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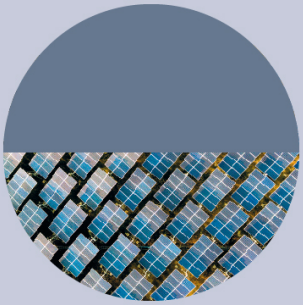

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More than a thought experiment -- conceptualizing and implementing an Urban Living Lab

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Abstract. In the context of growing urbanization,[1] cities are focal points of social interactions. Embedded in bi-directional feedback loops with wider regional environments and the global ecosystem, cities present, simultaneously, ideal reference points and vital arenas for generating debates about and testing pathways toward emerging sustainable models of livability and a re-defined prosperity. The latter no longer limited to mainstream economic definitions but encompassing a more holistic societal prosperity, nurtured by shared experiences, enhanced knowledge generation and exchange, eclectic encounters and ample space for creative expression. The paper presents the conceptual development of an Urban Living Lab (ULL). It employs existing literature on ULL to enable a basic frame of reference, draws on the concept of contextual logic and a philosophical understanding of flow to inform processes for rolling out such a multi-stakeholder engagement experiment. The paper attempts to conceptualize an approach that employs community participation to define contours of a socially inclusive and livable society. This approach aims at empowering networks for transitioning towards such a society within a specific context.

1. Introduction – Background

Europe's urbanization rate is forecasted to increase by nine percentage points from about 75 percent in 2020 to 84 percent in 2050.[2] Cities account for 60-80 percent of energy consumption and at least 70 percent of carbon emission while only occupying thee percent of the earth's surface area.[3] But they also generate about 80 percent of the global GDP [3] and have a comparative advantage in terms of environmental per capita footprint. As Edward Glaeser notes, the "average suburban home is a size 15 hiking boot, the environmental footprint of a New York apartment is a stiletto size 6 Jimmy Choo."[4] In this context, cities gain relevance when addressing the transition towards responsible consumption and production systems and their sustainability is at the heart of the United Nations' Sustainable Development Goals (UN SDG) 11 and 12.[5, 6]

2. Research objectives

The project aims to contribute to sustainable cities and communities, fostering responsible consumption and production, and ultimately supporting the UN SDGs in the context of a mid-sized Austrian city. The specific objectives include:

- Designing and implementing an open innovation approach leaning on the Urban Living Lab (ULL) principles, using co-creation by a wide range of stakeholders within the community to ideate and conceptualize a space as a new "commons". [7, 8]
- Identifying the purpose and sustainable long-term use of the space with the aim of ensuring engagement of and benefit for the wider community and enabling users to grow with social and cultural interactions, reciprocal learning, and creative thinking.

[1] As detailed by the Population Division of the UN's Department of Economic and Social Affairs,[1] national statistical offices use varying definitions for urbanization based on a range of criteria and thresholds – capturing for example settlements with 10.000 or more residents. In this context cities are of course only the apex of settlement density.

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- Conceptualizing the design of the physical space guided by a circularity-based implementation of the construction (e.g. through refurbishing old structure and encouraging zero waste).
- Conceptualizing and implementing decision-making and governance mechanisms that foster continued engagement of the wider community on an ongoing basis.[2]
- Conceptualizing and implementing a construction material bank and passport system to possibly scale beyond the project.

The purpose of this paper is to provide a basic frame of reference and outline a conceptual approach within which the objectives of the project could be achieved.

3. Epistemology and concepts informing our approach

In the following section we will elaborate on the philosophical underpinnings guiding our thinking on sustainability as well as on some key concepts informing the multidisciplinary approach of the project.

3.1. Philosophical underpinnings of sustainability

The sociologists Parks' and Burges' view of the city as "a laboratory for the investigation of collective behavior" [9] is more prescient than ever. What better place, than the city, to explore "how one might live"? This question is at the heart of the quest society finds itself entangled with, on its path to sustainability. The project will address all three elements of sustainability – social, environmental, and economic, and will distil and explore how individuals, as part of a community (city and neighborhood) might want to ideate, negotiate, contribute, benefit, re-define, re-design and potentially co-create a space into a new "commons" that supports environmental, economic, and societal dimensions of such a community.

3.1.1. Environmental aspects

The negative impact of construction on our environment is unprecedented and experts increasingly stress the environmental footprint, not only of the maintenance, but of the construction and deconstruction of built environments. In 2015, only twelve percent of construction materials in Europe came from secondary sources, meaning that the bulk of the materials are newly produced and not repurposed.[10] Lifecycle analysis, which considers the sourcing of materials, the energy use in the construction phase and the effects of decomposition, is rarely applied. In response, engineers and architects have launched approaches more conscious of environmental impacts such as modular and adaptive design that allow for changes in use over the lifespan of a building, as well as design for deconstruction and recycling which consider the end of life impact of a building. Thus, Circular Economy (CE) models are getting increasing attention.

At its core, the concept of CE aims at designing out waste and pollution, keeping products and materials in use, and regenerating natural systems,[11] principles that are highly applicable to making urban construction environmentally sustainable.

3.1.2. Economic aspects

There is an emerging space for questioning classical economic theory that assumes the standard case to be a private good and the default mechanisms for transactions a transparent and efficient market. A look at the price-differential of a house or apartment with the same properties located in a city neighborhood with access to public services such as good schools, green parks, functioning public transportation, health care facilities, clean streets, a flourishing job market and a low crime rate as compared to an

[2] For this we will assess the feasibility of creating a token ecosystem which allows the involved stakeholders to steer the process into specific directions, or alternatively voting mechanisms to contribute to a self-regulating and self-organizing system (this would include to considering different structures like quadratic voting or weighted votes).

inaccessible rural area or a less endowed neighborhood provides clear counter evidence. What we value and are willing to pay for is substantially influenced by public goods and commons.

3.1.3. Societal aspects

The evolutionist-functionalist thinking of some German sociologists such as Simmel, Spengler, and Tönnies have highlighted "the evolution of a community form to an associative form, characterized above all by a segmentation of roles, a multiplicity of loyalties and a primacy of secondary social relations (through specific associations) over primary social relations (direct personal contact based on affective affinity."[12] Resulting in a "crisis of personality" as the individual needs to cope with this breakage of solidarity and the process of "fragmentation of activities" by limiting his or her commitment in these different roles.[12]

3.2. Contextual logic and 'flow'

The focus of the project is on unveiling the interplay between existing social structures and human agency, for a process to emerge that will help in answering the question: how existing contextual logics give way for new ones to emerge during transitions towards sustainable urban habitats. Contextual logics have been used to study interactions in business relationships within the context of the business and social networks. Ojansivu and Medlin,[13] for example, draw from the theory of institutional orders or institutional logics [14] to propose the concept of contextual logics to understand how resources are mobilized through activities within networks. They follow Friedland and Alford's [15] observation that organizational behavior is better understood when locating it within a societal context.

Furthermore, our approach takes into account the 'flow' in the evolving process while recognizing the various agencies implicated in this flow. Bergson [16] and Deleuze and Guattari [17] inform our conceptualization of flows as processes that allow for integration and incorporation towards becoming something new without losing what used to be. This helps locate the value of individual actors, the value embedded in their links and relationships with each other, and how this could be leveraged for exploring paths towards sustainability.

In drawing on contextual logic and flow, the approach conceptualized in this paper lays the foundation for drawing in a wide range of stakeholders, empowering and documenting the mobilization of resources, the emerging activities, and relationships that will inform the process of transition. In doing so, we adopt a processual approach and embrace the idea of networks that facilitate this transition as constantly becoming.

3.3. Social innovation and architectural innovation

Contrary to traditional views on innovation that see the primary driver in profit maximization, social innovation's focus "on redistribution of knowledge, discovery, and cocreation changes the key assumptions and logics of the conventional innovation theory."[18] We find our project firmly situated in such an approach to innovation. Our epistemology is informed by the idea of architectural innovation put forward by Henderson and Clark, who propose that innovation could be practiced through a reconfiguration of an established system by linking components in novel ways.[19] For this project, this could be applicable in two ways: first, with respect to the tangible aspects of a physical urban structure with its material and design components that could be reconfigured through novel processes. Secondly, in a more metaphysical way, regarding the governance and project development process that can be broken up in its components to re-think, re-design, and re-configure them (e.g. the roles of the different stakeholders, the linearity of evaluation). At the same time, in contrast to Henderson and Clark, we do not juxtapose architectural innovation to incremental and even radical innovation but see room for the co-existence of both.

3.4. Co-creation and Urban Living Labs (ULLs)

Our thinking and process design is further influenced by the concept of Real-World Laboratories (RWLs). This umbrella term covers not only ULLs - which we will draw most strongly from - but a

range of other experimental research approaches such as living labs, urban labs, change labs, urban (sustainability) transition labs, sustainable living labs, city labs, smart city initiatives, community-based initiatives, niche experiments, and social innovation labs.[20] While there is no firm definition of the ULL,[21] they address urban sustainability challenges. They are often characterized by an experimental setting, transdisciplinary knowledge exchange, co-creation between stakeholders, and transformative potential.[20] A similar philosophy of co-creation for developing ideas for a tangible space and its future purposeful use is a common objective of the project.

4. Application and implementation

In the following section, we outline how we propose to implement these ideas in the development of the project, starting with a description of the physical space, the approach to building and design, and the conceptual framework guiding the evolutionary co-creation process.

4.1. Location and plot description

The potential location for the ULL is a privately owned centrally-located property with an existing semi-desolate building structure in Graz, the second biggest city in Austria and the capital of the Styrian region. As of 2016, the population of Graz was 320.587,[22] which is expected to grow by 18 percent by 2034.[23] With its universities and its industry clusters, the city of Graz has been one of the leading regions for Research and Development (R&D) and is also located in a region renowned for its agricultural production and forestry.

Under the revised Graz zoning map the project plot is designated as a general residential area with the primary purpose being residential use but also allowing for usage in line with the economic, social, religious, and cultural needs of residents (e.g., administration, schools, shops, hospitals). The lot has a total size of 2151m2, with a building density range of 0,6-1,2 translating into an allowed gross floor space of 2581m2. The current structure occupies a built-up area of 860,40m2.

While the experiment is being kicked off as a private initiative and the space is not public in the conventional sense, the aim is to stimulate a co-creation process through wide stakeholder engagement that allows for the emergence of a vibrant "new commons." The focus will be on fostering sustainable livable city life while catering to the needs of the neighborhood.

The principle guiding the emerging character of the physical space is that there is an intrinsic and unassailable relationship between the activity patterns in a space and the architectural/building patterns.[24] As such the function and the structure that will come into being cannot and should not yet be prescribed, and will emerge through an evolutionary co-creational process.

4.2. Circularity

Circularity is an integrated part of designing the proposed ULL and this study embraces the three principles of circular design in construction – reduce, reuse, and recycle. Beginning with low material designs, we plan to limit on-site waste production by exploring the possibility of reusing the existing building skeleton while using the ULL approach to identify technologies for extracting bricks and building materials for additional construction from existing stock. While the purpose and the design as well as the technologies will only become concrete in the co-creation process, we anticipate the ULL to be based on a modular design. This allows evolving parts of the building with different lengths of life cycles and efficient refurbishing possibility as needs for the repurposing of the space change over time as part of the continuous co-creation process.

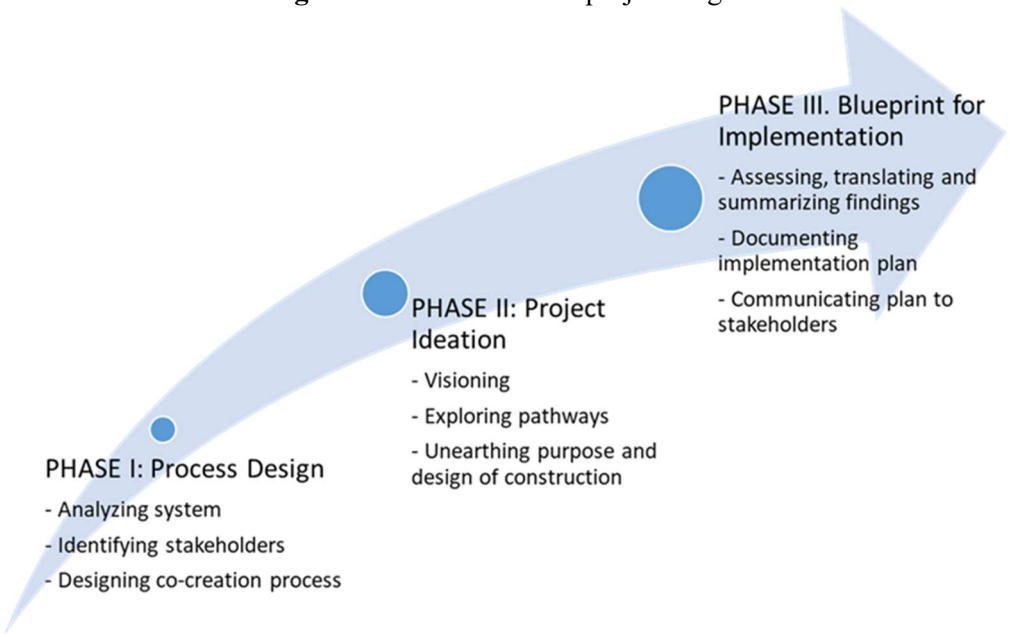
Circularity in construction supports the underlying idea of co-creation and an organic rather than inert evolutionary process. Involving citizens and the wider stakeholders in the decision-making processes about the purpose, the design and the construction materials and techniques will foster knowledge sharing (e.g. about building regulations, local expertise in sustainable construction methods, local sourcing of material from secondary markets). Furthermore, we aim to assess the creation of a material bank and material passports capturing the materials' history and allowing for

sustainable future use beyond this project. Finally creating new process of co-creation will foster sustainable and user-cantered mind-sets and foster sustainable business opportunities in the community.

4.3. Conceptual framework and research approach

The project will begin with a focus on sustainable built environments as that is the current need of the private property where this experiment is expected to take shape. We envision three phases. In the first phase, we will identify the key stakeholders and develop a process for engagement in the conceptualization of the built environment. In the second phase, we will center on the development of the purpose and design of the construction using a co-creation process. The final phase will document that process and prepare the grounds for project implementation. Each of these stages of the project are described in the Figure 1 below with a detailed outline of the aims, stakeholders and research approach for each phase described in Figure 3.

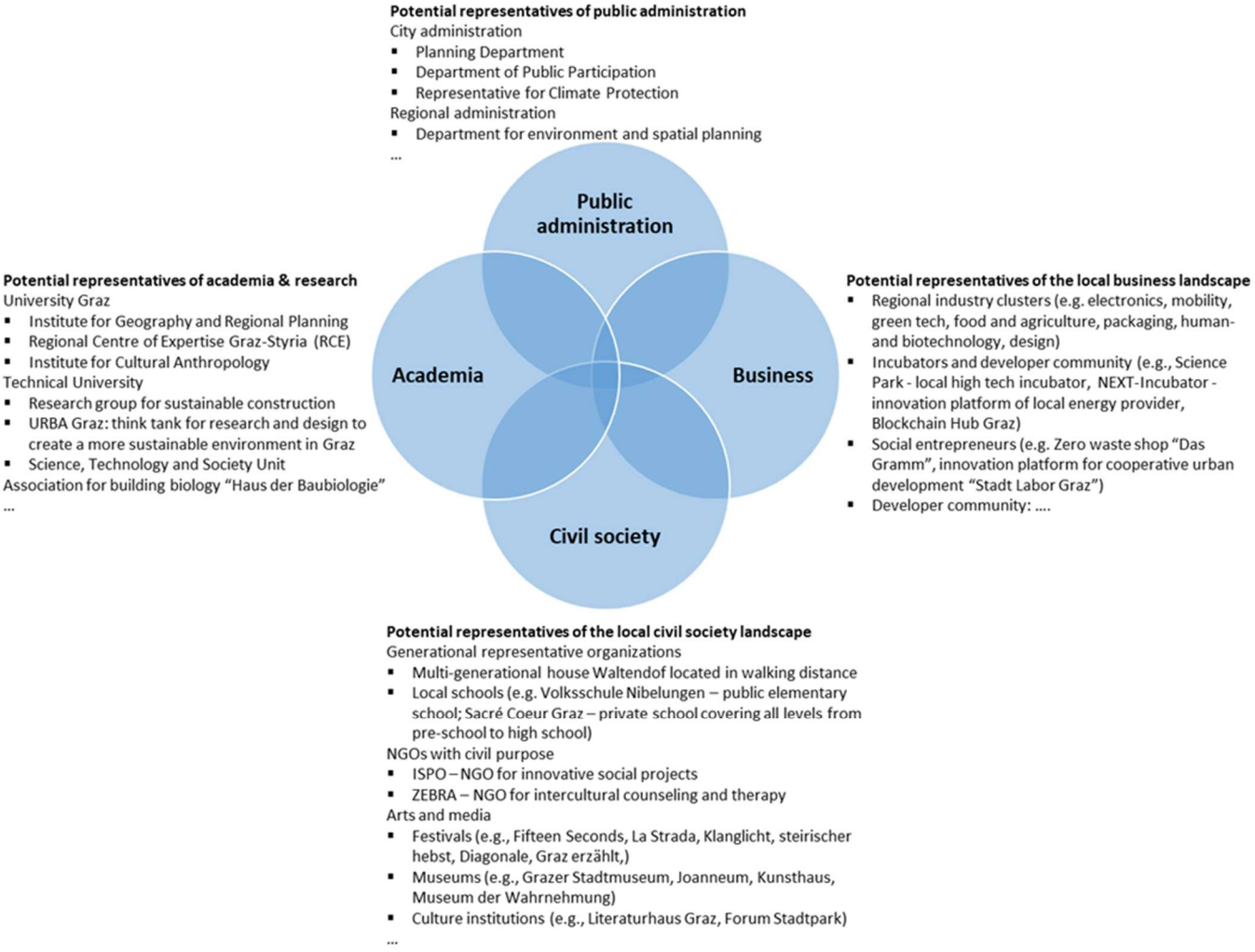
Figure 1. Overview of the project stages



To identify stakeholders we follow a quadruple helix model [25] - often used in innovation - that brings together representatives from academia, the business community, the public sector, and civil society (partly mediated through media and cultural institutions). This is also closely aligned with the citizen-public-private partnership (C3P) or Public-Private-People Partnerships (PPPP) adopted by many Urban Living Labs. We have already identified potentially interesting organizations (a selection of these is given in Figure 2) for unstructured interviews. These interviews will be with selected set of representatives from the local business, public administration, academic and civil society landscape, and will inform the design of the subsequent process that will widen the consultation to the general public

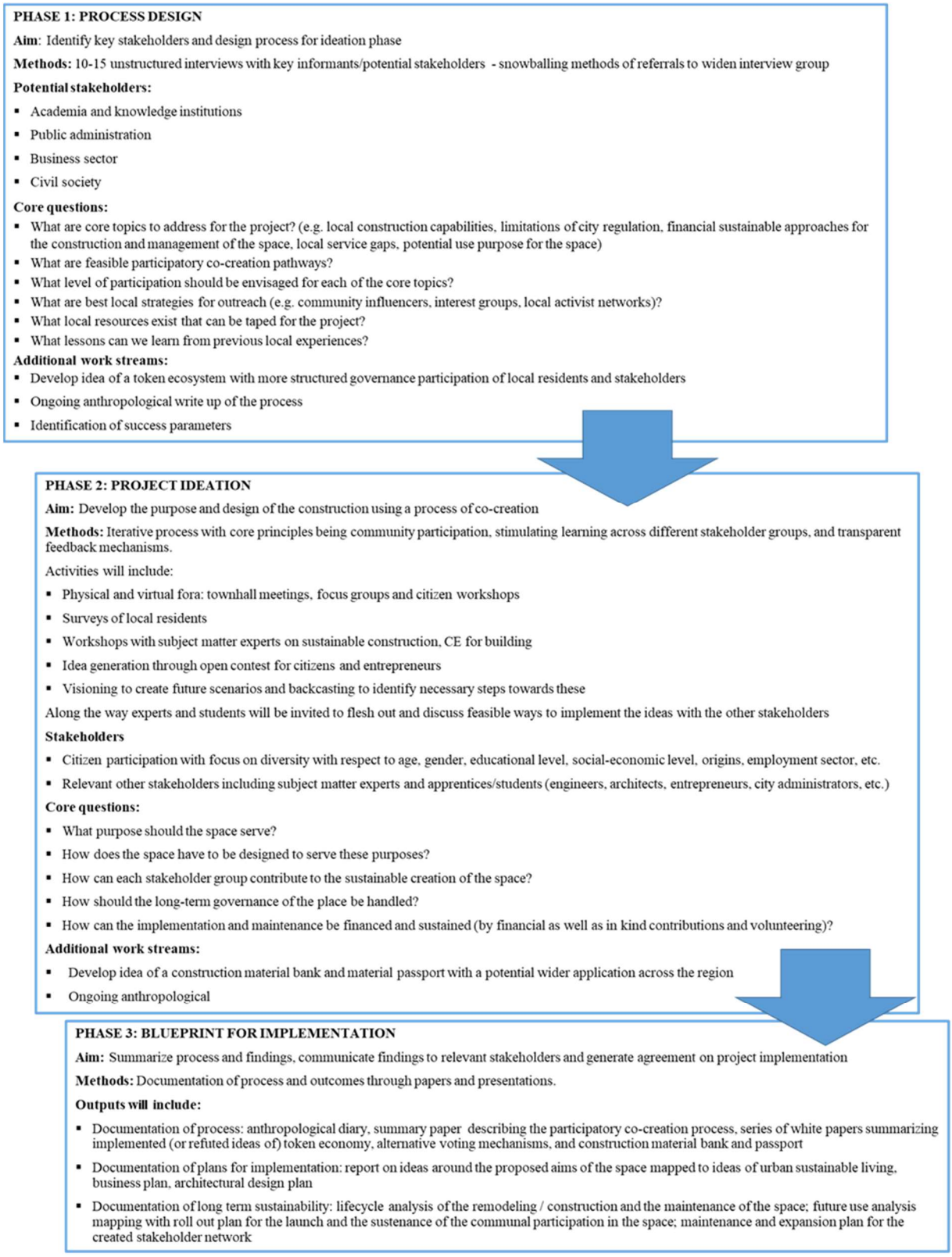
We expect the list of organizations and individuals to evolve over time based on referrals and new insights in the stakeholder landscape relevant for the project. We anticipate a continuous expansion and deepening of the network as well as an intensification and formalization of key partnerships. The anthropological documentation of this is one of the research interests of this project.

Figure 2. Illustration of quadruple helix model with selected set of potential stakeholders



In phase two, where the core the project ideation will happen, we plan to use an iterative process with core principles being community participation, stimulating learning across different stakeholder groups, and transparent feedback mechanisms. And, while we envision the use of several methods and approaches to achieve this, given the experimental and exploratory nature of the project, we expect an evolution and adaptation of the outlined process in response to the inputs and needs emerging in the co-creation process.

Figure 3. Detailed outline of project stages.



As several challenges can be expected in such a process, we wanted to briefly address a few of the most prominent ones.

Initiating creative and visionary processes can be inhibited if the participants' mindsets are strongly anchored in the present resulting in path dependency. To counter this in the ideation phase, we plan to guide participants in envisioning desirable scenarios for the plot in terms of activities taking place there and embeddedness in the wider community context. They should be inspired to envision new ways of city living in a more sustainable and livable community. Once such scenarios have emerged, we will use backcasting [26] to explore what steps would have to be taken to achieve this vision. Such approaches have been found very helpful in the area of sustainable transportation as they provide "an action-oriented approach focused on creating desirable future images and developing effective policies for achieving them." [27]

Dutilleul et al list the following other typical challenges in innovative processes of co-creation. "Cognitive barriers" resulting from the diversity in backgrounds (e.g., expertise, discipline or living situation) which can constitute communication challenges in finding a common language and create a mutual understanding, as well as "knowledge asymmetries" that create certain dependencies. "Motivational barriers" given the diverse drivers, interests and adopted strategies that can result in "social dilemmas such as the prisoners' dilemma and the tragedy of the commons" endangering the mutual trust and collaboration required for such an experiment. And finally, continued "user engagement and retention." [28]

These challenges are common but by no means insurmountable. We plan to mitigate them by the deployment of specialized facilitators with experience in moderating co-creation processes towards sustainable futures, transparent and inclusive processes, clear and open communication channels, and innovative ways of conferring agency to the participants. For example, through new voting mechanisms or experimenting with a blockchain token system that not only provides incentives to contributors, record and validate such contributions, but also draws in the local community of developers. Ultimately ULL are "governance experiments [that] serve to reconfigure capacities, resources and agency of actors in urban contexts"[29] and as such one of the central aims of the project is to unearth and experiment with the idea of a new commons that allows different networks to emerge, with new ways of resource mobilization, and agency.

5. Discussion

The success of the SDGs will, to large extent, depend on urban areas and in particular cities finding new ways of encouraging and enabling sustainable lifestyles to the increasing population share within their realms. As sustainability as such not only addresses environmental but also economic and social aspects it seems an inherent necessity for success to engage all stakeholders in the process of fostering such pathways.

Our project aims to contribute to achieving the SDGs on sustainable cities and communities (SDG11) and responsible consumption and production (SDG12), both in the ideation of the repurposing of a space taking CE principles as guidance for innovative design and construction, as well as in the dedication of the space to foster sustainable practices and promote knowledge sharing about these in the community. The research approach aims to i) build a coalition between residents, city government, local and international NGOs, local business and entrepreneurs, academics, and , civil society at large; ii) provide a blueprint for an integrated approach on designing urban living labs in context with circular economy, city mandates and innovative business opportunity; and iii) facilitate learning and knowledge transfer.

We see our project as a pilot and catalyst and aim to achieve a wider impact beyond the district of Sankt Leonhard by documenting our process and facilitating knowledge transfer (e.g., the material bank pilot could be rolled out beyond the project benefitting sustainable construction in the region, the token ecosystem could be expanded to other sustainable projects). This will involve developing white papers, outlining blueprints and plans, developing of technical platforms for knowledge sharing, etc. Effectively, we hope our project and our learning will be transferable and scalable in other contexts in Austria and beyond.

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