P/REFERENCES OF DESIGN

BRIDGING BY DESIGN: A DESIGNERLY APPROACH FOR CITIES TO SUPPORT INNOVATION PROCESSES IN THE URBAN CONTEXT.

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ABSTRACT | Transformation of the urban context is a continuous process of change, in which different interests and forms of rationality are converging. It is often the ground for agonistic forces that negotiate their values, projects and future views. (Concilio & Tosoni, 2018; Mouffe, 2000) However, in relevant innovation processes, such as urban or large scale projects, a design approach is crucial, as it helps to stay on course towards the ultimate purpose of the whole innovation process. In many urban innovation processes however, this approach is often overshadowed by considerations related to administrative or operative issues. This paper is based on the experience in an ongoing EU project, Climaborough, which is promoting a number of innovative initiatives in 12 European pilot cities in a Net Zero perspective. The first learning from this project highlights the designer's role in foregrounding the value of design in an innovative project. It does so by defining a design-based innovation process to promote initiatives for urban innovation. The paper will describe the three phases of the process: challenge definition, innovative procurement process and experimental sandbox and propose reflections on how the knowledge coming from those phases can be distilled, replicated and reused.

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1. Introduction

Cities are complex systemic aggregations in a continuous process of transformation, which involves a multitude of actors, rules, infrastructure and natural or artificial agents (Colclough et al., 2019). To add complexity, multiple temporal perspectives configure evolutionary paths, which follow different temporalities: financial, strategic, ecological, social and political. The urban context is the ground on which different forces are converging and confronting. Cities are, at the same time, a problem lab, a resource pot, a market, a political arena and a place where new ideas emerge and mature (Concilio & Tosoni, 2018). In this continuous process of change, agonisms and antagonisms emerge between groups and rationalities that negotiate or fight and generate new, ever-changing forms of hegemony (Mouffe, 2013)[1].

A design approach plays a crucial role in mediating or creating the logical, material, and technical conditions for the interaction among different rationalities and different economic, social, cultural and political instances.

In relevant innovation processes, such as urban or large-scale projects, a design approach is extremely valuable to support innovation processes by framing them into the general and ultimate purpose of those processes. This is particularly evident in those cases in which urban transformation is led by the ambition of a complex systemic change, which is supposed to transition cities towards radically different scenarios (Concilio et al., 2018).

In large systems, and for the multiple actors involved in their change, design is not only an approach used to plan and direct major infrastructural changes but also a general and diffused attitude (Manzini, 2015) that must be mobilized at different levels to produce changes in small communities (niches), in urban systems (regimes) or even in the broader cultural, social, legal and economic landscapes in which cities are placed (Geels & Schot, 2007).

The challenge for design, however, is to learn how to work in such contexts and how to mobilise people, technologies and legal or organizational infrastructure to address this transition. In the last decade, several scholars have been focusing on the design perspective on this challenge (Ceschin, 2016; Gaziulusoy & Ryan, 2017; Irwin, 2015, 2018), while others have specifically focused on how niche or punctual design initiatives could be scaled up or framed in larger systemic changes (Manzini & Rizzo, 2011; Author, 2015a, Author 2015b).

2. The Net-Zero Challenge and the Climaborough Project

One of the most relevant challenges in urban sustainability transition is represented by the Net-Zero Cities (NZC) initiative. Cities are accountable for more than 70% of the global CO2 emissions (Mukim & Roberts, 2023), but they are also at the forefront of innovation, even though they are far from having consolidated methods to govern such complex innovation processes. For this reason, acknowledging the significant impact urban areas can have, the European Union identified cities as a key leverage point and the place to start a radical change in lifestyles and resource use, with the ultimate aim of reducing carbon emission by 55% by 2030 and achieving climate neutrality by 2050 (netzerocities.eu). Within the mission-oriented European program, which aims at creating interconnected actions that link climate challenges, policies,

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[1] Chantal Mouffe conceptualises agonisms as a productive force that can lead to the articulation of diverse perspectives. In an agonistic democracy, the goal is not to eliminate conflict but to foster a respectful and inclusive space where competing viewpoints can engage. Antagonism instead, represents a deeper and more irreconcilable form of conflict that arises when there is a fundamental clash of interests or identities that cannot be resolved through dialogue or negotiation. Mouffe also discusses the dynamics of power and conflicts in democratic society through the concept of hegemony, a concept drawn from the work of the philosopher Antonio Gramsci. Hegemony refers to the dominance of a social group or class, based on consensus and the articulation of a dominant "common" sense. Mouffe points out that hegemony is a contested and unstable condition.

urban planning and scientific/technological change, *Climate-neutral and Smart Cities* is, in fact, one of the missions of the EU for the years 2021 – 2027. Among other initiatives, NZC has mobilized 112 European cities to accelerate the climate neutrality objective to 2030, thus becoming leaders in the effort towards the 2050 mission challenge. The 112 mission cities have been selected after a call for expression of interest launched in 2021.

The NZC initiative has mobilised a big effort in several European cities, thus helping to raise awareness of the meaning, as well as the political, social and infrastructural issues emerging from this challenge. Even those cities not funded by the NZC initiative had a chance to reflect upon policies and strategies to mitigate their CO2 emissions or adapt to the inevitable consequences of climate change.

In line with raising awareness for the Net-Zero challenge, the EU-funded Climaborough project has been designed to support NZC or cities that have applied for the NZC challenge, even when not successful. Climaborough supports 12 of those cities by employing a double cycle of public procurement for innovative project proposals that implement part of the urban climate neutrality strategy. The idea is to support projects that could generate significant changes in the pilot cities by working on different aspects, from technical feasibility to social, regulatory, cultural, or organisational issues.

In its four-year duration, the Climaborough project team will coordinate the two cycles of the procurement process by making sure that: a) the cities recognise the challenge the NZC goal represents for their specific development plans and translate this challenge into concrete actions, b) the procurement process is addressing those challenges and c) the results of the procurement process are integrated into the dynamics of change of the urban context.

The complexity of the work in these cities could be analysed in two directions:

- a vertical direction: any intervention in this project will necessarily target a niche, i.e., a very local and specific issue related to the general challenge of climate neutrality. The vertical connection between the specificity of this initiative and the more general target of (urban or regional or global) climate neutrality should, however, never be forgotten, to frame any possible intervention within scalability strategies;
- a horizontal direction: every single change in the complexity of the urban context implies the interaction of different competencies, cultures, stakeholders and technologies;

Any activity of change in this context, i.e., any design or planning activity, should take into account this complexity and raise the question of the role of a design approach in coordinating actions, navigating complexity and connecting horizontal and vertical issues.

3. An Overview of Existing Literature

This Climaborough project focuses on a specific challenge within a larger challenge referring to a wider disciplinary landscape. The larger challenge concerns urban planning and the need to integrate the inevitable instances of climate change in the design or redevelopment of urban areas. Such a challenge is characterised by a tension between mitigation and adaptation strategies (Davoudi et al., 2009). Combining the two strategies often implies an interaction between global perspectives that are implied in mitigation strategies, with specific challenges, i.e. local interventions, often related to adaptation. The challenge of climate neutrality is therefore to be framed at different scales, between the local intervention and the larger scale perspective (Shabb et al., 2023; Wu et al., 2023).

In defining the mission of Climate-Neutral and Smart Cities, the European Commission referred to an approach to multi-scalar challenges inspired by Mazzucato's mission-oriented innovation policies(Mazzucato, 2017, 2019). Mazzucato proposes such policies as a response to the most urgent global challenges. She does so by articulating the missions in a framework that mobilises different economic and

technical sectors through the promotion of mission projects (Miedzinski et al., 2019). This approach creates a framework for policymakers to address investments into meaningful innovations, creating a clear alignment between the scale of each proposed solution - the lower scale challenge -with the larger goal of climate neutrality.

The transition towards climate neutrality can be described through Geels multilevel perspective (Geels, 2010). Geels describes large transitions, such as the transition to climate neutrality, as a dynamic process that connects: (1) innovation in niches, e.g. small, protected environments in which innovation may happen and develop; (2) change in institutional regimes, i.e. the set of rules, norms and practice that shape the current system and (3) transitions to new socio-technical landscapes, which represent the broad socio-technical, economic, and cultural context in which niches and regimes operate. Design and urban planning operate at different scales in this process: while design has often been focused on interaction at the niche level, e.g. among individuals, or communities, the planning scale often refers to the regime level, as it concerns the entire set of tools, measures, and actions that cities may provide to the climate neutrality mission. (Arcidiacono et al., 2023). The role of design in innovation processes in cities has been explored in the work of policy and innovation labs (Thorpe et al., 2016; Thorpe et al., 2018; Voytenko et al., 2016) and in different projects, some of which have directly influenced the definition of Climaborough paradigmatic view and methodological approach. Among them is, for instance, the Designscapes project, which studied the role of design in the innovation processes between niches and landscape transitions (Concilio, De Götzen, et al., 2018); and the T-factor project, which suggested participatory design approaches to mission-oriented urban regeneration processes (Marmo et al., 2023). The methodological approach in the Climaborough project is the result of a combination of the theoretical frameworks derived from those projects and the operative experience of innovation assessment in cities (Colclough et al., 2019).

4. Methodological Approach

The working cycle adopted in Climaborough is based on a continuous conversation between the cities and the Climaborough design team. An overview of the process could be articulated in three phases:

1. **Challenge definition**: an initial phase in which each city's challenge is collaboratively crystallized and defined, main stakeholder groups that are affected by, or affect the challenge, are identified, and a number of use cases that elicit the details of the challenge and the institutional, infrastructural, social and data-related are developed. This phase serves as a foundational preparation for the public procurement process.
2. **Innovative public procurement**: the Climaborough project uses a preliminary market consultation, based on a preliminary negotiation dialogue with potential solution providers.
3. **Exploratory Sandbox**: this phase consists of preparing an experimental playground for awarded solution providers and municipalities to experiment with ways to apply the proposed solution to the urban context of the pilot city. A sandbox is a tool legally recognized by the EU (European Commission, 2023). The experimentation conducted within a sandbox can extend into regulatory, technical or societal realms.

It is worth noticing that the team involved in those phases had different competencies that have been used according to the phases of the project. In the challenge definition phase, the conversation with the pilot cities has been mediated by an innovation expert and by the '*city angels*' (i.e. two partner organisations: an association of municipalities and a lab working on urban transformation projects and have long-term experience in working with public administration) and designers, who collaborated to the definition of facilitation tools. The procurement process has mainly been coordinated by partners with long administrative experience. The nature of the experimental sandbox is still to be fully explored and will possibly involve designers, the above-mentioned innovation experts and the city angels.

At the time of the redaction of this paper, the cycle is not yet closed, therefore, this paper will explain the work in the three phases and propose some reflections about the learning in the first two phases and the forecast on the work to come.

4.2 Challenge Definition

In the first phase, the Climaborough consortium worked on the definition of a framework for the whole innovation cycle. This phase started about four months before the launch of the tender and continued during the tender. The purpose of this phase is to frame the whole innovation process, in preparation for the public procurement. In this phase, the pilot cities are engaged in a series of meetings, in which they are asked to identify:

- **A challenge**, concerning the main net zero objective for the city;
- **The innovation potential**, e.g. the ecosystem that can support (or hinder) the innovation process, the assessment of such potential was based on four pillars: Framework conditions, network enablement, innovation in action and sustaining value. The conversation with the pilot cities consisted of exploring the components of those pillars (the hexagons in Figure 1);
- **The actors in the ecosystem**, i.e., the users of the solution, but also the relevant stakeholders, such as business or public sector, the ecosystem has been mapped taking into account the level of interest and opinion of the stakeholders (figure 2);
- **Relevant datasets,** that are needed to build and evaluate the solution and will be integrated in a project platform;
- **Use cases**, which define possible scenarios for addressing the defined challenge and that elicit requirements, specifications and details that can be used especially in the description of the challenge as well as for helping the city representatives adopt a citizen-centred point of view (figure 3).
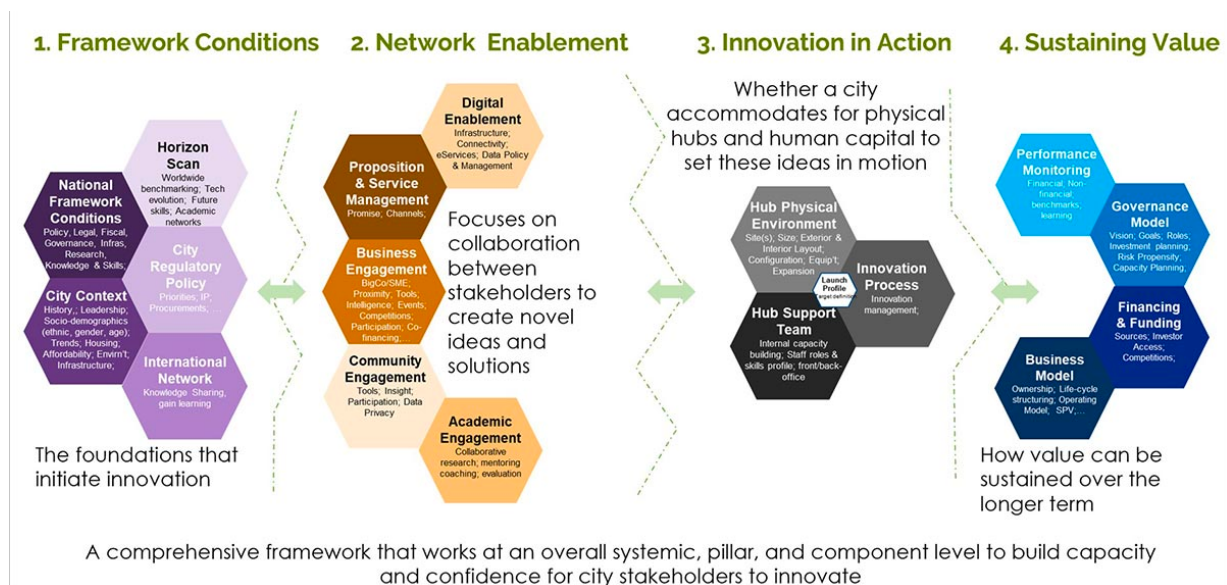

Figure 1. The 4-pillar systemic urban innovation framework. Source: (Colclough, 2023).

Figure 2. Map of the ecosystem actors by level of influence and opinion.

Figure 3. Use case template.

The project defined two *Climhubs*, i.e., two thematic areas: one hub focuses on urban challenges related to energy and mobility, while the second focuses on waste and circularity. Each pilot city's challenge can be associated with one of the hubs. The hubs are meant to support knowledge generation and exchange between cities addressing thematically similar challenges.

The pilot cities are either working through individual interactions with the design/research team or by exchanging knowledge with other cities in the same hub. Each meeting, whether individual or within the hub, has been facilitated by design-driven frameworks that supported the discussion on each of the themes identified above.

4.3 Innovative Public Procurement

Unlike the normal tender processes, the Climaborough project used an EU legally recognized tool, the preliminary market consultation, which makes it possible for municipalities (launching the tender) to open a dialogue with possible participants to the tender before they send the final offer (Sorokina, 2022). The preliminary market consultation consisted of a general information meeting with the potential applicant in each city. The knowledge acquired in the challenge definition phase is used in this phase to provide the applicants with all the necessary information to participate in the tender. This knowledge, together with the requirements elicited in the challenge definition phase, is distilled in the tender call and specified in one of the appendices of the call.

The public procurement process is divided into two phases: in the first phase, proposals are presented without specification of the budget, to be discussed in a one-to-one negotiation between the city and the proponent. It is crucial, at this point, that the city has a clear picture of the most relevant implications of the solution on the city ecosystem. In this phase, cities can propose changes that the proponent can include in a second submission (the second phase), which will also include budget details.

4.4 Exploratory Sandbox

This phase consists of preparing an experimental playground for innovators and municipalities to experiment with how to include new initiatives in the urban environment. In experimental contexts, a "sandbox" typically refers to a controlled environment where researchers can test hypotheses, explore ideas, and conduct simulations without risking any significant consequences that could instead occur on a real-world or a city-wide scale. This concept is often used in fields like computer science, where sandbox environments provide a safe space for testing software or algorithms without affecting the broader system, or in game development, where designers use sandboxes to test game mechanics, level designs, and player interactions before integrating them into the final product. Generally, the concept of a sandbox in experiments allows researchers to iterate, refine, and validate their ideas in a controlled setting before applying them in real-world scenarios. It provides a valuable tool for experimentation and innovation across various disciplines.

The European Commission provided some guidelines for the definition of the concept of sandbox (European Commission, 2023); The experimentation conducted in a sandbox can span regulatory, technical or societal realms. Regulatory experimentation may involve a temporary loosening of existing legal and regulatory frameworks to enable the testing of innovative technologies, products, services or approaches, which are not fully compliant with these frameworks. While the term sandbox has often been referred to the regulatory aspects of the experiment (Nesta, 2019), the European Commission also considers other experimentation tools to foster learning and experiments: testbeds and living labs. The former mostly focuses on technical aspects, whereas the latter refers to the social aspects.

All the aspects, regulatory, technical and social, should be tested through prototypes, or demos: the conversation with the cities is aiming at highlighting the most relevant technical, social and regulatory aspects that are expected to be tested and evaluated. Figure 4 is a snapshot from the conversation with one of the pilot cities, using a Miro board.

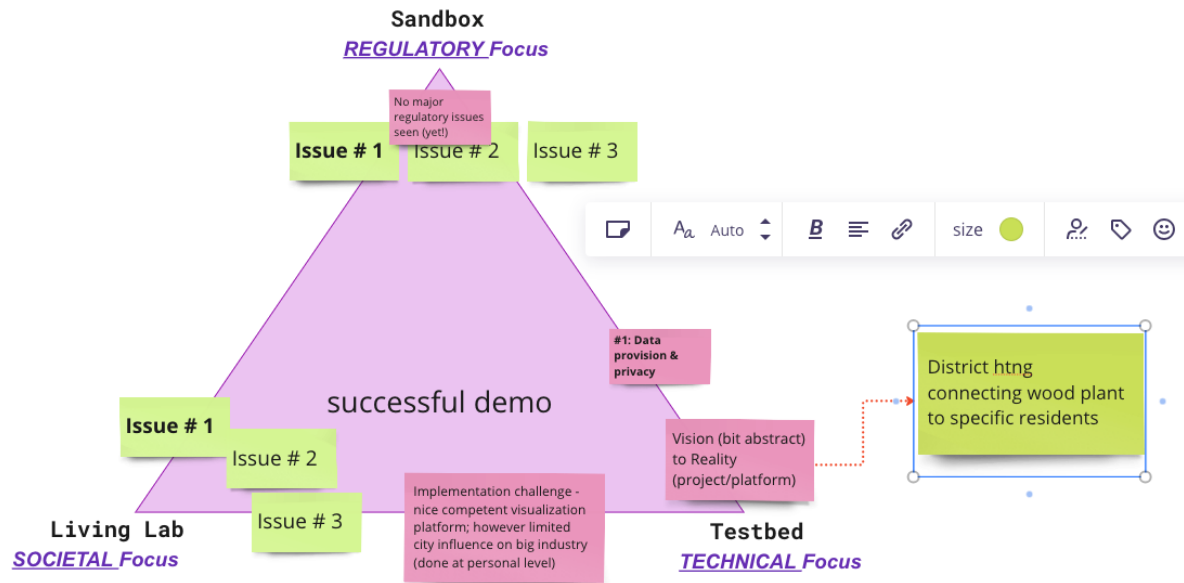N. Morelli, G. Colclough, R. Neuhoff, L. Simeone, J. Starostka, H. Zohar

Figure 4. Graphic representation of the characteristics of the experimental sandbox in one of the cities.

The three aspects of the experimental sandbox refer to different disciplinary areas: for years, living labs have used specific methods and tools, such as design jams, design sprints, workshops and systemic prototypes to engage communities in co-creation activities (Leminen et al., 2017; Schuurman et al., 2012). Technical aspects have also been used with different forms of modelling or prototyping. Regulatory sandboxes are used in healthcare, energy, transport, fintech and data (Nesta, ND), but they represent a relatively unexplored domain explored in the design discipline. Relevant explorations in this area have been undertaken by Nesta (Nesta, 2011, 2019, ND)and IDEO (I. Nesta, 2016), and suggest the use of different prototyping strategies to address different levels of complexity, from individual interactions to large regulatory systems.

5. Discussion

At the time of writing this paper, the project is far from being completed. The preparation phase has led to the preliminary market consultation and the preparation of the call for tender. A good number of solutions have been proposed and will be evaluated according to the appropriate procedure, as required by EU regulations.

As previously mentioned, this paper is the first opportunity to get an overview of an ongoing design research project, looking at what worked or not and the challenges to come. This is an *insider* overview, as the authors of this paper are directly involved in the design of the various phases, in the interaction with the city and in the negotiation of the process with all the partners in the project's consortium. This implies that, rather than a completed experience, the authors intend to propose a discussion about the perspectives and the learning from this first phase of the project.

5.1 Different Perspectives

The Climaborough project includes twelve cities, eight of which are *leader* cities (i.e. those that participate in the first cycle of the procurement processes), whereas four other cities are participating as *followers* (meaning that they will be involved in the second call for tender). Furthermore, leader cities in one hub will become followers in the other hub, which means they may be able to promote some activities in areas that have not been included in the first procurement process. Some of the cities are relatively large (Torino, Grenoble, Sofia, Athens), whereas others are much smaller. The administration structure is, therefore, quite

different, as different are the roles of the personnel participating in the project, from public servants working in offices dealing with specific problematic areas (e.g. urban waste, mobility, energy), to external consultants working with the municipalities. Finally, the different sizes of the pilot cities imply a different decisional structure: the big cities are obviously bounded by a more structured decisional process, whereas the smaller have a thinner, possibly more agile organization, but some of their decisional processes must be coordinated at the regional level. The diversity of perspective implies the need to find different *languages* to talk to cities and a unified strategy to organise the dialogue in those languages. The graphic format and the templates have been valuable boundary objects to support the conversation.

The different perspectives also impact on the capability to react on the pilot cities side, which means that the capability to influence decisions at the municipal level is different. This will possibly affect the way the sandbox can be organised. A regulatory sandbox, in which certain regulations are suspended to support experiments, may not be possible when the point of contact between the project and the city is not embedded in the municipal administration. On the contrary, personnel who work on specific municipal missions, such as waste reduction or digitalisation of public transport, may be more *embedded* in the administrative logic, thus they may find it hard to accept a different perspective, such as a broader view towards a circular economy, of models of mobility that support the reduction of circulating cars. The challenge in designing the sandbox will therefore consist of balancing the perspective on the specific problem and the connection with the overall themes of the Net Zero Strategy.

5.2 The Complexity of the Topics

To be compatible with the NZC goal, the change the Climaborough project is expecting to bring about in the pilot cities must be systemic, meaning that it needs to involve several aspects of the technical, social and organisational infrastructure of the city. On the other hand, the point of contact from the city is a person, or a small group, with specific competencies. What the project asks them is to enlarge their perspective beyond their competencies: experts on waste, for instance, are asked to provide information about available urban datasets or to invite other municipal public servants to the conversation. In this case, the role of design has been to provide tools for identifying relevant information about data, infrastructure, stakeholders, and institutional enablers, as for the use case templates in Figure 3.

5.3 The Drop and the Ocean

Experimenting in cities is not a new practice in urban projects, especially in EU-funded projects. Other projects tried to engage some pilot cities in the introduction of innovation and in following up on the transformation that this could cause. The level of engagement of cities, however, did not always live up to expectations, especially when the experimental phase required a complex and systemic effort. The advantage of having a procurement process as part of the Climaborough project has been to keep the interest of public servants and participants alive because the process implies very specific legal responsibilities and obligations for the cities.

On the other hand, the tangibility of the objective (the solution coming from the tender) risks narrowing the attention of the pilot cities partners on the technical, organisational or legal practicality of the solution, rather than extending the perspective to the systemic goal of climate neutrality.

The project team used the metaphor of the drop (the specific solution coming out from the procurement process) and the ocean (the systemic goal of climate neutrality at the urban level). The dialogue with the partners in the pilot cities always started from the representation of the interaction between the specific intervention, for which the procurement process was mobilised, and the climate neutrality framework and roadmap, trying to frame all the phases (challenges definition, identification of users, identification of datasets and the application of solutions) into the broader Net-Zero Goal, that should validate the pilot city strategy (Figure 5). It is clear that the single solution is not going to have any significant quantitative impact on the positioning of the city with respect to the climate neutrality goal, however, it is important to validate the solution with respect to the infrastructural changes they may require and the opportunities to amplify

the impact of the single initiative. This also implies eliciting considerations about the horizontal scalability of the solution (i.e. its reproducibility) and its vertical scalability (i.e. the possibility of integrating each solution in the institutional framework of a NZC strategy)(Moore et al., 2015).

This challenge is also very relevant in designing the sandbox. At this stage, a sandbox is a unique opportunity for designers to support experiments and test visions that can go beyond the existing regulatory, technical or societal limitations. However, the challenge for the design team is to keep the vision alive during and after the experiment, test and validation phases, possibly proposing forms of systemic prototyping or exploring scalability strategies to amplify the outcome of the experiment.
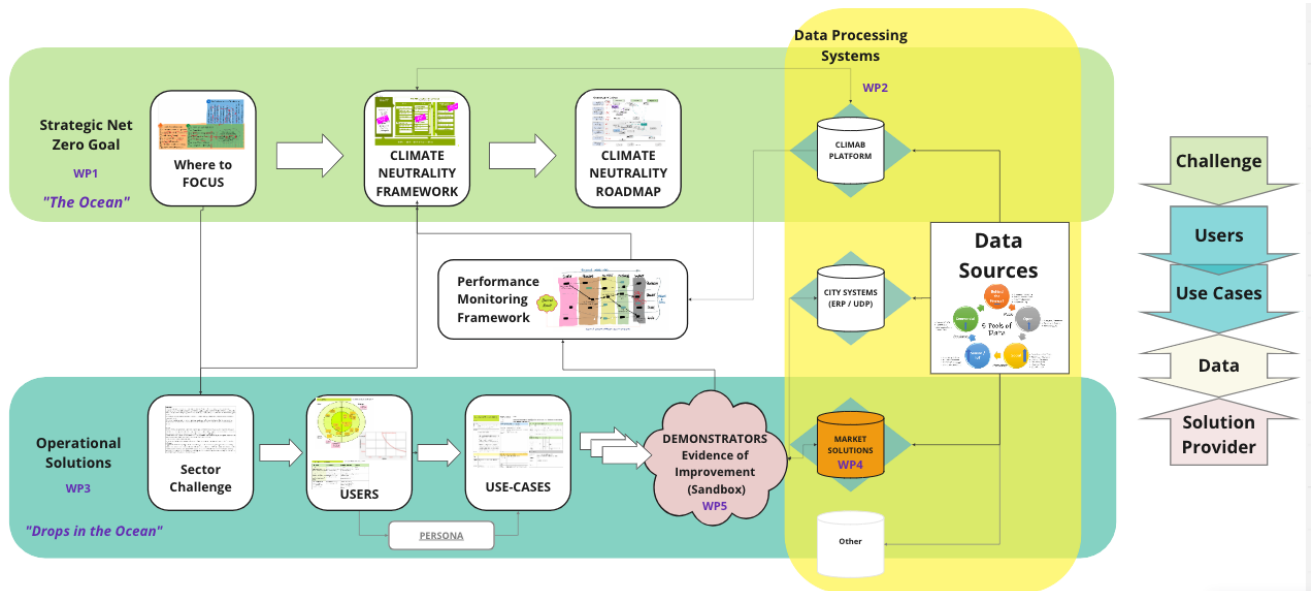
Figure 5. Linking the phases and investigations in the project with the systemic Net Zero Strategy.

5.4 The Hubs

As mentioned above, the twelve cities involved in this project are divided into two *Clim*hubs, focusing on 1) energy and mobility and 2) waste and circularity. So far, the work in the hubs consisted in sharing experiences and information in co-creation workshops. Hubs have worked as thematic areas, but also to facilitate the workshop organisation. However, the hubs are meant to have a broader scope in the project, namely to become an opportunity to develop and exchange specific knowledge, coming from the learning and the experiments in the sandbox. An activity of co-creation among the sandbox could also be proposed, that could amplify the result of each single sandbox or could test solutions across the pilots.

The hubs could become the legacy of the Climaborough project, after the funding period, possibly including new cities and becoming a repository of knowledge for cities that aim at implementing climate-neutral strategies. However, this poses some questions about the legacy of this design research project: the knowledge exchange in the Climhub is strongly supported by the project team, in particular by the city angels and the mediation of the design and innovation experts. The question emerging from the scenarios of a design research project like Climaborough is: to what extent is this knowledge reusable without the mediation of the experts and the design team? Can one assume that the collaboration between the team and the pilot cities develops a sort of *diffuse design capability* in the public administrations involved in the project? Can one assume that the knowledge repository represented by the Climhubs is effectively used also by cities that have not participated in the project? To what extent is the mediation of design and innovation experts essential to support climate neutrality innovation in cities? Finally, can the interaction for the design process be codified (for instance through a roadmap that indicates the necessary steps in the process and the tools used in each step) to distill the knowledge from the perspective of its replicability?

Those questions suggest an investigation of the model of support to design and innovation to large public systems, like cities, a question that has already been discussed in relation to the role of policy and design innovation labs around the world (Bailey et al., 2016; EUPAN, 2018; Holierhoek et al., 2019; Kimbell, 2015; Siodmok, 2017), but also in relation to the role of living labs (Nesti, 2018; Steen et al., 2017).

6. Conclusions

This paper is approaching a design problem, that concerns two levels of complexity: the complexity deriving by the convergence of multiple social, technological, organisational and political issues in the urban context and the complexity related to the multi-scalar dimension of the problem of climate neutrality.

The first dimension implies the role of design in the development of innovation at the systemic level, making sure that innovation processes are properly metabolised by the urban ecosystems and integrated into a sustainable transition process. In this sense, the paper reveals the valuable role of design in preparing the ground for procurement processes and in envisioning possible experimental conditions for innovation to be prototyped, tested and developed.

The second dimension concerns the scalability of the process, which means its replicability within the same urban context or in other urban contexts and the creation of a social, technical and institutional context that would support the replication and the diffusion of innovation. In this sense, design knowledge is valuable in defining collaboration tools, that help the actors involved in the process to scan the innovation capacity of the ecosystem, and to figure out relevant innovation conditions and the institutional enablers (e.g. through use cases and ecosystem maps, as mentioned in section 4.2 of this paper).

Since, as mentioned, the Climaborough project is an ongoing process, this paper has to be seen as a reflection in action, that aims at starting a conversation within the design community, but also beyond it. One of the most relevant questions emerging from the experience in the Climaborough process is whether the design knowledge emerging from the process so far can be codified, replicated and become part of the diffuse design capabilities of an institution, such as a city administration, rather than being an expert design competence.

Beyond the design community, the conversation this paper could suggest would also involve city representatives, or institutional stakeholders working on urban innovation and procurement processes, in the perspective of integration of design within the existing package of legal/technical competencies that support the processes of decision making in cities.

As mentioned, this paper is the first step of an ongoing project, but it is also a possible introduction for future research and a debate related to the design capability to support the innovation processes related to the mission approach, inspired by Mazzucato (2017, 2019), that the EU is adopting to structure large innovation processes for the coming future.

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