

ARCHITECTURAL SOLUTIONS FOR SHARED-ECONOMY PRINCIPLES WITHIN THE NEIGHBORHOOD SCALE

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ABSTRACT

This paper is an investigation about values and qualities of shared-economy principles when applied in residential architecture as a response to the problem statement of contemporary unaffordability of housing and urban loneliness on the Dutch housing market. It includes reflection on the contemporary housing models suitable for application of shared-economy as well as future-oriented conceptual studies in this domain. The main part of the paper is a reflection on conducted case study research that includes existing, state-of-art residential projects that were erected within domain of collective private commissioning. Finally it concludes about the potential of the collective private commissioning projects in relation to futuristic shared-living environment visions.

KEYWORDS: *circular economy, neighborhood design, residential architecture, private commissioning, shared use of space*

ANNEXES

1. *Annex I – research methodology structure.*
2. *Annex II – Case studies analyzes.*
3. *Annex III – Architecture for sharing – matrix of patterns.*

I. INTRODUCTION

Scope of this research paper is focused on the domain of the residential architecture design and its relation to the social and economic realms. This elaboration had been started via analyses of macro data about the housing market trends and characteristics for Europe, and then specifically for Netherlands based on CECODNAS Housing Observatory, EUROSTAT data and CBS Netherlands. It is highly relevant moment for analyses due to rapid changes on the market, as well as governmental policies affecting the build environment (linear economy to circular economy transition, environmentally friendly measures like carbon neutrality and energy neutrality agreements) that are in contradiction to issues and trends present on the housing market (unaffordability, insufficient amounts of dwelling units[CECODNAS,2012])

This conducted preliminary research had led to findings this two different approaches:

Firstly the housing market, especially the developers are expected to increase expenses on sustainability measures to fulfill the requirements of the new law, consequently increasing the overall price of the properties, whereas the ratio of affordability of housing for average income household in whole European Union is rapidly decreasing [CECODNAS,2012].

Secondly, the increasing urbanization ratio and urban residential developments density and average size of dwelling unit decreasing[EUROSTAT,2019],[CBS,2019], the number of people affected with urban loneliness issue is increasing.

1.1 Problem statement

1.1.1 Unaffordability of housing on the Dutch housing market.

One of the main contemporary social and built environment issue is the significant problem with housing affordability and housing shortage on the European market. According to CECODNAS reports most of the medium income inhabitants, starters, young families has immense problem with acquiring first property [CECODNAS,2012].

Especially on Dutch housing market, those trends are clearly visible, increase of property value, price speculations, like for instance 33% price increase of average property within 4 years (2015-2019) in Netherlands [CBS,2019]. Those factors affects inhabitants with salaries over the social sector maximum, unable to either acquire a property and fulfill social housing requirements.

This situation is not likely to change as the housing stock is highly dependent on profit-oriented developers, that are not willing to innovate, to reduce the investment risks, particularly during the housing shortage period, when the demand for any new housing is so high.

With expectation of continuing Netherland's GDP growth there will not be any external force changing the situation on the housing market. Profit oriented developers targeting mid-income groups would have to have a qualitative competition on the market.

There's an evident potential of increasing diversity of available tools and typologies at the housing market, that might not only rationalize affordability measures, but additionally improve community and collective qualities of contemporary living environments for significant groups of people.

1.1.2 Urban loneliness.

Recent data from Central Statistics office of Netherlands [CBS,2019] show that number of single-households will increase significantly, by 431 000 till 2030. It requires re-thinking the way how the housing projects are developed, what are the typological solutions and effects on daily life of those one-person households. Simultaneously 1,8 mln people in Netherlands is affected by syndrome of urban loneliness, consequently negatively affecting the mental health [CBS,2019].

1.1.3 Environmental impact of building industry.

Linear economy system that is present now worldwide means that most of what is being manufactured finish its lifecycle as a waste. Building industry is therefore responsible for tremendous CO2 emissions and material depletion. It is urgent to re-think the technical loop of the industry, especially that Dutch government is enforcing regulations to transform into circular economy till 2050. This implementation would mean environmentally friendly, durable and efficient flows of various resources.

1.1.4 Research Hypothesis.

To formulate the hypothesis and research questions literature study related to affordable housing design, resilient residential developments, future-oriented housing schemes, housing organizational models had been conducted. The study has showed an overall scope of directions, either existing and historical studies and future-oriented conceptual visions for housing models.

The result had been an aim of the project to respond to the stated problem via "Sustainable affordable Community" housing project. The theoretical framework studies led to the hypothesis that "private commissioning models possess the potential to innovate, as it lacks profit-oriented investor and the potential to build communities via communal living and sharing spaces, object, components, flows" It resulted in more in deepened elaboration on non-profit oriented housing organization models hand in hand with lecture about the sustainable innovation in residential architecture that reduces its environmental impact.

1.2 Theoretical framework

1.2.1. Housing organization models in future.

It is important to explore and analyze potential of the non-profit oriented development schemes, where participation of the future users is much bigger, providing chance to individualize and adapt design for the specific needs. Those schemes by elimination of profit of the external parties provide potentials to transfer those expenses into innovation, qualitative solutions, especially in the times of transition from linear to circular economy. Finally there is a present trend within urban governance to promote the collective private commissioning schemes.

1.2.2. Shared economy expansion.

Due to all the issues stated in the previous chapter it is evident that a shift in methods of organization of residential architecture developments is necessary. The response to those problems is clearly visible in rapid growth of shared economy. To specify its meaning it is “an economic system that is based on people sharing possessions and services, either for free or for payment...”[Cambridge,2019]. According to predictions the growth is expected from 14 bln \$ in 2010 to 335 bln \$ in 2025 [IMAGINE,2018], it is already omnipresent thanks to worldwide present companies like UBER (car sharing), AIRBNB, WEWORK, WELIVE etc. The analyzes of the most prominent think tanks related to future of living environment has shown increased interest in shared-oriented living forms that should be further researched [IMAGINE,2018]

1.2.3 Research question

The aim of this research paper is verification of the potential of the shared economy principles applied onto the residential architecture realm, especially on the scale of the neighborhood, that had been chosen as a proper community building scale.

The research question has been a form of conclusion out of those investigations, with a challenge to find a notion that can bind together social, spatial and technological aspects of living environments (that are referring to the problem statement, unaffordability – spatial, loneliness – social and technological – circular economy transition). I have formulated question that refers to shared economy, envisioned as one of the key areas of development by EllenMacArthur Foundation think-tank towards future-proof design. To conclude I have focused on elaboration on:

“What qualities, values can sharing on the scale of the neighborhood provide in social, spatial and technical domains for living environment?”

Sub-questions:

What functions could be predicted for shared use?

Which spaces and objects can be shared among residents?

How does sharing oriented organizational model affect users participation in decision-making process?

What are the economic and social values of sharing for the residential neighborhood?

What can be shared in terms of building components and structures?

How energy production & material flows can be shared by the residential development residents?

II. RESEARCH METHODOLOGY

Research document related to the question of “What qualities, values can sharing on the scale of the neighborhood provide in social, spatial and technical domains for living environment?” required reflection on the most appropriate methodology to apply in it. The aim of this research paper is critical reflection on existing case studies, that fulfil specific and formulated criteria of choice with knowledge from theoretical framework. An reflection on what qualities had been achieved via sharing, as well as, what could have been achieved according to the state-of-art literature about the domain.

Each of the case studies had been chosen basing on the criteria that increases relevancy of their context for the graduation project site, therefore location criteria (analogical conditions to the graduation

project site). Moreover different periods of realization had been applied, as well as, literature support evidence of presence of sustainable and sharing oriented ambitions of the projects.

Each of the case studies had been analyzed in linear-analytic research method. It combines descriptive and exploratory elements via introduction of crucial data, description of the project, answering research sub-questions of spatial, social and technological aspects related to shared economy present in the context. Those aspects are graphically represented in form of diagrams forming “catalogue of patterns (types)”. Finally epistemic axonometric drawing showing the physical location of architectural elements that refer to those sharing aspects within the analyzed architectural project. The need for multi-case study research method, basing on the research question had been defined. A bigger scope of the study projects provides potential of higher number of types, each of cases should represent residential architecture project with evidence based relation to the research question. Their number should be sufficient to create a base of types for final elaboration.

The main principles for reliable case study analyses that were implemented are:

- a) cases studies and their relation with real-life context,
- b) explanation of correlations and links,
- c) interrelation between case study and development of the supportive theories;
- d) basing on multiple sources for evidence;
- e) the potential of the method to generate theory.

Analyses of case studies that are embedded in the real-life context is not only a simple study of phenomenon in the surrounding. It has to be explanatory about the broader circumstances that has formed and led to the specific real-life condition. Therefore it had been integrated to the case study research via descriptive study of the decision-making and organizational process behind the realization of the case project, answering the question “What led to the achievement of those specific qualities?”. This enabled better understanding of the correlation of the processes, that could be further integrated in the graduation project program. The development of the theory, general knowledge about the phenomena is essential, when the purpose of the research is to elaborate on it within the context. Is essential to have sufficient supportive theoretical “grid” for the process, not necessarily an extensive theoretical study²⁰. In response to that the theoretical framework had been formulated before the start of the case study analyzing procedure, the study of the history of “sharing” in the living environment and the contemporary examples (“The new architecture of the Collective), the theories about relevant residential models (“Learning from co-housing initiatives”, and “Profiles of a Movement: Co-operative housing Around the World”). Finally the researches about future of residential architecture and urban systems had been reviewed (“Exploring the brave new world of shared living” and “Cities in the circular economy: An initial exploration”).

That allowed finding relevant cases to analyses, as well as, provided knowledge about what to particularly analyze and look for within this theoretical framework.

Basing on the multiple sources of knowledge is essential for the data reliability, therefore choice had been taken for case study projects that had been well documented, with existing scientific reports, most importantly with livability assessments conducted by professional parties. That would allow the conclusive part be as close to the factual realm as possible.

Final part of the research paper is organized graphically into a matrix showing the relevancy of each of those patterns for the research questions. Finally, we can critically assess the value and quality of these aspects.

III. SHARED ECONOMY PRINCIPLES IN THE LIVING ENVIRONMENT

3.1. Importance of shared economy principles application within living environment.

Rapid changes are ongoing within the built environment, according to experts prognoses the level of urbanization worldwide will increase from 50% in 2010 to 70% in 2050 [UN Department of Economic and Social Affairs,2019], simultaneously statistical level of housing availability is achieving record-breaking low measures among starters (people aged 24-35). That requires rethinking the methods of allocation of increasing number of urban dwellers, at the same time responding to increasing and speeding up pace of life and lifestyles [IMAGINE,2018]. Shared economy is a potential direction of the general solutions, as it provides series of approaches towards increased housing affordability, and for instance assumes reduces size of an average dwelling unit. As a consequence it increases chances of achieving sufficient number of units to accommodate the general urban growths (in the Dutch housing market context, it would be fulfilment of the One Million Homes challenge to built 100 thousand homes a year from 2020 till 2030). Second important aspect is contemporary switching the lifestyle that relies on huge amount of objects, materials and flows that average person is using [CBS,2019], that leads to depletion of various natural resources.

Netherlands is aiming to till 2050 become a complete circular economy state, that requires “closing” loops of materials and media flows. The sharing of resources is an logical direction to increase feasibility of the transition, smaller “loops” results in easier achievement of the objectives, therefore shared economy principles constitute of highly valuable approach.

3.2. Housing organization models suitable for the shared-oriented living.

The hypothesis-based analyzes of collective private commissioning schemes has led to a conclusion that its main principles are beneficial for the implementation of shared economy principles and reflection of what values contemporary private commissioned developments provide for built environment.

Firstly, the organizational model allows easier implementation of the ideas of sharing, as end-users are the investors as well. There is no profit-oriented entity within the development. Consequently each of the initiators possess the possibility to co-define the common vision of the project, as well as ways of functioning within it. That democratic model functions well during the design phase as well, where there is possibility of direct interaction between end users and architects, to adjust the design decisions to the factual needs of the end users.

Secondly, the economic model allows greater financial potential for additional expenses, the final price of the development is equal to the construction process and land acquisition price. Moreover, the collective group of initiators after forming a legal entity possess immense financial potential for loans, additionally Dutch banks had recently increased their acceptance ratio for loans given to CPC organizations.

Finally, the process of forming and conducting a design and construction of the residential project in CPC results in close cooperation between the initiators, as well as, enables defining the common vision, ambitions for the shared living environment. That results in the integration between residents and a socially resilient community achieved already at the beginnings of the operation phase of the project.

3.3. Contemporary collective housing models

In 2019 two main tendencies for shared living models are being observed present on the housing market. Firstly the top-down predicted and designed shared living environments provided by external investors, developer as form of a service for their clients/dwellers. Worldwide companies like Welive emerges in the biggest urban agglomerations to provide their target group (young, high-income professionals, freelancers, of a highly intensive lifestyle and often changes of their working

environment). Those high-end models provides minimal living units for the clients and various shared amenities like kitchens, working spaces, leisure zones, entertainment rooms (i.e. Cinema room),gym, restaurants with packages of full alimentation, analogical to hotels, including 24/7 administrative support. The clear disadvantage of those developments is their exclusiveness, only small group of the highest income can afford participation within the scheme, moreover tenants are not co-owning the buildings/apartments/shared spaces, therefore their identification with those places is highly doubtful. [IMAGINE,2018]

Second trend is bottom-up shared living initiatives, elaborated already in the previous chapter, those constitute of a groups of individuals that form entities to as group develop a residential projects based on sharing and co-owning on various elements.

3.4 Contemporary shared living values&qualities. Case studies analyzes results.

Analyzes case studies has focused on this group and elaborated on potential achievements and values as a response to unaffordability, loneliness and environmental impacts.

Case studies were supposed to formulate guidelines for designers of residential developments to show how specific spatial, social and technical strategies can be beneficial for the overall livability and inclusiveness of housing. This guidelines in form of catalog of patterns [C.ALEXANDER, 1955] on a graphical matrix are incorporated into this research as Annex 3.

In each of the case studies functional program for shared use of space had been observed, its summary is presented in each of the case studies in Annex 2 and on the matrix in Annex 3. Those spaces can be grouped as multi-functional rentable spaces for community members for meeting, events workshops etc., co-working spaces, rentable guest apartments, community centers, shared leisure zones placed integrated in the circulation areas.

In terms of shared use of objects, in all of the case studies those aspects had been observed. Mainly in context of the mobility (car sharing, e-bike sharing), but also co-use of kitchens and kitchen equipment, communal workshops with shared workshop tools, storage spaces, laundries etc.

The participation of users in the decision making process (social aspect of sharing) varied depending on the organisational structure, the bigger scale of the development the smaller participation of users was achievable. From preliminary participation in public consultations during the urban planning(annex 2, case study no3 process till close collaboration with architects in co-design approach (annex2, case study no4).

In all of the case studies examples of shared approach towards building components and structures had not been observed. In annex 2 and annex 3 elements that possess the potential of further development into complete shared technological domain had been highlighted.

For media and energy flows high level of integration had been observed in analysed case studies. It appears as the easiest sector for incorporation of the circular approach, that had been proven in the example of Schoonship neighbourhood (annex2 case study no2), where power and heating system is completely independent and using connection to the smart grid with real-time exchange between users.

IV. CONCLUSIONS

4.1 Processes behind achieving shared living qualities.

Examples of projects analyzed have shown how complicated and long-term the process of achieving a socially coherent settlement is. In the case of larger projects, it is also necessary to involve local authorities, especially. in the case of large projects. As there is the need to cover huge infrastructure investments as well as to provide public spaces, as was the case with GWL in Amsterdam or BO01 in Malmo. It is important for the final success of such a process to consciously include external experts or educational organizations, especially in the case of a high level of ambition for future residents (in Schoonship external, innovative energy companies helped in development of the smart grid system). Innovative companies in the climate and energy industries has to be invited to achieve innovative technological solutions to achieve circular built environment measures.

In addition, the BO01 example of Malmo showed the effectiveness of additional government support for environmentally friendly, sustainable solutions. Similar subsidies should be established to support the necessary innovations in order to achieve circular built environment.

4.2. Architectural solutions stimulating values and qualities of shared living.

4.2.1 Affordability.

The analyzed case studies have proved that a high level of affordability for qualitative housing projects is achievable. The Spreefeld Co-housing (annex 2, case study no 4) has used highly efficient measures to create an environmentally friendly, affordable living environment. Firstly, the approach of the municipality has helped, by formulating the requirement for affordable housing within the master plan for the area, that has declined the interest of profit-oriented investors. The formed co-operative could cover 30% of the land acquisition and development of the project, while the rest is financed via bank loans. To achieve rental costs on the level of the German social housing sector, the project strategy assured construction of the buildings with finished and furniture collective zones financed by the cooperative and raw unfinished interiors of private apartments, only with joints to media like water, sewage, electricity etc. Consequently, that reduced the final price of the project, becoming inclusive for a bigger range of household incomes, additionally providing the personal freedom for finishing the apartment in the "DIY – do it yourself" approach. The level of investment in those spaces varied depending on the income level of the residents.

4.2.2 Social resiliency

Community formation has already taken place during the process, in very large investments such as GWL as well, where future residents took part in a co-design project with architects, or visits to the construction site, organizing integration meetings and other events. In the case of smaller investments such as Schoonship and Spreefeld, the originators of the co-operatives met repeatedly in order to determine common goals and ambitions, a way to carry out investments, resulting in the integration of the group. During the use of the examples, physical and non-physical solutions were demonstrated in the formation of neighbor bonds. The spaces provided programmatically for joint use, especially common kitchens and living rooms (case study 4 annex 2) work by integrating individual clusters of residents. The second aspect is the organizational structure, visible in both the co-operatives (case study 2, case study 4 annex 2) and housing corporations (case study 1 annex 2). Dividing responsibilities for "working groups" that manage and maintain the spaces allocated to them in impeccable condition. The neighborhood board organizing general meetings and representing the entire population, or the manager of the development allocated by the municipality office to solve social problems (case study 1 annex 2) show high efficiency in raising the satisfaction of residents and the level of their integration.

4.2.3. Circularity

Despite the fact that each of the selected case studies presents a high level of sustainability ambition, and environmental-friendly measures, requirements in context of materialization have not been observed for circular approach. In analyzed case studies innovative solutions for "closing" energy and heating circuits were observed, achieving independence from external networks e.g. Schoonship. In addition, the cases showed the effectiveness of co-possession of such networks at the level of the neighborhood and the inclusion in the smart-grid, for real-time exchanges. In addition, water management systems, especially stormwater, have been introduced in all cases where, using blue-green grid measures, rainwater is being reused and discharged naturally without burdening external sewage systems. Schoonship also attempted to close the circulation of wastewater with nutrient satiating and natural treatment process. These solutions have shown high effectiveness of reducing the negative impact of the use and life cycle of buildings on the environment.

In all cases, the measures of circular built environment materials had not been observed, where buildings are expected to be banks of materials, in a closed circuit, the main assumptions of designers were the use of low materials embodied Energy levels, with a particular ambition to use local manufacturers.

4.3. Recommendations

The analyzed case studies have proved that the stated hypothesis that **“private commissioning models possess the potential to innovate, as it lacks profit-oriented investor and the potential to build communities via communal living and sharing spaces, object, components, flows”** is a correct assumption. However those organization models are the most suitable for development of innovative, circular residential projects and application of the shared-economy principles there is an evident need to develop methods of implementation of sharing especially in the technical domain. In terms of sharing circular building components, sharing various objects that are exchangeable and recyclable. Finally, those housing schemes constitute of an relevant base for the futuristic housing visions of Effekt and Imagine [IMAGINE,2018]

4.4 Further research directions

This research could be expanded via changed case study choice criteria to look for and analyses existing projects that incorporate innovative approaches towards circular built environment in terms of building technology. It would constitute of continuation of this study.

V. REFERENCES

1. Alexander, C. , Ishikawa, S. and Silverstein M. (1977). *A Pattern Language : Towns, Buildings, Construction*. New York: Oxford University Press,
2. ARUP, (2016), *Circular Economy in the Built Environment*. ARUP
3. CECODNAS (2012) Housing Europe Observatory. *Housing Affordability in the EU, Current situation and recent trends*, Housingeurope.eu
4. CECODNAS (2012) Housing Europe and ICA Housing. *Profiles of a Movement: Co-operative Housing around the World*, CECODNAS Housing Europe and ICA Housing
5. Christ, E. and Gantenbein, C. (2011), *Typology transfer – towards an urban architecture*, ETH Zurich,
6. Debord, G.(1956) *Theory of the Derive*. .Les Lèvres Nues #9
7. Ellen Macarthur Foundation (2017). *Cities in the circular economy: an initial exploration*., Ellen Macarthur Foundation.
8. Gehl, J. (2010). *Cities for People*. Washington, DC: Island Press.
9. Hooimeijer, Fransje (2019). *Architecture Methodology*, retrieved from <https://prezi.com/5ukgddp8mp-q/architecture-methodology/>,
10. Hyde, Rory (2012). *Future Practice : Conversations from the Edge of Architecture*. Hoboken: Taylor and Francis.
11. Lucas, Ray (2016). *Research Methods for Architecture*. London: Laurence King Publishing.
12. Space10, Urgent.Agency(2018). *Exploring the brave new world of shared living*. SPACE10.
13. Tummers, Lidewij.(2017) *Learning from co-housing initiatives*. Architecture and the Built environment.
14. Wang, David, and Linda N Groat (2013), *Architectural Research Methods*. Second Edition / ed. Hoboken: Wiley.
15. Yin, Robert K (2010). *Case Study Research : Design and Methods*. Fifth ed. Applied Social Research Methods Series, V. 5. Los Angeles:
16. Vitra Design Museum, and Centre D'innovation Et De Design (Hornu, Belgium),(2017). *Together! : The New Architecture of the Collective*. Edited by Mateo Kries, Mathias Müller, Daniel Niggli, Andreas Ruby, and Ilka Ruby. Weil Am Rhein: Vitra Design Museum.
17. Cambridge Dictionary (2019) retrieved from <https://dictionary.cambridge.org/dictionary/english/sharing-economy>
18. CBS (2019) retrieved from: <https://www.cbs.nl/en-gb/figures#theme=construction-and-housing>
19. Eurostat (2019) retrieved from: <https://ec.europa.eu/eurostat/web/regions-and-cities>
20. UN Department of economic and social affairs, (2019) retrieved from: <https://www.un.org/development/desa/en/key-issues/population.html>