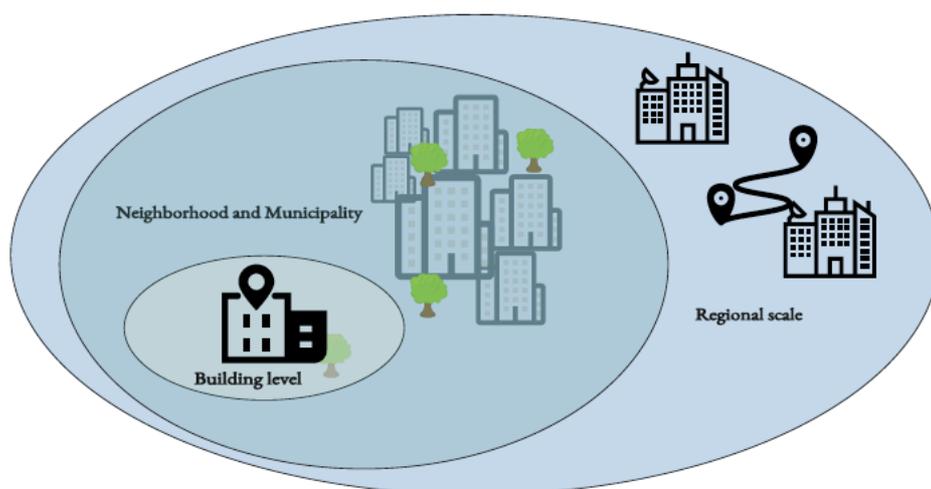


Figure 9. Levels of governance analysis.

4.2.2 Governance schemes and particularities found at each of the demo-building context

Resulting from the consultation process held in Task 3.1 and the first series of co-creation workshops (Task 3.2) a governance structure for each of the sites has been developed:

Demo-site 1 – Els Mestres (Sabadell)

The so-called *Teachers' block* ("El bloc dels Mestres") is a residential building built in the early sixties and it is owned by the AHC, under a social housing scheme. Currently, the building, with 16 medium-apartments, is empty, but very soon (early 2021) the Sabadell City Council will announce the call for new houses- Once new inhabitants populate the building, AHC will then deal with contracts of the inhabitants (or the so-called "the users" in the jargon of the AHC). Therefore, AHC and Sabadell City Council are the main bodies that will deal with the building's future residents. In addition, the building has a public school (another public institution that is managed by the municipality), they also know about HOUSEFUL and have already expressed their willingness to engage but they are lacking availability. The building is located in the Campoamor neighbourhood, which has its own social dynamics with high socio-cultural diversity, and for which the town council is promoting from its social work department. Sabadell City Council has mediation dialogue tables, ecological transition tables, and social housing tables, which have shown interest in HOUSEFUL. Another step forward, in the Valles Occidentals region, and in the region of Catalonia there is a strong commitment to position towards a circular economy approach. Both the regional government (Gencat) and other private initiatives are promoting this positioning, of which



Sabadell has several pilots. Examples are the Observatory of the Circular Economy in Catalonia and the Vallès Circular initiative.

Demo-site 2 - Sant Quirze

In Sant Quirze del Vallès, it is a small community where most people know each other. The demo site is a social housing rental building – with 24 small apartments and a common backyard- that is currently in the process of concession renewals. The majority of the tenants are young families. The building owner is Incasol⁷, the Catalan Land Institute which is a public company of the Catalan government. AHC is the building administrator and manage the building "users". However, the municipality of Sant Quirze del Vallès are in charge of the new concessions, if indeed there are any. Within the municipality of Sant Quirze del Vallès, there is a low number of public housing available, however, this is something that the recent municipal government would like to change, due to the increasing demand of affordable housing. More and more young people are coming to live in municipalities like Sant Quirze del Vallès that are close to the city of Barcelona, as they would have better access to housing, social services while being close to natural green areas. For this reason, Sant Quirze del Vallès City Council also wants to promote new public-private housing formulas that respond to the increase in demand. They know that this profile of young people, value sustainability and is a group that is conscious of these aspects including circular economy. Therefore, having circular buildings will help to provide a response to a demand for accessible and sustainable housing. On the other hand, the building is already a pilot for another H2020 initiative (Plug n'Harvest project). Therefore, the residents already know that their involvement is very much needed and valued. However, currently, there is no consolidated neighbourhood management structure, which sometimes makes it difficult to have effective governance in the building's decision-making. Furthermore, being tenants, their involvement in issues with regards to the building is limited and hinder a bit their interest to participate in co-creation activities.

Demo-site 3 - Cambium Community Center Cambium

The community of residents in Cambium was founded in 2014 with the aim to build an economic, social and ecological sustainable village. In May 2019, Cambium bought the property with an "asset pool", a direct credit campaign, with over 250 investors. The goal is to build an eco-village with minimal environmental impact and therefore to implement sustainable agriculture techniques and circular building

⁷ Public law body dependent on the Ministry of Territory and Sustainability. Its tasks include the promotion of residential land, subsidized housing, the promotion of land for economic activities, the rehabilitation of historical heritage and urban renewals, <http://incasol.gencat.cat/es/inici/index.html>



technologies. Cambium operates as a private initiative cooperative. The residents themselves are organised in a sociocratic circle structure based on consent decision making processes. Its governance is particularly transversal, and it is located in an area where there is mainly single-family housing in low occupation density.

Since the first plans of the community to move in and buy the old military barrack, they have been in close contact with the neighbourhood and the municipalities. As the property was owned by the city of Fehring, the decision to sell it to the community project was made by the municipal council. For this reason, the involvement of the neighbours to counter certain fears or doubts was an essential point from the beginning.

Today, there are still regular events and tours organised by the Cambium community to keep in touch with the neighbourhood and build local initiatives.

On a regional level the city of Fehring is part of various initiatives, for example "Vulkanland" and "KLAR - Klimawandelanpassungsregion"(climate adaption model region), promoting sustainable and ecological projects. The Cambium community is linked to these initiatives in order to advance common goals.

Demo-site 4 – Donaufelder Straße 115 (Vienna)

This pilot building has already had its inhabitants for 3 years, in a social renting regime. The building was already designed to have common spaces. When the inhabitants moved in, they were accompanied by a social dynamisation company to create the existing structures for communal management and use of common spaces. The building is located in the 21st district and has a good public connection. The average age of the inhabitants is quite young resulting in one quarter of flats being used by a single person. Neues Leben is acting as property manager and therefore in charge of any changes and maintenance within the building. In the case of HOUSEFUL and the co-creation activity, the building has not been the great reference point in the discussions as there will not be much intervention with technical solutions. Therefore, in this case, the governance model has focused more on using this pilot as a model of social housing for the city of Vienna. The actors involved in the WP3 co-creation process have been both those most involved in the building itself and those in the value chain of the circular economy and housing in Vienna. The inhabitants of the building were not involved in the Co-creation process, since there won't be any technical solutions implemented. As already stated, this building represents the building standard in Vienna and through its participation at HOUSEFUL is interesting to the municipality and the building association.

4.2.3 Future trends of social housing towards circular economy and the capacity to adapt

If the future is that to have more refurbishment and more waste



The future of the housing sector at the governance level can be broken down into time scales such as the participants in the co-creation activities mentioned i.e., short- and long-term feasibility issues. A similar approach over the four demo-cases is found in the long term, as many more rehabilitation actions are foreseen, and they need to follow more circular schemes, and aligned with the SDGs. They understand that this is an extra effort at an organisational level, but the necessary mechanisms are already in place. However, the participants are concerned that the current policies and regulations do not incorporate the long-term time frame. Without it, it would be difficult to follow a clear path. They thus believe that international sustainability policies such as the SDGs would help to prioritise these actions. However, the SDGs do not seem to lend to, or are not perceived to lend to, priorities focussed on housing and sustainability policies and/or regulations.

"All I know is that lately, there's been a lot of trying to design open spaces, roofs for community gardens, and so on, but I have no idea where compost is stored, where it can be delivered, how the garbage dumps are managed and the additional accumulation of garbage or green waste / biowaste ... so I have relatively little influence".

There is certain ambivalence observed in the short term, in which an imperative need to do much more is identified, but it is also recognised that many things are already being done, when it comes to the more specific level of the municipality or neighbourhood in question. The circular economy and the housing sector are two areas where the governance is complex, broad and transversal, requiring mechanisms that operate within this. In the short term, we would need to uncover mechanisms of support, to unite the efforts of similar initiatives, and to begin to genuinely collaborate between institutions. However, establishing effective mechanisms for horizontal and transversal work, especially together with public bodies, requires a more long-term approach.

In the case of Catalonia (demo-sites 1 and 2), public institutions involved have reflected that do not yet have a clear mechanism of interaction towards the circular economy. For example, the AHC does not have a clear mechanism to interact with other public agencies such as Incasol (Catalan Land Agency), ARC (Waste Agency of Catalonia), or ICAEN (Catalan Energy Institute), in terms of circular economy. Also, there is clearly a need to interact more with the neighbouring communities, however when it comes to seeing this implemented it is somewhat more complicated and requires additional efforts that are not always present and is something that requires high effort.

In the demo cases in Austria, this specific topic has been discussed in less detail during the consultations made.

The figure below shows the current categories distribution in the current HOUSEFUL Database, where public agencies have a substantial proportion as a key role in the Houseful stakeholder map.



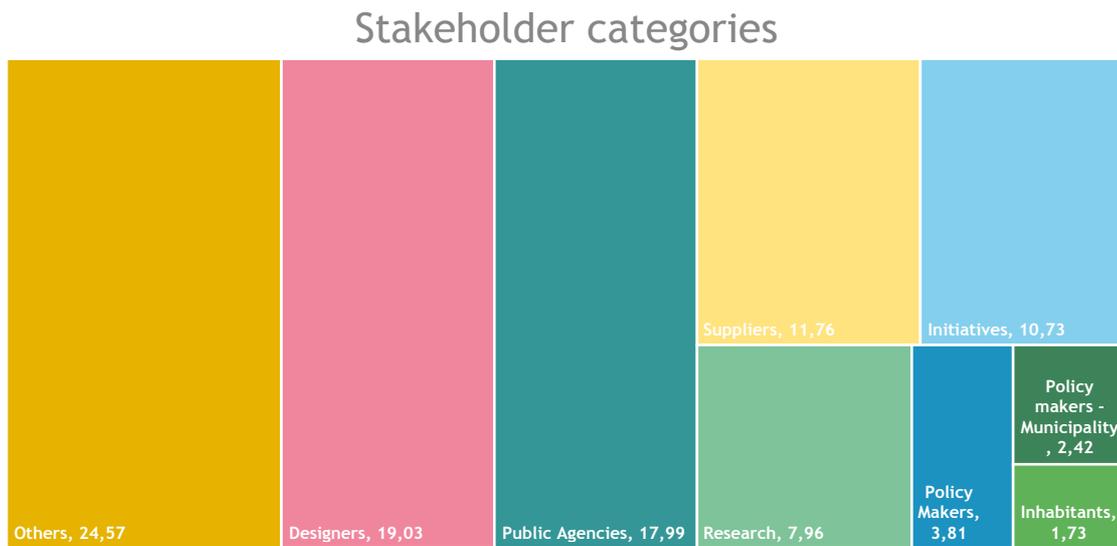


Figure 10. Stakeholders Categories distribution in the current HOUSEFUL Database (n=289).

The figure below summarises the factors evidence in this subsection:

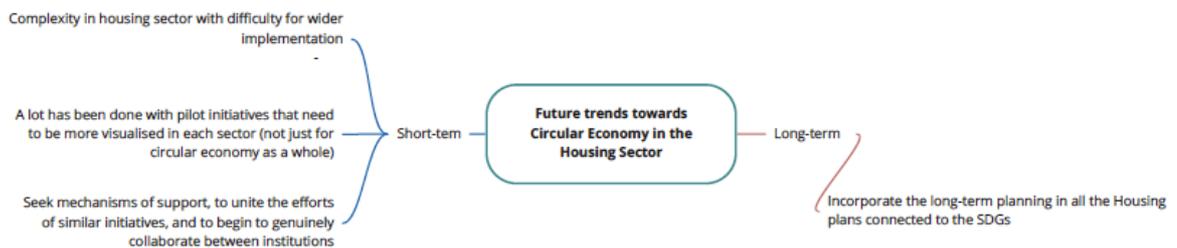


Figure 11. Mind-map of factors evidenced future trends towards circular economy in the housing sector.

4.2.4 The role of the cities

The role of the municipalities where the demo-sites are hosted has been an induced aspect of the activities carried out. Although this was not found as relevant in the literature reviewed, it has become an important factor, relevantly emphasized by participants as derived from the co-creation activities. One aspect common to the four demo-sites, is that city councils of the four locations of the demo-sites are participating in the HOUSEFUL co-creation activities. They are demonstrating high interest to showcase what they are doing in their municipalities in two ways, either to reinforce innovation activity or to promote local sustainability in their current



policies. Sometimes these sustainable approaches are already taking shape of the circular economy approach, e.g. Vienna.

Some instruments have been mentioned, like mediation services between public and private housing or the promotion of co-housing mechanisms. These both are evaluated very positively by the city councils that have been involved in a shift towards circular approaches.

In terms of new governance models at public institutions at the local level, importance is given to the establishment of sustainable working groups to foster the required transversality mentioned above. Priority in the city councils is to promote social housing by mobilising also the private sector, additionally as a priority it is also vital to include environmental issues in this process.

"It is interesting because the City Council is committed to promoting environmental measures at both city and building levels (demo-site 2)"

Relevance of circular pilot actions is also crucial, as it raises awareness and create trust (as mentioned in section 5.1), therefore municipalities already acknowledge the need of increasing awareness of those pilots in their municipality.

The mind-map below provides an overview of factors observed in this sub-section:

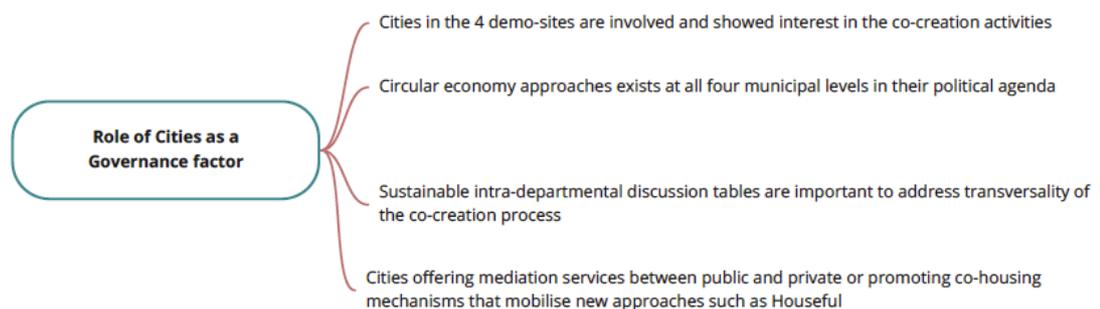


Figure 12. Role of cities as a factor shaping governance for the HOUSEFUL services

4.2.5 How can institutional knowledge be mobilised?

As highlighted in the literature review the mobilisation of knowledge sharing through institutional capacity is one of the key elements to further address the paradigm shift that circular economy requires.

This not only concerns public institutions but also the significant role that private institutions can play and the various ways of grouping them together (e.g. clusters, associations).



More information is needed at the private entity level about cost structures in general, so that it can be better understood how solutions such as those in HOUSEFUL can impact on the current cost structure.

Between the environmental, water, engineering and air quality sectors, there is a certain disconnection in terms of knowledge capacity, and the nexus that exists at the practical level which is not fully seen. At a general and theoretical level of knowledge, it is perceived that a certain nexus does exist, but at a practical level it is lacking.

In the social housing sector, public bodies need to know more about the profile of their users in order to better understand their needs and in this sense, they are interested in knowing more about servitization.

Institutional capacity should also aim at connecting the circular economy with local initiatives, and to showcase them as pilot initiatives and make them visible at an institutional level. Learning modules on circular economy should be introduced within institutional education as well.

The mind-map below provides an overview of factors observed in this sub-section

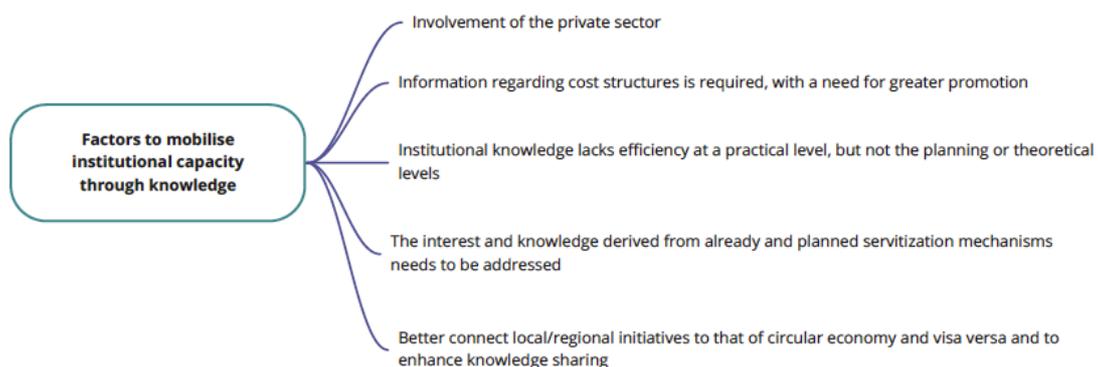


Figure 13. Key factors evidenced to mobilise institutional capacity in circular economy.

4.3 Behaviour towards the implementation of circular solutions in the Housing sector

This section is articulated following the Theory of Planned behaviour (TPB), in order to identify factors that are configuring behaviour towards the use of circular solutions in the 4 demo-sites. TPB has already been introduced in the literature review in Section 3 of this deliverable and here is provided a more detailed overview of the variables in the context of the HOUSEFUL project. The TPB framework determines behavioural intention by attitude towards circular behaviour

(ACB), subjective norm (SN), and perceived behavioural control (PBC)⁸. For the purpose of this report (as already introduced in Section 3.1), we have identified the following variables that can help address TPB in the framework of HOUSEFUL. The independent variables are the following:

- **Attitude towards circular behaviour ACB** – Attitude is generally defined as "a psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour" (Eagly and Chaiken, 1993). Attitude is considered to have an influence on human behaviour. It is usual for a person who holds positive attitudes towards a certain behaviour to perform the behaviour, and conversely (Ajzen and Fishbein, 1977). We use this approach for pro-circular behaviours. Understanding what the behavioural attitudes are (ACB of an individual or a group) towards the use of certain circular solutions is important to help predict those behaviours and form interventions.
- **Subjective norms (SN)** - Subjective norms (SN) are here conceptualised as the perceived social pressures about the performance of behaviours towards circular housing practices. What a person believes that the other stakeholders (the ones that are influential for them) would think of them performing the behaviour or of them performing such behaviour (Ajzen, 1991). We have here differentiated these subjective norms in two aspects: related to **cultural beliefs (SNC)** and related to how the **market and economy (SNE)**.
- **Perceived behavioural control (PBC)** – It specifies how easy or difficult people perceive the performance of circular behaviours in the housing sector. Generally, factors such as the availability of resources or opportunities, should increase the likelihood of this behavioural achievement. However, the presence of these factors alone does not always influence one's action, it is their perception what leads to an action according to Azjen 1991. Therefore, in this variable we identify people's control beliefs to form suitable resources and opportunities that would allow them to perform a circular behaviour or to help form interventions or

⁸ Most human behaviour is goal-directed and people are expected to behave according to their intentions, goals or plans (Ajzen, 1991; Gollwitzer and Bargh, 1996). Drawing from social psychology and using insights from behavioural sciences, the basic model from Ajzen (1991) of knowledge behaviour explores the attitude towards knowledge transfer (cognition). Secondly the model stresses the pressure to transfer knowledge (normative/motivational reasons) based on the likelihood that important referent individuals or groups approve or disapprove. Finally, the model explores the perceived control over knowledge transfers and the perception of presence or absence of capacity, resources and opportunities. The more resources and opportunities one possess, the fewer obstacles one perceives to have, and will have more perceived control over behaviour. Perceived behavioural control is linked to control beliefs and originates from the concept of self-efficacy (Bandura, 1977), which ultimately finds its roots in the social cognitive theory. This helps us to understand how community in the demo-building would behave in terms of the implementation of circular solutions.



resources, aimed at communicating the appropriate behaviour enablers (e.g., tools, opportunities) that are available to them.

The figure below shows the interrelation of the above-mentioned variables to explain the TPB for the purpose of HOUSEFUL. Moreover, sub-sections below addressed specific aspects from each variable as analysed from the transcriptions.

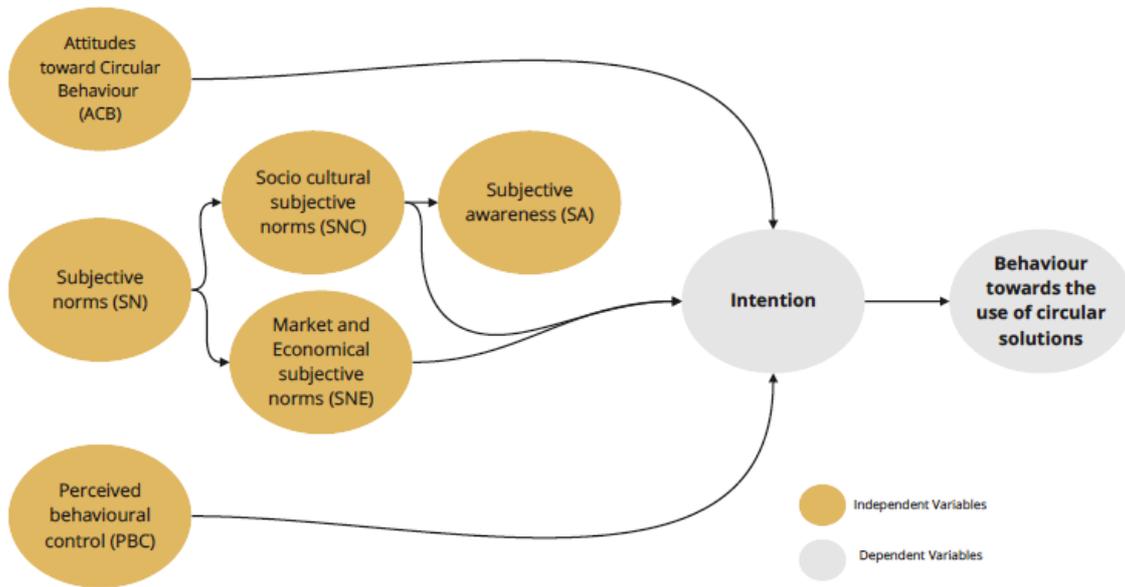


Figure 14. Theory of Planned Behaviour in HOUSEFUL

4.3.1 Attitude towards circular behaviour (ACB)

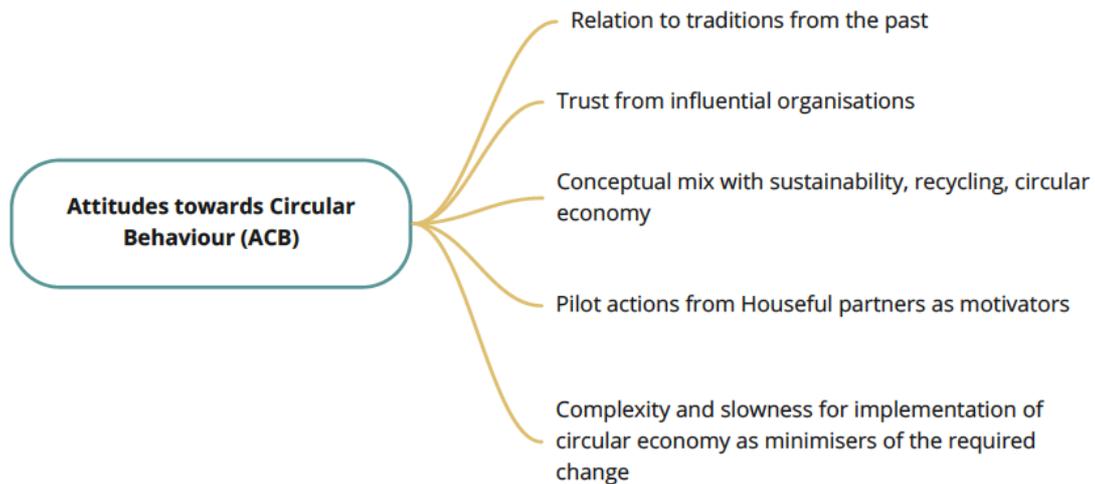


Figure 15. Attitudes evidenced towards circular behaviour



The circular economy is a familiar concept among the consultation community, and generally people recognised that they do "something" for it. We distinguish between those actors: whose business is framed by the circular economy; actors who, although not aligned in their mandate with the circular economy, already do something for it; and organisations that have nothing to do with their activity but do "something" related to circular economy in their personal lives. This "something" is usually connected with actions that were already being carried out in the not-too-distant past. The connection with traditional actions from the past is often mentioned. Circular economy is not addressed as a new practice, but rather a reconnection with the resource cycle from traditional actions.

"We have to evolve in this sense or to "un-evolve" because many years ago things were already done that way"

While it is recognised that circular economy practises already exist, this is sometimes confused with the extent of sustainable practices such as the practice of recycling. Conceptually, trying to identify behaviour towards circular economy is intrinsic to identifying behaviour towards sustainable actions.

"It takes time for people to change consumption preferences and habits. Creating awareness and trust in consumers is key. In particular when it comes to reusing construction materials and products, traceability needs to be ensured, e.g., through material passports, or other material tracking and labelling systems"

The "need to change behaviour" is a constant demand coming out from the community engaged. For those actors who belong to institutions that have a mandate closer to the circular economy and/or to sustainability practices, there is some concern about the slow progress of the circular economy implementation in the building sector. It is recognised that it is a diverse and complex sector, involving a wide range of structures and actors. The attitude towards projects such as HOUSEFUL is that their pilot cases are exemplary and show that the circular economy can be reached in a simple and comprehensible way.

When addressing the issue of **influence**⁹, this can be understood at two levels: at the level of influencing the change towards a CE approach, and at the level of using CE tools. During the interviews, and because we were mainly addressing experts in the sector and stakeholders (not the final users), the first level (influencing change towards a CE approach) was broadly addressed. The second level still remains to raise the importance of influencing community approaches in the phase of using the solutions. The influence on their decisions is largely marked by questions of "trust" - who is moving the mechanisms towards the circular economy? The policies of

⁹ **Influence:** Those stakeholders that have an organisational / legal mandate, a high political legitimacy, and / or those who have control over economic resources in their area. Also, the level of influence can be measured by those stakeholders that have key positions concerning their networks.



public institutions and research projects such as HOUSEFUL extend the framework of trust and respond to the need for "we want to see circular economy in action". There is a common shared feeling that these stakeholders have less and less influence to mobilise the housing sector towards more circular approaches, but knowing the above-mentioned situation, they are now trying to collaborate more with the business sector. In the end it was mentioned in the consultations that the main influencer should be the public administration. With regards to the business sector, circular economy represents an opportunity to expand their business because, as further elaborated above, ecological attitudes also represent attractiveness in the market sector.

The characteristics of the housing scheme of the HOUSEFUL's pilot cases is worth noting. Demo-sites 1,2, and 4 are in the field of social housing, and demo-site 3 of the collaborative economy through a housing cooperative. In the first case, it is essential that public institutions are the main drivers of circular economy practices that motivate users (tenants, inhabitants) to exercise those practices generating trust.

"We have to open new areas of business and they have an obligation to work in the circular economy sector in order to bring in new solutions. This project can show the way forward and be an example of how to integrate the various circular solutions together in one building"

From public institutions it is demanded to take over urgent responsibility in changing current legislation and as HOUSEFUL has public institutions as partners and also as pilot, and this is something that needs to be highlighted, they are already trying to initiate change.

"In my opinion, legislation and mentality is the essential duality here"

In the case of demo-site 3, the users are also the promoters and managers of the building, they need to have greater visibility of pilot actions of circular economy to gain motivation to change. The implementation of the circular solutions support and reassure users towards the further adoption of circular solutions in their location. With the support of the visualisation that materials can be reuse in the pilot demo-sites, this is expected to impact in the level of trust of the nearby community. Increasing trust as a snowball. Additionally, the use of an approach towards servitization also can help to adopt this approach



4.3.2 Subjective norms related to cultural aspects

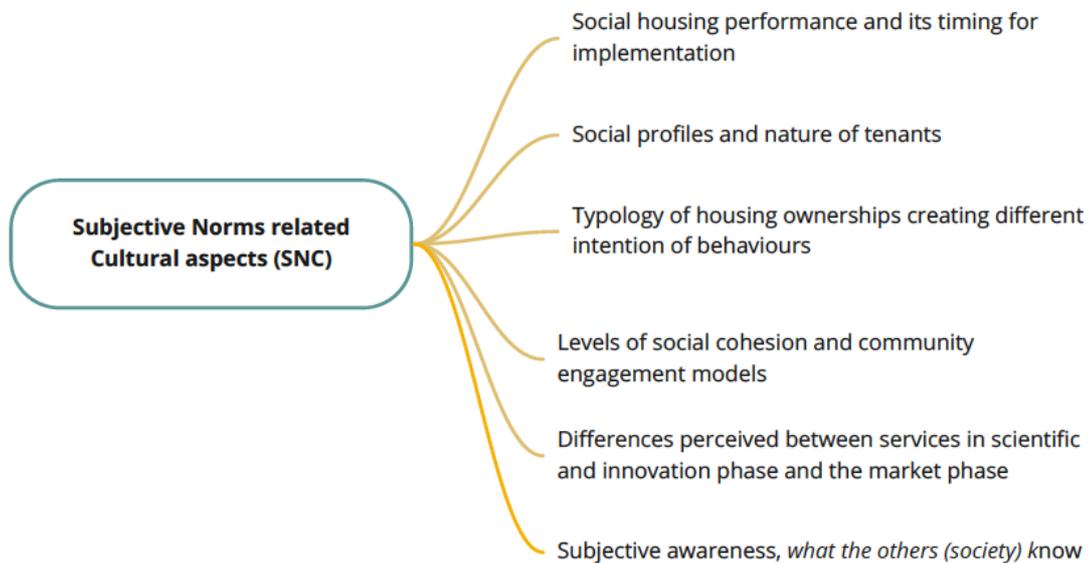


Figure 16. Subjective norms related to cultural aspects

A relevant factor, that was identified and characterises the social norms is the fact that the project has a focus on **social housing**. Considering that the way society lives i.e. the houses we live in are perceived as a social status, one can envisage how subjective norms can shape behaviour on circular housing.

"Housing is a kind of a status symbol"

Several beliefs are considered with regards to subjective norms in the social housing sector. The Spanish case studies are associated with areas of social conflict (low income, social inclusion problems, etc.), where social inequalities seem to be more evident. The different idiosyncrasies of the different social profiles require different levels of behaviour, as well as different levels of knowledge regarding circular economy. Here we re-emphasise a variable that Muranko 2018 already highlighted in his pro-circular model, regarding "**subjective awareness**" (what others know). And precisely in social housing, it is assumed "that they know little" and therefore, it is assumed that they are little prepared to face changes.

"In theory it is known that we have to react to climate change, but circular economy as a solution is not in the foreground. There is a lack of awareness. Circular economy is an academic topic, it is not discussed in mainstream media or discussions"

The figure below shows the level of knowledge of the stakeholders that participated in Step 1 (exploratory questionnaire).

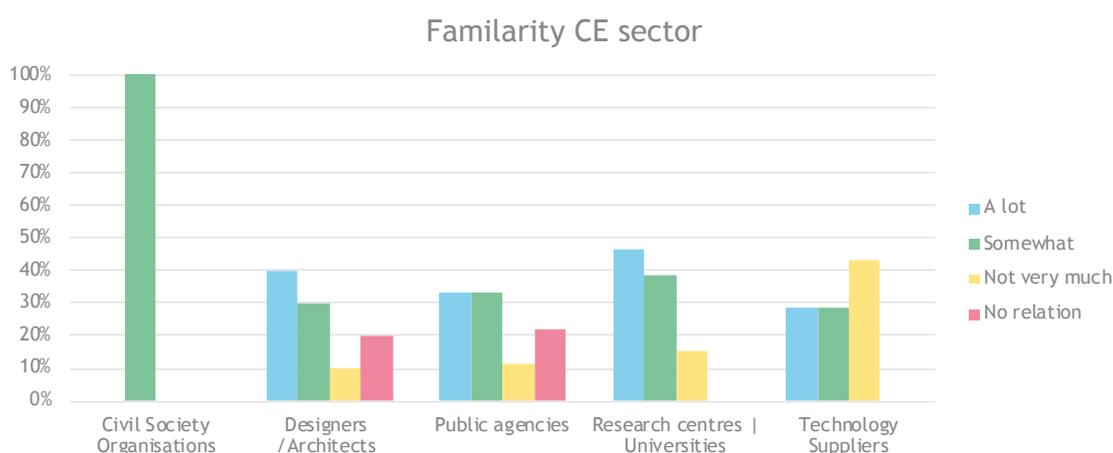


Figure 17. Results from Step 1- Questionnaire showing the familiarity of respondents with Circular Economy (n=57)

Another subjective awareness factor refers to the controversy around decentralized solutions proposed by circular approaches versus centralized ones. And to the question why one should use a new technology if the current centralized ones are already implemented and working. "Why a change is required if the one operating is already known and it is widely implemented?". For instance, the central heating system in Vienna was remarked on.

Another aspect considered from the social housing point of view is that it is understood as a sector with a lack of flexibility, which is needed for the wider implementation of circular economy approaches.

At the level of the building itself, circular solutions require an approach of **sharing spaces** in the building and the common use of the solutions, which ultimately requires a certain level of community cohesion around the demo-site. This aspect entails some factors in the field of CNS, as in the Spanish cases it is expected that there will be greater reticence to this approach as it is not immersed in our culture of coexistence. While in the Austrian cases it seems to highlight that, in general, shared uses are more developed at a community level. Of course, the fact of having to "share" generates a greater complexity or an extra effort at the level of acquiring agreements in the inhabitants, which requires a greater commitment, and a differentiation by social profiles. In the context of demo 3, as a cooperative, this is already intrinsic to the organizational nature, and this effort is already integrated. But a greater effort to achieve social cohesion around shared use is foreseen when dealing with rental systems. In this sense, a further concept of property emerges. It seems to be expected that there will be a greater degree of commitment to what one owns than if it is only rented. Moreover, the issue of "sharing services" have raised the need of having more space, which for some of the case studies located in high density populated areas represents a potential problem in regards where to place them.



The fact that the HOUSEFUL project is in the research/innovation phase also implies certain features that shape behaviour. Being a research project relaxes the decision making, as these are solutions that can be withdrawn later. It also generates more confidence because it responds to general interests under the guidance of the European Commission, and not to market interests. The factor is therefore the role of research projects in building trust.

4.3.3 Subjective norms related to economic and market aspects

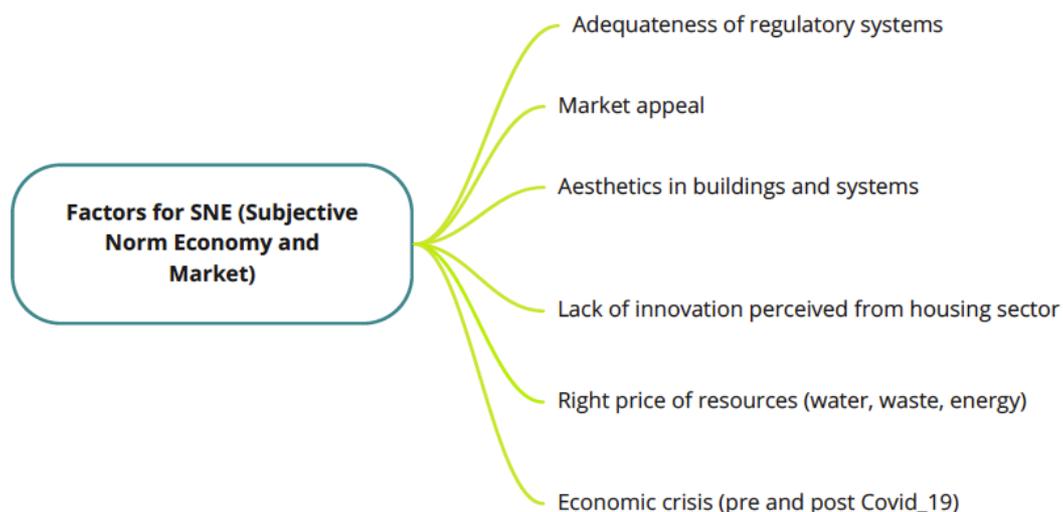


Figure 18. Subjective norms in economy and market.

At the market and economic level, some aspects are identified as subjective standards. With regards to the price of resources (from consumption of water, energy, etc.), the interviewees (mostly experts in the sector) believe that the general public does not perceive what a fair price is for water and solid waste. If the general awareness or tendency is that the price of water and waste in daily bills is perceived as expensive, the true value is not being attributed to it. Questions such as "do we have to pay for something extra that is not necessary if what is already there works", requires greater effort to clarify the need to switch to circular systems. In general terms, on an economic level, what is "low cost" in the construction sector and what is "beautiful" is perceived as attractive to the market, so it does have an influence on whether circular solutions have an aesthetic appeal in accordance with the user's profile.

"When it comes down to any added value for the individual people, be it lower costs for anything or longer useful lives, it would make the solutions attractive."

The construction sector market tends to be seen as slow, not very innovative or responding to sector specific interests. In fact, speculation in this sector was the cause of a serious economic crisis in Spain in 2008, and it still persists in the individual inventory that its capacity to acquire innovations is somewhat slow.

"We continue to make conventional projects because the market today is not yet mature"

Precisely, being a sector that has been greatly affected by the crisis, the level of configuration of subjective norms is also evident. In this case, we must speak in pre-pandemic Covid-19 terms (when Step2 interviews were carried out), where the housing sector was perceived again in recovery and being able to already afford innovation changes towards circular economy models. Already in the workshops held later during the Covid-19 pandemic this observation has changed completely into a continuous uncertainty. In market jargon, when we talk about "users" or "buyers" we refer to demand, and in that sense, it is evident that there is little knowledge of what demand may require from the circular economy, and it is related to a need to have a regulatory framework more adapted to circular solutions. On the other hand, there is confidence that it is the market itself that will push for circular solutions, attracting this "demand".

"Circular/environmental-friendly solutions will only become constant features in the construction sector if there's a change of legislation and/or mentality from the market – but mostly of legislation"

4.3.4 Perceived circular behavioural control

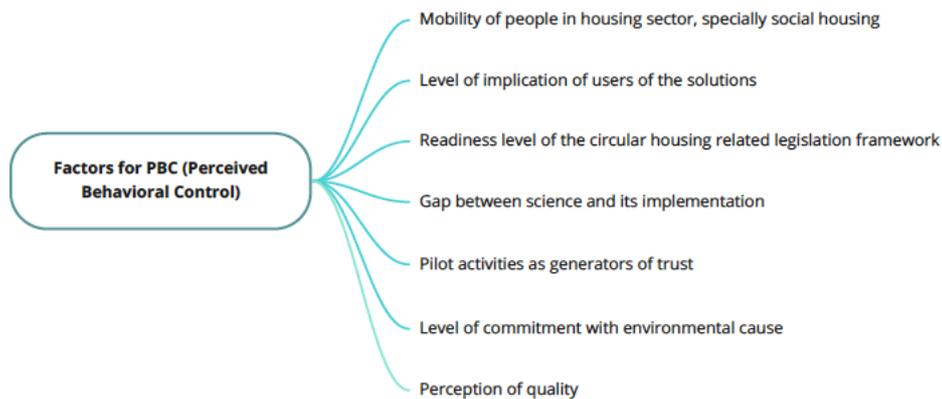


Figure 19. Factors of Perceived circular behavioural control.

In the context of housing, one of the factors that influences the sense of control to perform a circular behaviour is that, the solutions to be implemented are installed, maintained and/or are used by the inhabitants and the maintenance and management staff of the buildings. What happens when this changes? The movement of tenants in social housing is high, but so is the change of contracts of



the maintenance teams. Therefore, one possible obstacle for long-term usage of the circular solutions (as it could happen with any other novel technology), is if the first users are engaged but then with the changes the solutions are abandoned. In this sense, HOUSEFUL's solutions do not always represent the same level of interaction, indeed some of these solutions will practically require no interaction at all. There are other solutions, however, that will imply a daily implication from the users, i.e., the degree to which we can measure behaviour varies. From some interviewees, a certain amount of controversy arises. Some interviewees (especially those who tend to deal with users on a practical level) believe that solutions should be as passive as possible. On the contrary, it is suggested that if solutions involve a greater degree of participation, they generate more commitment and therefore a greater understanding of the processes of circular economy. This is also where some social aspects of resource reuse arise, which other authors have explored extensively (Fielding, Dolnicar, and Schultz 2018), which includes the "yuck factor" or non-acceptance. This is the case of grey/black water treatment and reuse. For instance, it was seen as controversial for the consulted public agencies, because this system would require the involvement and commitment of tenants/users, and not all users seem to be on board with this idea.

As in the previous variables that shape the behavioural intention, the aspect that HOUSEFUL is a project framed in the research field emerges again. This offers greater positivity towards the use of the solutions that are developed since it is understood that they do not have to be permanent. The statements established by those consulted are therefore relaxed towards its use without any major reticence if this does not compromise the quality aspects. There is a clear positivity towards participation in pioneering and emblematic projects (such as HOUSEFUL). Therefore, once again, doubts arise regarding the gap between science and practice. It is precisely at the level of the experts consulted that there is a certain saturation in their opinion, and less so at the practical or operational level.

"An advantage could be personal satisfaction and satisfaction at the company level to participate in pioneering projects in the subject of sustainability. If a company is the first one you are the leader in this, it gives you added value, such as the subject of the LEED certificates that at first gave you more advantage. Right now, everyone is equal in conditions."

Another emerging factor already addressed in the above-mentioned behavioural variables, is the level of readiness of regulation and legislation. If public institutions were to show greater evidence that this is progressing well, then the behavioural intention might change to be more positive.

Actors generally perceive that they are taking individual or organisational actions towards a circular economy, but sometimes this can lead to a false sense of control as they confuse or mix up issues of circular economy with sustainability actions such some isolated actions (e.g., rainwater harvesting, waste separation, etc.)



4.4 Socio-economic issues with regards to housing and the circular economy

This section provides an overview of the main socio-economic factors that have been highlighted during the stakeholder's consultations

In Austria the stakeholders mention that idea of making social housing more prestigious and that there is a need for more social housing, even if Austria is considered as a model country. On the contrary in the Spanish context there is an idea of "social housing emergency" meaning that availability of affordable housing is very much compromised

For the specific case of Sant Quirze del Valles (SQV) the following points can be highlighted: i) systematic lack of social housing; ii) high prices of social houses; iii) possibility that some social houses are rented to people who no longer "need it"; iv) limited ability of public housing agencies to reach the demand of social; V) young people have to move away from SQV as there are no social houses.

Other than the public administration the conflict potential in social houses for the maintenance of circular solution is significant, meaning that there is a history of distrust between public administration and inhabitants.

The socioeconomic profile for the housing sector (not the case of the social emergency group) is for young people (the case of the demo-site 2 and 4). Social housing for young people uses to happen that those users change over the time, so there is the issue of users' rotation in this type of buildings.

"Normally, young people used to have a more sustainable background, for instance in Vienna not all of the youth have driving license just because they are committed to have more sustainable ways of life."

Young profiles are the preferable social strata that widely support sustainable buildings. These are normally the social strata that is more committed and connected to sustainable issues.

Social housing is mainly targeting young families.

Participants expressed that the main concerns that are related to the elderly population of loneliness, depression, etc. can be overcome if circular economy can mobilise comminute activity and cohesion then it could be an interesting choice for this group.

"This is not going to work in those building with old people"

"There is an aging population, and the fact is that many people are left alone at home. And there are issues of loneliness, depression, and so on"

Gender has not provided any evidence as an issue that raises concerns, or interest in the housing sector.



The figure below summarises main socioeconomic factors as evidenced from the stakeholders’ consultation:

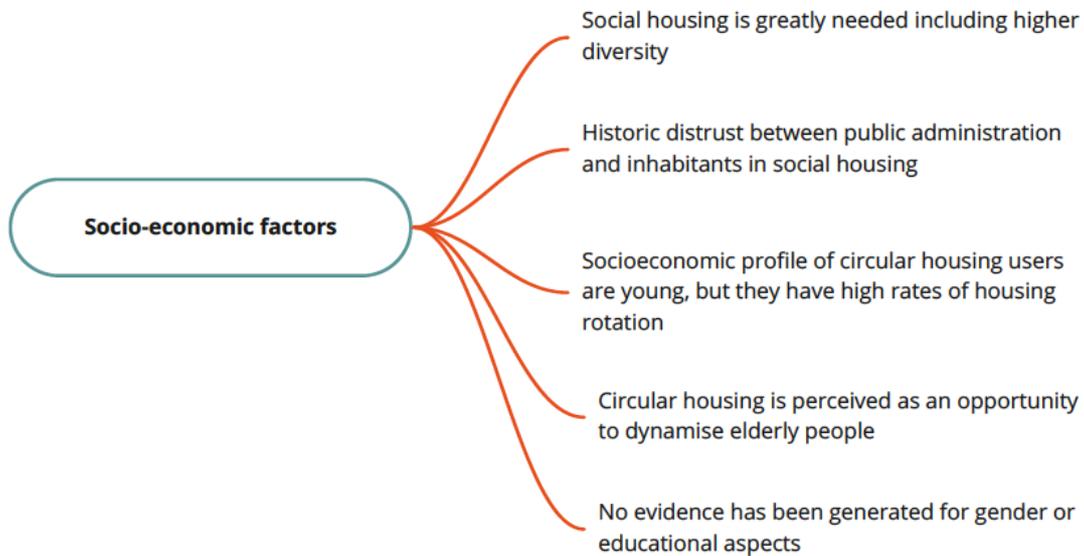


Figure 20. Mind-map of evidenced socio-economic issues in the circular housing.

4.5 Specificities of the environmental parameters

With regards to particularities arisen from the consultations, the figures below provide results from the Step 1 of the Methodology (initiation-questionnaire) when asking about the applicability level of the circular solutions in each of the environmental parameters addressed by HOUSEFUL. The majority responded either high or very high, for all of the parameters.

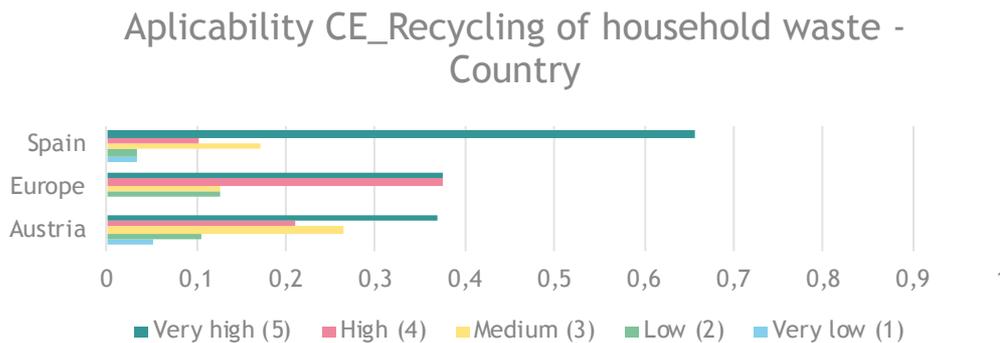


Figure 21. Applicability level of circular solutions with regards of the recycling of household waste, n=57.



Aplicability CE Building materials reuse - Country

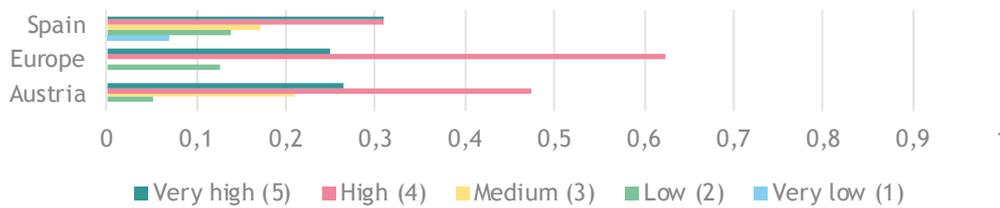


Figure 22. Applicability level of circular solutions with regards of the reuse of building materials, n=57.

Aplicability CE_Water reuse and efficient water management - Country

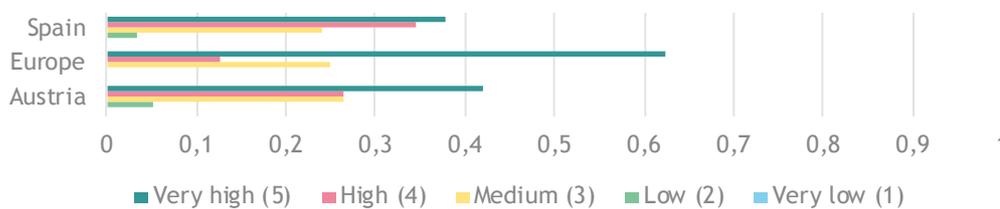


Figure 23. Applicability level of circular solutions with regards of water reuse and efficient water management, n=57.

Aplicability CE_Energy efficiency / energy saving - country



Figure 24. Applicability level of circular solutions with regards of energy efficiency and savings, n=57.

With regards to the water sector, perception analyses of water reuse are very extensive, as stated in the literature review. In this section we will simply try to highlight what the particularities are that have been collected during the exploratory phase.

The water reuse schemes that have been raised in our interventions have led to specific comments in the field of water. For instance, in Vienna, there does not

appear to be a priority, as major problems are not perceived related to water, however in the Step 1 questionnaires, if water reuse schemes were seen to have wide applicability. In the two Spanish cases, water reuse is perceived as necessary, as it is linked to the fact that it is a very scarce resource in the country, but the applicability of water reuse is not as high as was seen in the Step 1 questionnaires (Figure 23).

In the housing sector, the concept of water reuse is often closely related to rainwater harvesting and grey toilet separation, and less to other wastewater reuse schemes. The experts consulted found that most of the advances in toilet reuse have not been fully implemented or are not seen on a real scale. Furthermore, the return on investment on water reuse is perceived as to be very long, which means that the implementing agencies do not finish installing these systems.

Energy and housing seem to be pair-concepts that have been discussed over a long time and addressed. In social housing energy is a common priority, as talking about energy, many times the issue of “energy poverty” is raised. Therefore, one of the key priorities is with regards of energy efficiency and heating. Heat loss also is a problem mentioned mostly in the Vienna context.

“If we talk about social Housing, the majority of the people living there they are under energy poverty conditions.” “It is important for social housing to minimize the energy bill.”

The users’ perspective is here crucial, seems that energy issues raise most of their concerns, not an irrelevant topic. They are really facing comfort problems due to a lack of energy efficiency or they want to rally improve on that. Energy is about both, comfort and savings in terms of costs consumption.

In the Catalonia region, there is concern with regards the obligation to install solar panels to heat water. They are installed as the law forces to do it, but after that, there is no proper maintenance of those systems

The heating losses in Vienna it is also something that raises concerns.

“think the water heating is in Austria still a big thing with little to no energy efficiency. No heat recovery, etc. We are quite good with renewable energy sources; our electricity mix is quite good but still a lot more can be done.”



5 Conclusions: The perceptions and beliefs of circular economy at the building scale

The housing sector is the sector most in need of user behaviour changes in order to shift towards a circular economy (Ellen MacArthur Foundation 2013). However, there is currently a lack of research on consumer behaviour with regards to the Circular Economy (Murancko 2018, Ellen MacArthur Foundation, 2013) and data collection on this is still very preliminary due to its challenging and multi-disciplinary scope (Atherton,2015). With the initial version of this report, we conducted a first exploratory consultation phase with the HOUSEFUL stakeholders that has allowed us to gather some initial ideas on attitudes and beliefs in shifting to the circular economy in the housing sector. Given the idiosyncrasies of the 4 demo-sites of the project, naturally, our analysis is based on the assumption that results are contextualized around these demo-sites. It is for this reason that our analysis provides a lot of evidence around "social housing" and cooperatives in the housing sector. The literature review has allowed us to have a clear idea of the dimensions and variables of analysis, and some main ideas of the important issues collected around questions of sustainability or circular behaviour in the housing sector. However, in this initial phase, the generated discussion has remained within the broad context surrounding circular economy in the housing sector and how the paradigm shift can take place instead of specific information regarding the solutions at each demo-site.

In successive phases of the co-creation process (the forthcoming *Deliverables_3.3_Social conditions for the co-creation of all HOUSEFUL services and co-created materials and 3.5. Social perceptions and beliefs in circular economy at building scale version II - Final*), more efforts will be concentrated in certain sectors and on the specific solutions for each demo-site.

Through studying the users' **risk-benefit perception**, we are able to clarify the problems, enablers, and needs encountered for circularity in the housing sector at this first initial level of analysis. HOUSEFUL is a project in the research and development phase. Therefore, it raises some reticence in relation to the safety and quality aspects around the implemented systems being operationally sound. On the contrary, the fact that this is an R&D project also provides an opportunity to make circular economy pilot cases in the housing sector more visible and indeed viable. This can support greater understanding and awareness around the materialisation of the circular economy scope by taking the theoretical discussions to real-life settings. With regards to the implementation of the circular technologies, there is perceived restraint as well as certain enablers taken from the stakeholders' opinion. For instance, there is concern over the cost structures and how these can impact on the daily consumption of the inhabitants, or indeed the costs of maintaining these novel systems. Examples of enablers perceived are related to the opening of new markets that is promising but at the same time would require innovative financing



structures. In the framework of social housing, doubt is generated on whether it is feasible for this sector to be innovative enough to include these circular solutions. Undeniably, there is a certain complexity in the decision-making process, and not only related to the social housing sector but in the case of cooperatives as well. This complexity is slowing down the agility of the sector and is discouraging a quicker process for policy implementation in circular economy schemes.

When investigating the **governance models** of the demo-sites and the future of the decision-making process to implement circular buildings, we have identified three spatial levels of analysis. These levels are: 1) the building, its surroundings and the solutions (the governance of the solutions, community of neighbours and the nearby neighbourhood); 2) the municipality and the involvement of city plans, and 3) the regional scope that normally also involves a community of experts and general policy planning. At any level, the factor of complexity is raised for the housing sector and the involvement of different areas of expertise and the typologies of institutions. However, we have noted that the municipalities involved are addressing this complexity by creating transversal modes of interaction between different departments that include sustainability and housing aspects. Despite the efforts of addressing this complexity, there is still a long-term perspective in policy planning towards circular housing that is lacking.

In this report, broader evidence has been gathered in terms of **stakeholders' knowledge levels as a key factor to mobilizing behaviour towards circular economy in the housing sector**. The typologies of knowledge that we could look into deeper detail at are the following:

- The knowledge acquired and needed for the solutions applied at each demo-building and the levels of understanding among the different actors (specifically focussed on the governance scales and not only at the demo-site scales)
- The subjective awareness (*whether the participants perceived the knowledge regarding circular economy is known by society or not*). What society (*others*) seem to know, has been very relevant among the evidence gathered, showing patterns of behaviour influence, for instance behaviour related to "if the others know better I can act". This is very related with the factor of trust generation through effective communication regarding the HOUSEFUL solutions in a multi-directional way.
- The circular economy concept has not yet been proven to be widely known, and it is perceived at a theoretical level or more a concept from research and innovation projects. Therefore, knowledge with a goal-directed perspective needs to be exchanged with regards to specific purposes of Circular Economy in the housing sector. For instance, the connection of this knowledge with traditions from the past that already were addressing circular practices.
- Institutional knowledge, especially from the social housing cases, has also been addressed in order to move forward towards effective policy plans and regulatory schemes addressing circular approaches.



Other motivators creating intentions towards change to a circular economy is the existence of a portfolio of pilots, that are tangible and realistic. This is the case since significant importance has been placed on the visualisation of the benefits of the HOUSEFUL solutions that highlight the success of these solutions. With regards to the timing of policy plans and the required changes in the regulatory schemes towards a circular housing perspective, more actions need to take place at a short-term level, in order to be able to achieve long-term global sustainable goals. In the housing sector, issues of identity are seen as important, aesthetics is mentioned as a motivator, the circular solutions should be perceived as something nice and pleasing, as a building represents a symbol of identity for society. Finally, one last key motivator towards implementing circular solutions is to mention the levels of social cohesion and sense of community that exists prior to the implementation of circular solutions. Higher levels of community seem to lead to higher levels of acceptance, especially for those solutions that are to be used within the neighbourhood community.

5.1.1 Factors addressed in the selected co-creation ideas in each demo-site

Much of the evidence in the form of needs, concerns and expectations from stakeholders already gathered here has been translated into ideas for HOUSEFUL's co-creation process. This evidence has been prioritised by stakeholders in the first series of co-creation workshops. In the table below, the thematic clusters of the co-creation ideas are shown with regards to the factors gathered in this report on social perceptions and beliefs in circular economy. Therefore, the initial social decisions derived from the needs, concerns and expectations of the stakeholders are shown. According to the co-created roadmap these co-created ideas are being further developed together with stakeholders. Thus, we will be able to gather more specific information in the next phase of this analysis that will be presented in Deliverable_3.5_Social perceptions and beliefs in circular economy at building scale version II - Final.

Table 2. Relation between co-creation process (ideas prioritised) that are addressing the factors shaping social perceptions and beliefs in circular economy at housing sector.

Thematic area of the co-creation ideas	Related factors observed about social perceptions and beliefs in circular economy	Selected by (demo-site)
Training in the use of circular solutions	Complexity, adaptability of solutions, security aspects, readiness to adopt solutions, creation of mechanisms for support, knowledge acquisition (including costs), trust generation and user's implication	Demo-site 1, 2,3



Visualising the benefits of the circular solutions	Trust, understanding of circular economy, the gap between science and practice	Demo-site 1, 2,
Reducing the costs of the Houseful solutions	Knowledge regarding the cost-structures, changes in financial schemes, new business models, correct resource pricing, economic crisis	Demo 1
Governance of the HOUSEFUL solutions	Community cohesion, reducing complexity, long-term scope of the solutions, institutional knowledge,	All demos
Effective communication	Science-practice gap, understanding circular economy, trust, preparedness of society towards a change towards circular economy,	Demo-site 3 and 4
Aesthetics of the solutions	Ownership, personal identity, quality perception	Demo-site 3 and 4
Materials (creation of a materials database)	Quality, healthier, level of awareness.	All demos

5.1.2 Limitations of the analysis observed

With regards to the typology of stakeholders addressed so far, most of these stakeholders already had a significant understanding of the Circular Economy principles. As the process of co-creation evolves, the snowballing process of identifying new stakeholders will be extended until it reaches all those stakeholders who -at each demo-site – would be required to be involved, whether or not they have a clear understanding of the circular economy.

In this initial phase the perspective of the inhabitants has mainly been represented by associations and not by the individuals themselves. As the project development and co-creation phase progresses, their involvement should increase.

It should be noted that the level of in-depth opinion of the HOUSEFUL solutions is very low, as these consultations were carried out at the beginning of the project when there was little information associated to it.

Another limitation with regards to providing personal opinions from participants was that we were always asking them on behalf of the organisations they belong to. This can create certain restraint to some of the participants to provide freely their opinions as their own opinions could potentially go against those of their organisation.



The next version of this document will look to gather more evidence of the co-creation process as a whole, including the evidence from the interaction with inhabitants, municipalities and other citizen associations.

From this first analysis it is evident that circular economy solutions in the housing sector are not only essential but as of yet have been poorly evidenced from social sciences point of view. HOUSEFUL is showing that through detailed demonstration and enhanced targeted knowledge, circular solutions in the housing sector won't only be a reality but will be something desired by building inhabitants, by the nearby communities and neighbourhoods as well as for the related municipalities and regional experts' community.



6 References

- Anguelovski, Isabelle. 2013. "Beyond a Livable and Green Neighborhood: Asserting Control, Sovereignty and Transgression in the Casc Antic of Barcelona." *International Journal of Urban and Regional Research* 37 (3): 1012–34. <https://doi.org/10.1111/1468-2427.12054>.
- Bakare, B.F., S. Mtsweni, and S. Rathilal. 2016. "A Pilot Study into Public Attitudes and Perceptions towards Greywater Reuse in a Low Cost Housing Development in Durban, South Africa." *Journal of Water Reuse and Desalination* 6 (2): 345–54. <https://doi.org/10.2166/wrd.2015.076>.
- Barnicoat, Greta, and Mike Danson. 2015. "The Ageing Population and Smart Metering: A Field Study of Householders' Attitudes and Behaviours towards Energy Use in Scotland." *Energy Research & Social Science* 9 (September): 107–15. <https://doi.org/10.1016/J.ERSS.2015.08.020>.
- Domènech, Laia, and David Saurí. 2010. "Socio-Technical Transitions in Water Scarcity Contexts: Public Acceptance of Greywater Reuse Technologies in the Metropolitan Area of Barcelona." *Resources, Conservation and Recycling* 55 (1): 53–62. <https://doi.org/10.1016/j.resconrec.2010.07.001>.
- Domnech, Laia, and David Saurí. 2010. "Socio-Technical Transitions in Water Scarcity Contexts: Public Acceptance of Greywater Reuse Technologies in the Metropolitan Area of Barcelona." *Resources, Conservation and Recycling* 55 (1): 53–62. <https://doi.org/10.1016/j.resconrec.2010.07.001>.
- Ellen MacArthur Foundation. 2013. "Towards a Circular Economy." *Greener Management International*. <http://www.ingentaconnect.com/content/glbj/gmi/2005/00002005/00000050/art00004>.
- Espuga Trenc, Josep, Beatriz Medina, Albert Presas, Mar Rubio-Varas, and Joseba De la Torre. 2017. "Las Dimensiones Sociales de La Percepción de La Energía Nuclear. Un Análisis Del Caso Español (1960-2015)." *Revista Internacional de Sociología* 75 (4): 075. <https://doi.org/10.3989/ris.2017.75.4.17.02>.
- Fielding, Kelly S., Sara Dolnicar, and Tracy Schultz. 2018. "Public Acceptance of Recycled Water." *International Journal of Water Resources Development* 0627: 1–36. <https://doi.org/10.1080/07900627.2017.1419125>.
- Frantzeskaki, Niki, and Nico Tilie. 2014. "The Dynamics of Urban Ecosystem Governance in Rotterdam, The Netherlands." *AMBIO* 43 (4): 542–55. <https://doi.org/10.1007/s13280-014-0512-0>.
- Hamann, Ralph, and Kurt April. 2013. "On the Role and Capabilities of Collaborative Intermediary Organisations in Urban Sustainability Transitions." *Journal of Cleaner Production* 50 (July): 12–21. <https://doi.org/10.1016/j.jclepro.2012.11.017>.
- Hamilton-MacLaren, Fiona. 2013. "Public Opinions on Alternative Lower Carbon Wall Construction Techniques for UK Housing." *Habitat International* 37: 163. <http://mendeley.csuc.cat/fitxers/80f2b9dcb44030e11c39ab9445bbac5a>.
- Heiskanen, E., and K. Matschoss. 2017. "Understanding the Uneven Diffusion of



- Building-Scale Renewable Energy Systems: A Review of Household, Local and Country Level Factors in Diverse European Countries." *Renewable and Sustainable Energy Reviews* 75: 580–91. <https://doi.org/10.1016/j.rser.2016.11.027>.
- Hernández-Sancho, Francesc, Birguy Lamizana-Diallo, Javier Mateo-Sagasta, and Manzoor Qadir. 2015. "ECONOMIC VALUATION OF WASTEWATER THE COST OF ACTION AND THE COST OF NO ACTION." https://wedocs.unep.org/bitstream/handle/20.500.11822/7465/-Economic_Valuation_of_Wastewater_The_Cost_of_Action_and_the_Cost_of_No_Action-2015Wastewater_Evaluation_Report_Mail.pdf.pdf?sequence=3&isAllowed=y.
- Horne, C., and E.H. Kennedy. 2017. "The Power of Social Norms for Reducing and Shifting Electricity Use." *Energy Policy* 107: 43–52. <https://doi.org/10.1016/j.enpol.2017.04.029>.
- Luo, W., M. Kanzaki, and K. Matsushita. 2017. "Promoting Green Buildings: Do Chinese Consumers Care about Green Building Enhancements?" *International Journal of Consumer Studies* 41 (5): 545–57. <https://doi.org/10.1111/ijcs.12364>.
- Mankad, A., and S. Tapsuwan. 2011. "Review of Socio-Economic Drivers of Community Acceptance and Adoption of Decentralised Water Systems." *Journal of Environmental Management* 92 (3): 380–91. <https://doi.org/10.1016/j.jenvman.2010.10.037>.
- Meehan, J., and D.J. Bryde. 2015. "A Field-Level Examination of the Adoption of Sustainable Procurement in the Social Housing Sector." *International Journal of Operations and Production Management* 35 (7): 982–1004. <https://doi.org/10.1108/IJOPM-07-2014-0359>.
- Muranko, Zaneta, Deborah Andrews, Elizabeth J. Newton, Issa Chaer, and Philip Proudman. 2018. "The Pro-Circular Change Model (P-CCM): Proposing a Framework Facilitating Behavioural Change towards a Circular Economy." *Resources, Conservation and Recycling* 135: 132–40. <https://doi.org/10.1016/j.resconrec.2017.12.017>.
- Olanipekun, A.O., B. Xia, C. Hon, and Y. Hu. 2017. "Project Owners' Motivation for Delivering Green Building Projects." *Journal of Construction Engineering and Management* 143 (9). [https://doi.org/10.1061/\(ASCE\)CO.1943-7862.0001363](https://doi.org/10.1061/(ASCE)CO.1943-7862.0001363).
- Organ, Samantha, David Proverbs, and Graham Squires. 2013. "Motivations for Energy Efficiency Refurbishment in Owner-occupied Housing." *Structural Survey* 31 (2): 101–20. <https://doi.org/10.1108/02630801311317527>.
- Pelău, C., and A.C. Chinie. 2018. "Econometric Model for Measuring the Impact of the Education Level of the Population on the Recycling Rate in a Circular Economy." *Amfiteatru Economic* 20 (48): 340–55. <https://doi.org/10.24818/EA/2018/48/340>.
- Poortvliet, P.M., L. Sanders, J. Weijma, and J.R. De Vries. 2018. "Acceptance of New Sanitation: The Role of End-Users' pro-Environmental Personal Norms and Risk and Benefit Perceptions." *Water Research* 131: 90–99. <https://doi.org/10.1016/j.watres.2017.12.032>.



- Vassileva, I., and J. Campillo. 2014. "Increasing Energy Efficiency in Low-Income Households through Targeting Awareness and Behavioral Change." *Renewable Energy* 67: 59–63. <https://doi.org/10.1016/j.renene.2013.11.046>.
- Zhang, L., L. Chen, Z. Wu, S. Zhang, and H. Song. 2018. "Investigating Young Consumers' Purchasing Intention of Green Housing in China." *Sustainability (Switzerland)* 10 (4). <https://doi.org/10.3390/su10041044>.
- Zhang, L., L. Chen, Z. Wu, S. Zhang, and H. Song. 2018. "Investigating Young Consumers' Purchasing Intention of Green Housing in China." *Sustainability (Switzerland)* 10 (4). <https://doi.org/10.3390/su10041044>.



7 Annexes

7.1 Further specification on the methodology

7.1.1 What is a Focus group?

A small group of people whose opinions about something are studied to learn the opinions that can be expected from a larger group.

The focus group process will follow a number of open questions included below, as a guide to orientate the moderator. It is important to keep in mind that these are guiding questions to the moderator that should be used to generate a conversation.

Two restrictions to be reminded of:

- Ask on behalf of the organisation/department that the interviewee represents
- Contextualize the questions in the areas of circular economy and housing.

During the discussion the participants should speak one at a time, we ensured that everyone has an opportunity to give their views. The general rules were:

- Respect the opinions of others - everyone's view is valid.
- There were no right or wrong answers.
- Notes were taken but everything that is said will be kept confidential – no names were put against comments.
- If anyone had any specific questions that did not relate to the discussion, there was an opportunity at the end of the meeting.

7.1.2 What is an in-depth interview?

Interviews are ways for participants to get involved and to talk about their views. In addition, the interviewees are able to discuss their perception and interpretation in regard to the HOUSEFUL project. Interviewing is a way to collect data as well as to gain knowledge from individuals. Kvale (1996, p. 14) regarded interviews as "... an interchange of views between two or more people on a topic of mutual interest, sees the centrality of human interaction for knowledge production, and emphasizes the social situatedness of research data."

The interviews will be systematic, controlled and have a logical and consistent order of questions. All participants are required to answer the same questions delivered in the same way. The semi-structured interview is based on a questionnaire with a list of questions, that can be asked in different order and in different ways to adapt to the context of the participants of the consultation. The major objective is for neutral



interviewers to obtain comparable information from a potentially large number of subjects.

The general rules were:

- Notes were taken but everything said was kept confidential – no names were put against comments
- If a participant had any specific questions that did not relate to the discussion, there was an opportunity at the end of the meeting.

7.1.2.1 Limitations

Some limitations are expected.

Regarding *logistical issues*:

- A lack of availability of participants or a need to speed-up the process due to another appointment.
- External issues that can hamper the process of a face-to-face interaction: inadequate room, noise, etc.

Regarding the *facilitators attitude*, some constraints and risks are identified:

- Positioning and facilitator's own motivation: every facilitator should try to not interfere in the respondent's opinion, but due to the consciousness and commitment to the HOUSEFUL project, some answers or conversations could be biased by the enthusiasm or interest shown by the facilitator.

Regarding the *transcription of interviews*, some constraints, and risks can be identified:

- Interview transcription literality: after the development of interviews each partner of the HOUSEFUL project transcribed interviews. According to the established protocol transcriptions should be translated into English and be literal. However, some transcriptions have captured main ideas and not the whole dialogue. This to certain point can influence the descriptive analysis of interviews as subjective viewpoints can be lost during the process

Regarding *participant's attitudes*, some constraints and risks can be identified:

- Respondents' own motivation: as with any type of research, bias can be a problem. The participants may be interested in the project. Others may be participating because they would like to interact and exchange ideas with the participants or facilitator to look for future opportunities (networking). These trends can lead to inaccuracies in the data, generated by an imbalance in the respondents who think excessively positively or negatively on the subject.
- Sincerity: while there are many positive aspects with face-to-face interactions, a lack of sincerity can still be a problem. The respondents may not be 100%



honest in their answers. This can happen for several reasons, including the social desirability bias and the desire to protect privacy or confidentiality issues from the organisations they represent. To avoid the lack of sincerity, respondents have been informed that the process does not allow for personal identification.

7.1.3 Interview protocol

- **Preparation, before the focus group/interview**
 - Invitation via email and after a phone conversation, to confirm their availability. Email invitation can be similar to the step 1

ENGLISH VERSION

Dear XXXXX,

The reason for this email is because the entity you represent has participated in the Houseful project questionnaire. We would like to thank you for your participation in this questionnaire and the willingness to be involved in the participatory process of the project. For the next step we would like to request your collaboration with the participation in an interview, prepared under the framework of the Houseful project (www.houseful.eu). This project, funded by the European Commission H2020 research program, proposes circular solutions to make the use of resources in the housing sector more sustainable. This perspective promotes, in turn, new forms of co-creation, increasing cooperation among the stakeholders in the housing value chain.

The interview we would like to undertake should last around 1 hour.

One of the aims of the project is to actively engage with relevant and interested stakeholders in the Houseful processes. Therefore, with this interview we would like to analyze and deepen the points of connection between the stakeholders involved and to assess the possible interests in the aspects derived from circular economy and housing in your region. Additionally, the purpose of the interview is to identify the knowledge that we have to acquire from the social context for the demonstration of the 11 Houseful solutions, and to identify the possible gaps we need to consider. With your participation, as a relevant stakeholder, you will be contributing to building knowledge in the circular economy and the housing sector.

We would very much appreciate your collaboration and are looking forward to arranging a time and date for the interview.

Therefore, we would like to propose the following dates and times, please let us know which one suits you best.

Xxxx



Xxx
Xxx
xxx

Finally, we thank you for your participation and collaboration.

Sincerely,
The Houseful team

- Check and adapt questions if needed and validate changes with WE&B
 - Familiarise with the questions before the meeting
 - Print a copy of the protocol, copies of the consent sheet and bring some project leaflets with you.
 - **Please, do not forward in advance interview questions to actors as the intention of the interview is to gather sincere and spontaneous answers.**
 - Keep as well in mind that no answer to a question is as well valuable information to us.
- **During the meeting**
 - Please fill out the table below with the name of the person in each of the roles

Date and Location	
Facilitator(s)	
Rapporteurs (if any)	
Participant (s) name	
Participant (s) age and sex	



- Introduce the Context and the Problem (example below for the case of a focus group)

In representation of the Project financed by the European Commission Houseful, we are carrying out a more detailed study from a social sciences point of view.

Introduce yourself and your organisation and your role in Houseful

In this project, Houseful, we are working on the activity regarding social strategies to the generation of commitment through the co-creation of solutions. For this, it is very important to consider the opinions and knowledge of the actors involved in the process.

Thank you very much for participating in this meeting. First of all, please sign the consent sheet that informs you about this study in detail and how after the data will be used in an aggregated format and never with an individual perspective. Secondly that you allow me to record the conversation for transcriptions purposes and because this will facilitate my role as moderator and rapporteur at the same time. You are also completely free to leave the discussion at any point.

The dynamic of the discussion will be that I will be asking you questions, and for each of these questions we will open a conversation where each of you will be able to give your opinion at your convenience, and the others intervene to show agreement or disagreements, to make a related comment, reflection, etc.

We ask you to give sincere answers and keep the tone in a friendly discussion. I will be here to moderate the discussion, re-orient to the related issue if the conversation loses the focus and change to the next question when needed.

Let me remind you about the objective of the project.

The project is called **HOUSEFUL, INNOVATIVE CIRCULAR SOLUTIONS AND SERVICES FOR NEW BUSINESS OPPORTUNITIES IN THE EU HOUSING SECTOR**, focuses on implementing 11 innovative solutions of circular economy in the rehabilitation of buildings as for example, grey water recycling, organic solid waste recovery or solar panels. In this way, the project will demonstrate in 4 large-scale housing buildings, new integrated services focused on the optimization of the use of water, waste, energy and material resources for all stages of the life cycle of buildings

Houseful proposes 11 solutions so that the use of resources throughout the life cycle of a building is more sustainable, taking into account an integrated circular approach that considers the aspects of energy, materials, waste and water. These solutions must foster collaboration between the interested parties in the value chain of the home.

The proposed solutions will also require a change in thinking from involved stakeholders and interested groups, considering not only technical but organisational, social and



governance dimensions.

In order to achieve these improved interactions, we need to generate an understanding of how people, groups, organizations and networks interact at the moment and are perceived in the context of the housing and the circular economy in [...].

The responses to this group will allow us to gain a better depiction of the key institutions working in the areas where HOUSEFUL will implement activities. This will enable us to better understand the social context to identify gaps as well as key connection points amongst the stakeholders.

- Hand over to the participants the Informed Consent sheet (see WP8 ethical procedures)
- To ask for permission to record the conversation and if agreed, record the conversation
- Make the Questions and let the participant(s) speak
- Closing – Summarize the major findings with them and explain the next steps
 - All results from the focus group/interview will be analysed in an aggregated way and presented in a report, never from an individual perspective
 - We will organise workshops at each of the demo-sites and the results will be used to better frame the issues to be discussed.
 - The recording will be deleted once we have reviewed the answers and aggregated the results. We will not keep any records on file.
 - Thank participant(s) for their time
- **After the meeting**
 - Transcribe (in English) the meeting according to the questions template and save it in a document with the following naming format : WP3_Focus_group/interview_your_organisation_name_location_date (eg. WP3_Focus_group_WE&B_barcelona_5th November 2018).
 - In the text, highlight your own thoughts and appreciations and relevant statements.



- Provide a short summary (one two paragraphs with your own reflections that could help the analysis and integration).



- **Interview questions**

1. What could be your **potential role** in the decision-making process of developing circular solutions? And/or in the Houseful demo-sites? *(to explore interest in the project)*
2. In the recent survey we undertook, between 69% and 94% of respondents consider: energy saving, recycling and water reuse as environmental aspects that can easily be applied to the housing sector.

Are these environmental aspects mentioned in the survey the same as the **environmental priorities** in X area? If not, what are the **environmental priorities** in the X area (Penzing and Floridsdorf or Sabadell and Sant Quirze*) that we would need to consider?

*If the actor is “very local” consider only the district/city level, if the actor is regional or European consider both regions within a country or even both countries.

3. What would you say are the **housing priorities*** in the X area (Penzing and Floridsdorf or Sabadell and Sant Quirze)? Other than the environmental and housing priorities you mentioned, what are the other main priorities in your area?

Statements to stimulate discussion

- a. *In Sabadell 81% of households are private and 13,86% are rented. The suburb of Campoamor is marginalized within the city context. This contrasts with the political trends with incentivise social housing.*
- b. *In Sant Quirze of the 7.470 households 4% are empty and of 31 new households none are designated as social housing. This contrasts with the political trends which incentivises social housing.*
- c. *Floridsdorf is characterized by an over average high population density.*
- d. *Penzing is characterized as stable and inhabited by rather older and relative prosperous people.*

*For this question we want to infer which housing type each actor prioritizes in X area (if the actor is “very local” consider only the district/city level, if the actor is regional or European consider both regions within a country or even both countries).

4. What can you tell us about **circular economy approaches**: water reuse, nutrient recovery from source, energy efficiency measures, etc.? What is your opinion with regards to these approaches?



Are you aware of any other project from your organisation that is focussed on circular economy approaches? If so, please detail the project here.

5. How much do you **know** about the area in which the **demo sites** (Penzing and Floridsdorf or Sabadell and Sant Quirze) of the Houseful project are situated*?

Points to encourage discussion:

- a. *Think about the Political system and participation in decision making processes. coordination between different local organisations and public organisations.*
- b. *Is there community stability and cohesion?*
- c. *Is there Market appeal of green building projects.*

**If actors do not know the project or the area this is also useful information to us.*

6. According to an initial survey respondents mentioned the following benefits of the Houseful proposed solutions (i.e. grey water recycling, organic solid waste recovery and solar panels): over 90% believed it would result in a change of paradigm in the housing sector towards sustainability, 84% believed there would be an increase in environmental awareness and 74% believed there would be an optimization of the long-term costs.

In your opinion what would be the expected **benefits** for your **organisation** and for the surrounding **society** if the Houseful proposed solutions are implemented well?

Some examples to encourage discussion:

- a. *End user satisfaction*
- b. *Change in attitude and behavior towards reuse and recycling*

7. In your opinion could the following factors **influence** the implementation of the proposed circular solutions and if so, how?

Some examples to encourage discussion:

- a. *Trust in the building manager*
- b. *Aesthetics of the proposed solutions*
- c. *Community stability*
- d. *Market appeal of the proposed solutions*



8. According to the survey respondents mentioned as potential problems for the implementation of Houseful solutions: strict legislation for reuse in the housing sector (62%), low acceptance of housing plans (58%) and low acceptance of users of the circular solutions (33%). Which potential **problems** do you envisage from the **operation/development** at the site of your **organization**? And for the **society**?

Some examples to encourage discussion:

- a. *At implementation level (rejection, policy acceptance, market acceptance, high costs, etc.)*
- b. *At operational level (need of maintenance, etc.)*

9. In the survey, 54% of respondents mentioned low acceptance of the products to be reused due to the risk they pose.

What **risks** do you envisage there could be for implementing and using the proposed **technologies** in the field of **reuse** (water, food, energy, and nature based solutions)? And for risks to **society**?

(in case these issues were not addressed in the previous question)

10. According to the survey 77% of respondents mentioned the lack of financing and 28% mentioned maintenance costs as barriers to implement circular solutions.

What do you think could be the main **barriers for the co-management** of the proposed Houseful solutions?

Some examples to encourage discussion:

- a. *Renting vs buying could influence? (property rights)*
- b. *Maintenance of buildings?*
- c. *Cultural situation*
- d. *Human health*
- e. *Lack of commitment*
- f. *Lack of funding, etc.*

11. With whom do you usually interact in the housing sector and/or the circular economy approach: technology providers, other public agencies, inhabitants, etc.?



12. According to the survey 40 respondents wanted to be involved in the co-creation workshops for circular housing solutions and 34 in other face-to-face meetings with a technical approach.

Who do you think we should **involve** in the process of co-creation of the Circular Economy Business Opportunities (CEBOs) solutions? And how could we involve them?

Who do you think we should **involve** in the process of co-creation of the Circular Economy Business Opportunities (CEBOs) solutions in the **long term**? For example, in the Spanish context, cooperative schemes are used more in co-management

And how could we ensure effective engagement beyond the project (i.e. in the long term)?



- **Consent sheet to be signed before the interview**

[Date, place]

Dear Sir/Madam,

The Houseful project, funded by the European Commission H2020 research program, proposes circular solutions to make the use of resources in the housing sector more sustainable. This perspective promotes, in turn, new forms of co-creation, increasing cooperation among the stakeholders in the housing value chain.

We would like to analyze and deepen the points of connection between the stakeholders involved and to assess the possible interests in the aspects derived from circular economy and housing in your region. Additionally, the purpose is to identify the knowledge that we have to acquire from the social context for the demonstration of the 11 Houseful solutions, and to identify the possible gaps we need to consider. With your participation, as a relevant stakeholder, you will be contributing to building knowledge in the circular economy and the housing sector.

The aim of this document is to affirm your consent to participate in this interview/workshop in the framework of the HOUSEFUL project. The information provided by you is voluntary and will be used for research purposes only.

The provided information will be treated anonymously, which means it will be aggregated with other data and not used as individual data. This is in accordance with the data protection regulation from the European Commission: art. 5.1, "b", of the Regulation (EU) 2016/679 of the European Parliament and of the Council, of 27th April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC.

The results from the study will be stored in the HOUSEFUL database which will be archived by WE&B. The results will be available to other collaborating researchers within the HOUSEFUL project.

Most participants will find the discussion interesting and thought-provoking. If, however, you feel uncomfortable in any way during the interview session, you can decline to answer any question or to end the interview/workshop.

If you want to receive a copy of the results of this study, please, identify yourself and contact us at:

[Houseful partner organisation's name]

[Data manager name]

[street name]

[city]

[country]



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 776708

Or via email: [email address of data manager of HOUSEFUL partner organisation]

Yours truly,

[name, organisation unit and contact details of responsible HOUSEFUL researcher]

7.1.4 Co-creation Idea factsheet template

CO-CREATION FACTSHEET IDEA FACTSHEET	IDEA	TITLE
<p>Context</p> <p><i>To add about the context of the idea: region, demo, etc.</i></p>		
<p>Description</p> <p><i>Short description of the co-creation idea concept considering "design", "problem/objective", "strategic consideration", and "normative consideration" of the idea)</i></p>		
<p>List of assumptions (from CWS2)</p> <p><i>Expectations and needs from housing sector to achieve the desired futures that should be thought of in the CWS2.</i></p>		
<p>Roles and responsibilities</p> <p><i>Identification of actors responsible for the implementation of the idea and its development alongside with their roles (this can be initiated in btw. CWS1 and CWS2)</i></p>		
<p>Tasks</p> <p><i>List of designed activities that have to take place in order to further develop the idea (this can be initiated in btw. CWS1 and CWS2)</i></p>		
<p>Planning (to be developed in CWS2)</p> <p><i>Action plan for the development of the co-creation ideas gathered in the Idea Factsheet. This cell is to be developed together with stakeholders in the CWS2. The idea is to organise the previous cells (tasks, roles and responsibilities) into one strategic plan per each idea. The</i></p>		



planning should have at least the three elements of the table below (tasks, responsible, and timing)

<i>Task</i>	<i>Responsible</i>	<i>Timing</i>

Requirements for the full implementation of the idea
What would be required during the course of HOUSEFUL project to develop this idea. To identify resources available and non-available.

Targeted audience
Describe which community/ies (or types) this idea is aimed at/affected, as precisely as possible.

Working group members	Related HOUSEFUL Project Tasks (Tasks)
<ul style="list-style-type: none"> <i>Organisation (Name, Surname)</i> <i>Organisation (Name, Surname)</i> 	<p><i>To be filled by HOUSEFUL members.</i></p> <p><i>HOUSEFUL WP leaders will validate the list</i></p>

HOUSEFUL Solutions (CEBOs)	Communication tips
<i>To List what are the "affected" HOUSEFUL solutions by this Co-creation idea</i>	<i>Lessons learnt for the communication of HOUSEFUL CEBOs</i>

Sources of Information

Here information sources to develop the co-creation idea can be placed. This will contribute to the development of the idea in the CWS2

Table 3 Template of co-creation factsheet.

7.2 Table of Risk Benefit perception

https://www.dropbox.com/s/67vtiw1xgqxo4rw/risk_benefit_table_mbr_bm.xlsx?dl=0



