Social innovations for supporting regenerative lifestyles: exploration of three pioneering co-housing projects in Austria.

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Abstract. “Limiting global temperature increase needs demand-side actions and lifestyle changes”, stated the IPCC in their Special Report on Global Warming of 1.5. Social innovation in the form of alternative models for spatial production and ownership can support such regenerative lifestyles and emission reductions in the emissions-heavy building sector. However, today’s real estate market hardly supports the development and realization of alternative housing models. In response, practice shows that innovative models of housing are often driven by the initiative of the (future) inhabitants. In this study, we investigate and analyze different models of social innovation in housing based on three recently completed building case studies in Austria. The case studies are situated in a broad range of spatial contexts: re-activating the countryside, vitalizing a newly developed neighborhood, or bringing new life to abandoned, existing buildings. They are showcasing strategies such as: innovative models of (co-)financing and (co-)ownership to provide affordable housing; the shared use of spaces, functions and resources for reducing environmental footprints. We provide insights as to how alternative housing projects are being established successfully, what models groups are exploring for governance, financing and ownership, and which other social innovation practices may support or enable the implementation of regenerative lifestyles.

Keywords: Social innovation, Housing, Lifestyle changes, Demand-side action, Sharing Economy, Cohousing, Sociocracy, Buildings, Construction, Whole Life Carbon, GHG emissions, Reduction pathway, Decarbonization

1. Introduction

1.1. The need for regenerative models of housing

“Limiting global temperature increase needs demand-side actions and lifestyle changes.” [1] 37% of global, energy-related greenhouse gas (GHG) emissions arise from activities across the life cycle of buildings - material production and processing, transport, energy for building operation, maintenance, repair, eventually deconstruction and end-of-life processing. The magnitude of this figure highlights the importance of buildings in context of the climate crisis. Here, buildings are both an important part of the problem as well as a field with strong potential for being part of the solutions. However, current practices in building design, construction and also modes of use, hardly manage to provide buildings within Earth’s environmental boundaries [2], while providing the necessary functions and services required for a just green transition aimed for in Europe and beyond, e.g., as suggested in the European Green Deal and the New European Bauhaus initiative.
1.2. Social innovation for regenerative housing

The term “social innovation” describes novelty through the generation or application of knowledge to address social problems and needs, so Solis et al. propose [3]. The authors suggest that social innovation can be “linked to grassroot innovation, institutional innovation, transformative innovation, inclusive innovation, territorial innovation and environmental innovation” [3].

An inherent element of social innovation further is the central goal to enable socially responsible practices, rather than profit-driven social entrepreneurship [4]. To this end, Solis et al. suggest to view social innovation practices in function of different contexts and territories [3]. We consider this particularly true when investigating social innovation in the context of housing, where different contexts and territories provide different problems and needs and hence require adequate, place-based responses.

1.3. Case study housing projects

In this study, we investigate and analyze different models of social innovation in housing based on three recently completed building case studies in Austria. The case studies - see Figure 1 - are situated in a broad range of spatial contexts: re-activating the countryside, vitalizing a newly developed neighbourhood, or bringing new life to abandoned, existing buildings.

The first case study “KooWo” (Kooperatives Wohnen Volkersdorf) is situated on a former farm 16 km from Graz. It consists of a farm building with today all communal spaces, three terraced house buildings and farmland. The property was purchased in 2015; the group of 40 adults and 30 children moved into the project in the summer of 2019. The second case study is an urban cohousing project with the name “Bikes and Rails”. It is situated in Vienna, in the Sonnwendviertel-Ost, a newly developed urban area next to the new main train station. For four plots there was a concept-based bidding among “Baugruppen”. Baugruppen are groups of people deliberately formed to build (co-)housing projects together, as an alternative to regular offers on the housing market. The project Bikes and Rails won this

Figure 1. Photos of the three case study projects and their situation. KooWo (left, ©Jomo Ruderer); Bikes and Rails (right, ©Hannah Mayr); Cambium-LiG (bottom, ©Jomo Ruderer)
competition in 2015. In summer 2020, the group of about 31 adults and 12 children moved in. The third case study is the ecovillage “Cambium-LiG” (Cambium – Leben in Gemeinschaft). It is situated on the premises of former barracks next to the small town Fehring in Eastern Styria. Since moving in 2017, the barracks have been transformed bit by bit on a do-it-yourself basis. After a two-year-lease the group finalized the purchase in 2019. Today, around 45 adults and 25 children live in the ecovillage, which is supposed to grow in the future.

1.4. Objective and research questions
The objective of this study is hence to explore in the following the potentials, strengths and weaknesses of social innovation in housing based on three recently established (co-)housing case studies. Each of the projects is perceived as applying promising models of social innovation for housing, and, indeed, sustainable development. Guiding our analysis are two main research questions (RQs):

1) Which emerging approaches of social innovation can be identified in contemporary (co-)housing projects to enable sustainable models for spatial production, ownership and use?
2) Which economic and/or environmental synergies (or trade-offs) do the different social innovation strategies, e.g., co-ownership, co-funding and shared-use, lead to?

2. Methodology
Our analysis applies a mixed methodological approach, inspired by methods from fields of architectural design research, cultural anthropology, as well as quantitative sustainability assessment.

Drawing research. The drawing research method can be divided into two approaches: i) Spatial Drawings: axonometric views of the buildings and its surroundings - as a method of understanding and visualizing the plot structure and building typology. ii) Structure Drawings: Visualization of the organization of ownership and funding, internal organizational structures – for enabling understanding of interconnections and co-dependencies of spatial and organizational system.

Participation observation research. Visits to the individual projects are at the heart of our research approach. Interviews and guided tour may intermingle here as the researchers take part in community activities, such as lunch together in Cambium-LiG, or a tour with children to their favorite playgrounds along the river at the KooWo property.

Semi-structured interviews (on-site). Interviews with building design professionals and users at the project location, served as an important element to comprehend the process and context of each case study. The selection of interview partners aimed at capturing different perspectives by talking to building design professionals as well as the clients, i.e. the inhabitants who, depending on the project, are often also the clients, co-funders and co-owners. For building design professionals we focused mostly on the architects, who in some cases also acted as initiators of the projects.

Life cycle assessment (LCA). To obtain an indicative estimation of life cycle-related carbon footprints of the different case study projects, we investigate both embodied and operational carbon emissions of the case study project. For embodied carbon estimation, we apply a statistical building LCA approach which builds on data from the meta-study on whole life cycle carbon of buildings of [5,6], which provides indicative values for embodied carbon of different types of buildings, considering their structural material and providing values per life cycle stage over a life cycle of 50 years. Our assessment of operational carbon builds on information received by the users for energy consumption, with own calculations acc. to Austrian OIB guidelines (RL 6).

3. Results and discussion

3.1. Context, place and building typology

3.1.1. KooWo. The cooperative housing project KooWo is situated on a former farm in the village Purgstall, twenty minutes by car from Graz, Styria. The plot of land is 3.6 hectares big. The entrance to
3.2. Project development and participation process

3.2.1. KooWo. KooWo was initiated by architect Werner Schwarz, who had been looking for a site suitable for a co-housing project for several years. The property close in Volkersdorf close to Graz was possible after the asking price was lowered two years after the first encounter. A core-group around Werner Schwarz decided to buy this property and develop a co-housing project together. The group collaborated with realitlylab, a company that designs social processes, to support the groups development and internal organization, and with schwarz.platzer architects. It soon became clear, that they will base the project on collective ownership. At the same time, Die WoGen was founded, the first cooperative,
which exclusively realizes collective housing projects with and for people. In search of their first project, they made contact with the group KooWo and together they developed the first WoGen housing project.

3.2.2. Bikes and Rails. The project Bikes and Rails was a submitted project of architect Georg Reinberg with a core group to the concept award competition for a site of the City of Vienna in the newly developing Sonnewendviertel. The plots for neighborhood houses and building groups were competitively tendered in a two-stage concept award procedure at fixed prices. These houses are seen as "jewels" on the urban body and are distributed accordingly on the site so that they positively influence the urban planning and user qualities in the entire project area (Temel in [8]). In the following years after winning the bid, the group changed, but the general design idea remained the same. The residents had little participation in the development of the design, they had a say in the form of ownership, the equipment of the shared areas and their own apartments. Bikes and Rails can be described as a politically initiated urban participation.

3.2.3. Cambium-LiG. The Styrian group “Leben in Gemeinschaft”, short LiG, had discovered an abandoned casern in 2015 through reports in the local media. As the group LiG was too small for the size of the premises, they merged with the group Cambium, who had formed in 2015 after a one-year research project dealing with “How can we manage life in a community?” in Vienna. Thus, two groups had joined, which had been dealing with aspects of joint undertaking inspired by other European eco-villages. “Right from the start Cambium-LiG benefited from professional support in community building, moderation and sociocracy by experts who had lived in housing communities for many years. Cambium-LiG has been developed with a strong ethos of DIY and self-sufficiency. They renovated the barracks themselves, fixed the sanitary facilities, built-in a sauna, or a bathroom of rammed earth.

3.3. Organizational structure and decision making
A shared feature of all three projects is that they are self-managed and use principles of sociocracy. Sociocracy is a system of management tools and can be applied by any organization, which is drawn by a common vision. The intelligence of the group is leveraged to find appropriate solutions for community and individuals. Rather than in pyramid-shaped hierarchy, the system is structured in mostly autonomous, connected circles. An example of the sociocratic framework is presented in Figure 2.

![Figure 2: Sociocratic circles framework example. General circle at the centre linked to working groups and sub-working groups with double binding.](image-url)
The different duties are distributed in subcircles and related working groups. Every circle has a domain, an area of authority. The general circle, consisting of two delegates of each subcircle, represents the general leading and coordinating level. The aim of sociocracy is to make as many decisions as possible in the specialized working groups and not at leading level. In addition, in the plenum, a regular meeting of all members, the most relevant issues are dealt with. According to the momentousness of decisions, they are made in the working group, the working circle, the leading circle or in the plena [9].

Decisions in sociocracy are made by the principle of consent. In contrast to a consensus, a consent does not need full accordance of opinions and views. The consent is reached, if there are no grave objections to suggested solutions. If solutions for challenges are searched for, the group produces suggestions, that are then evaluated by asking the amount of resistance they arouse – no objection, little objection, severe objection. Severe objections have to be justified with regard to the aims. In case, problems could not be solved due to severe resistance, they can be postponed or delegated to the next higher level. With this culture of decision-making, problems in the group can be recognized systematically and enable a greater amount of participation of the individual in the shaping of the housing project than conventional, majority-based decision-making would do. The special thing about consent is that objections are welcome, because they lead to even better solutions regarding the overall intentions [9].

3.4. Financial structure and ownership

3.4.1. KooWo. KooWo is the first built project of the cooperative Die WoGen, which was founded in 2015 to support collective housing projects. The buildings and the land are owned by the cooperative. The KooWo association rents the premises from the cooperative. As indicated in Figure 3, all residents are both association and cooperative members and as such, co-owners of all buildings of Die WoGen. For financing, every household paid 550 € of equity per square meter of their allocated flat. The monthly cost is 12.50 € per square meter, this includes the pay-back of the loan, the individual rent and all operating costs for the shared spaces. When the loan is repaid after 30 years, the monthly costs will be lower and thus secure affordable community housing space for a long time to come. In the event of exit, the investment may be withdrawn again, index-adjusted and after deduction of depreciation.

![Figure 3. Models of (co-)funding (investors, financial structure), (co-)ownership as well as investment and monthly cost – by example of the KooWoo project, based on [10].](image-url)
3.4.2. Bikes and Rails. Bikes and Rails is part of the organization habiTAT, which promotes self-governing and solidarity forms of housing. It follows the model of the Mietshäuser Syndikat in Germany, where around 173 house projects have already been supported since its foundation in 1996. The aim is to develop affordable housing and withdraw it from the speculative market. The system is the following: Together, the house association (Bikes and Rails) with 51 percent, and the national organization (habiTAT) with 49 percent, founded a joint Ltd (Bikes and Rails GmbH), which acquired the property. The asymmetrical distribution of power is important: It guarantees the housing association freedom of design and establishes a veto right for the umbrella organization, which can be used against the sale of the house. The house was built by the non-profit developer Familienwohnbau and purchased by the Bikes and Rails GmbH after its completion. The concept-based bidding by the City of Vienna meant a fixed, reduced price for the land plus municipal funding over 25% of the costs. For the remaining amount, the group applied for a bank loan and started a crowdfunding campaign. Together with 250 friends and supporters the group raised 1.5 Mio. €. Residents themselves contributed to the crowdfunding, but were not obligated; it was important for the group that it should be possible to join the project without having private funds. The monthly living cost is now 10 € per square meter.

3.4.3. Cambium-LiG. Cambium-LiG chose the principle of the wealth pool (in German “Vermögenspool“) to finance the project. The wealth pool is advertised as a sustainable approach for impact investment or long term depot for private people and small communities. The concept does not foresee a payback, but (yearly) dividends in the range of inflation rates, to stabilize value. In this participatory form of funding, the residents and supporters deposit money on a joint account that is held in trust. In the case of Cambium-LiG, the full sum of 2.2 Mio. € could be collected by 250 supporters. For the future residents, the group agreed that a deposit of approximately 2,000 € per adult would be adequate. But there is no obligation to contribute, as a financial entrance hurdle was to be avoided in order to enable the use of property. The monthly expenses are also tailored to suit a person’s financial standing. The guide value per adult stands at 250 € usage rent plus 100 € contribution for the association. Children are cooperatively financed by the community. Based on the individual consumption, each adult member pays 7 to 10 € per day additionally into a food box. In the former casern canteen, they cook for a day.

3.5. Ecology, energy and emissions

3.5.1. KooWo. The KooWo project, being situated in a rural region, from the onset aimed to incorporate farming and agricultural co-production as part of the project, pursuing an idea of partial self-sufficiency towards supporting food sovereignty. The new buildings in the KooWo project are a mixture of mass timber and timber frame construction using straw and other bio-based materials for insulation. Figure 4 shows our analysis of the estimated carbon footprint of the building(s) in the KooWo project, i.e operational and embodied GHG emissions across a life cycle of 50 years. We find that the KooWo project, out of the three case studies, has the lowest emissions for new production and construction (A1-3, A4-5) and also shows the lowest carbon emissions related to operational energy use (B6) as well as maintenance and replacement (B1-4). However, when comparing the whole life carbon performance with the “net-zero carbon transition design target” suggested at the last world sustainable built environment (WSBE) conference [11], we observe that, considering the full life cycle, the project might end up just above the carbon target of 500 kgCO2e/m² (10 kgCO2e/m²/a * 50 a).

3.5.2. Bikes and Rails. As the name suggests, mobility is at the core of the Bikes and Rails project. Bike mobility is an integral part of the project. The new building of Bikes and Rails is built as concrete frame structure, with internal walls, envelope and façade realized in timber. Furthermore, the building was designed following a passive house energy performance rating. However, analyzing our estimate of the carbon footprint of the building – see Figure 4 – in comparison with the other case studies over a life cycle of 50 years, we observe the highest carbon emission profile for both the production and
construction stages (A1-3, A4-5) as well as the full life cycle overall. Even more than the KooWo case study, this project does not meet the carbon transition design target. While it may stay within a fictional carbon budget of 500 kgCO2e/m² considering upfront emissions from production and construction as well as energy-related emissions from building operation over 50 years, a consideration of to-be-expected emissions from use-phase related processes such as maintenance and replacement (B1-4) as well as the end-of-life processing (C1-2, C3-4), will overshoot the target for this otherwise promising project.

3.5.3. Cambium-LiG. As mentioned, the Cambium-LiG project is situated in an existing building complex. Members of the community made many small changes in and around the buildings, yet for a long time no external design professionals were involved for large-scale adaptations or additions. Now, the group aims to join forces with external professionals, like architect Georg Reinberg (Bikes and Rails architect), to implement new ecological measures such as addition of PV panels, green facades, greenhouses, a biotope for natural sewage retention. Similar to KooWoo, Cambium-LiG has a focus on food sovereignty and aims for partial self-sufficiency, with several acres of land used for agricultural co-production. The community aims to extend their agricultural areas further in the future. Investigating the project’s estimated carbon footprint, see Figure 4, we now have a different situation than for the other projects when considering the emissions related to production and construction processes. As the project started by re-suing and reviving an existing, abandoned former casern building, we consider the emissions of the original buildings’ production and construction outside the system boundary for this comparison. From this perspective, the carbon footprint of the Cambium-LiG project’s buildings only starts at the use stage, with emissions such as those related to maintenance and replacement (B1-4) and certainly operational energy consumption (B6). Here we see clearly, that the project has the worst energy performance out of the three case studies, strongly increasing use-related carbon emissions. Yet still, when considering the previous production and construction of the existing structure out of scope, and focusing solely on the use phase and eventual end-of-life processes, the Cambium-LiG buildings show the lowest, i.e., best carbon life cycle performance out of the three projects. Even staying below the “carbon transition design target”.

![Figure 4. Case studies’ estimated whole life carbon emissions in different life cycle stages. (Legend: Green line: KooWo; blue line: Bikes and Rails; red lines: Cambium-LiG (continuous line = building existed already, no production and construction emissions; dashed = if new-built))](image-url)
The Cambium-LiG group, which has occupied the previously abandoned building since 2017, could have decided to demolish the existing building and construct a new one in its place. Our perspective considers that the re-use of the existing structure leads to an absence of emissions from a potential demolition of the existing building as well as construction of a new building. As for the other groups and projects, we include the emissions related to the decisions of the groups. The authors believe it is important to support sustainable development of the built environment that applies circularity principles and utilizes the potential of existing structures wherever feasible.

3.6. Considerations on scalability of social innovation approaches

The question arises if and how these different approaches of socially innovative housing projects can be scaled up, for example through the application in more or larger projects?

Currently, in an environment of a financially heated housing market, the access to affordable land is the biggest obstacle. Besides the high cost, a group of private people is usually slower to close a deal than professional for-profit investors due to, for example, communal decision making processes and less streamlined ways of financing. However, since many conventional investors are not that interested in transforming existing buildings, obtaining existing buildings and preventing their demolition (as was done by Cambium-LiG and partly also by KooWo) might offer a particularly promising approach. In addition, deliberate municipal support can enable access to land and help foster more socially innovative bottom-up projects – such as by implementing concept-based bidding or land lease like in Vienna.

Another consideration is the position of the different stakeholders within or outside the established system of spatial production. In Austria, there is an established and well-functioning system of limited-profit housing associations (gemeinnützige Wohnbauträger). Most of these housing associations have been in existence for decades, building and managing thousands of affordable apartments for a considerable part of society, especially in the capital city Vienna. However, this is not necessarily the adequate framework for alternative, more experimental and socially innovative solutions. To support innovation, the establishment of new associations (or cooperation with existing ones) could be incentivized in order to enable access for innovative actor groups to housing subsidies, expertise and good credit conditions. The association habiTAT and the cooperative Die WoGen consciously decided to operate outside this established system of housing production and started building their own networks. habiTAT, which is connected to the German Mietshäusersyndikat, currently counts seven projects across Austria. The cooperative Die WoGen has now started their third project. Time will tell how these approaches and networks develop.

4. Conclusions and outlook

In this study, we investigated and analyzed three case study housing projects in Austria, which are pioneering social innovation approaches for re-activating the countryside, vitalizing a newly developed neighborhood, or bringing new life to abandoned, existing buildings.

The first research question asked which emerging approaches of social innovation in (co-)housing projects enable sustainable models for spatial production, ownership and use. We find that a social innovation found in all projects are different approaches of collective ownership and sociocratic organization and decision making processes. We analyze the innovative means of co-financing that are applied in the three projects.

Our second research question inquired which economic and/or environmental synergies or trade-offs the different social innovation strategies lead to. On this we find that the social innovation approaches are closely linked to organizational and economic concepts, such as co-ownership and co-funding, of how the inhabitant groups ensure that the qualities established in the projects - such as shared use of resources, shared decision making - are ensured in the long run. The three projects investigated in this study manage to satisfy long-term food and housing needs of their respective inhabitants through co-ownership, co-finance and shared-use of resources. The legal and organizational joint ownership and management structures require groups to systematically consider both shared needs and individual needs in their decision-making processes. At the same time, investigating project buildings’ estimated carbon
footprint, we find that even innovative projects struggle to establish their (new) buildings within carbon targets and only the project reusing an existing building manages to stay within the fictive carbon budget.

Investigating commonalities and differences between the three case study projects, we did not identify a clear link suggesting different contexts necessitating one or the other form of organization, decision making, funding or ownership. On the contrary, we find that the different aspects and social innovation described in this article are taken as building blocks and combined to fit the individual needs of the respective group and project. A common aspect all projects share is their being located and constructed in a context that made it financially feasible to take the extra effort required for implementing such innovative housing projects. Furthermore, we want to highlight that the innovative projects presented here, all relied – in one way or another – on support from their respective communities (e.g. via crowdfunding, wealth pool) as well as the good will and at times active support of political decision makers.

As an outlook, we identify a several knowledge gaps to be addressed in future research. Namely, the following questions seem relevant for follow-up investigations: How can emerging approaches of social innovation and their synergies with sustainable development be scaled to be accessible to more people and applied in more places? How can circularity approaches, such as reuse and adaptation of existing buildings be further supported? How can identified environmental trade-offs be overcome to enable regenerative lifestyles, including the required built environment, within environmental limits?

In response to the introductory quote from the IPCC, emphasizing that our answer to the escalating climate crisis has to include demand-side reduction and lifestyle changes, amongst many other necessary actions, our findings suggest that lifestyle changes can be supported by the kind of social innovation and social action found in pioneering (co-)housing communities such as the ones presented in this paper.

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