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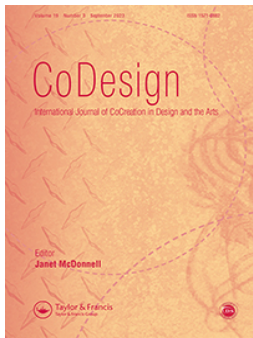
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# Co-designing a housing and livelihood toolkit with low-income older people for future housing in Klong Toey, Bangkok, Thailand

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## ABSTRACT

The purpose of this article is to examine the co-design process of a research project which was implemented to support an initiative led by low-income older people in Klong Toey, Bangkok. The primary objective was to co-produce a design toolkit that can guide the development of live-work housing for low-income older people in Klong Toey. A three-day co-design workshop was held with local stakeholders to develop design alternatives for the prevailing live-work activities identified as a part of the field study. Within the framework of co-design methodology, the researchers engaged with the users as facilitators and translators to produce design options that informed the toolkit. The toolkit was developed under the overarching AgeingHood project, inspired by the unique housing and livelihood needs of the older people of Klong Toey, who often run small businesses from their own homes. It was conceived out of the understanding that ageing, housing and livelihood are interrelated aspects of the lives of low-income older people in this area of Bangkok. In addition to the toolkit, the project also led to impacts such as supporting residents' live-work needs assessment and positive engagement and collaborative working with various local stakeholders.

## ARTICLE HISTORY

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## KEYWORDS

Housing; ageing; livelihood; live-work; co-design; Bangkok

## 1. Background and study context

The purpose of this article is to examine the co-design process of a research project which was implemented to produce a housing and livelihood toolkit that can be used to support an initiative led by low-income older people in Klong Toey (KT), Bangkok. This initiative was in response to the precarious housing situation local residents are facing, which is also threatening their welfare, given that most of them, and particularly older people and women, depend on their housing for their livelihood. The research project explored the connection between three key domains of human life: ageing, housing and livelihood for the low-income residents of KT.

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### **1.1. Housing and livelihood**

Adequate housing is a key determinant of healthy living, particularly for older people (Sixsmith et al. 2014), and is crucial for cultivating the cognitive and emotional aspects of home that enhance self-identity, independence and sense of place (Wahl and Oswald 2010). Housing for older people means much more than a physical dwelling space: often, it is a lifetime home (Nygren et al. 2007) and, increasingly, it is an asset that supports older people's livelihood in developing countries (Moser and Dani 2008).

Attempts to improve low-income people's livelihood conditions are challenging, largely because newly proposed housing solutions may neglect the complexity of everyday life in favour of more simplistic solutions. Moreover, modern approaches to housing markets combined with urban clearance and urban renewal programmes have led to spatial inequalities through the dismantling of low-income neighbourhoods and large-scale displacement (Shamsuddin and Vale 2017). Access to decent housing for low-income populations is a considerable challenge in the developing world.

Housing and livelihood are important and interrelated human needs. However, the significance of the relationship between these two domains of human life for low-income older people is often ignored in literature, policy and practice. As a result, this can have a profound impact on the welfare of vulnerable groups, especially older people and women. This remains the case for KT, where ongoing uncertainties around secure housing and livelihood continue to have a negative impact on low-income older people's health and wellbeing (Rojnarakint 2002; Tangkoblarb 2005). Additionally, the Bangkok Port Authority's proposed housing solutions do not take into consideration place and community attachment and social networks, which are crucial for maintaining livelihoods and protecting the wellbeing of residents. While there is research that examines the living conditions of the KT communities and the provision of strategies to guide the relocation process (Albright et al. 2011), studies on the impact of the KT built environment on older people's living conditions and livelihood are lacking.

### **1.2. Study context**

Klong Toey settlement is located near the port of Bangkok on the land property of Bangkok Port Authority. The settlement dates back to 1939 and currently has over 100,000 inhabitants. Since 1973, there have been several attempts to evict the residents to allow for the expansion of the port's facilities, but without success (Albright et al. 2011). Recent plans for eviction or relocation include a cash compensation scheme, the rehousing of the families in new 24-storey residential buildings and the relocation of the affected families through the provision of land in the outskirts of Bangkok, without further financial aid. Affected families believe relocation to the outskirts will take away their livelihood, because their current dwelling, in many cases, also serves as their means of subsistence. The range of alternative housing solutions being proposed do not meet the needs and expectations of the affected population group in terms of live-work opportunities, especially those of older people, as most of these families depend on housing for their livelihood.

Three settlements in KT were selected for the purpose of this study due to strong links with these communities, these are Walk-up flats, Ban-Mankong and Ban-Kluay.

### 1.3. The main study's findings

The main study led to the development of a design toolkit, which proposed live-work housing options for this vulnerable group, and can be used as a co-design tool to explore housing and livelihood solutions at the dwelling and neighbourhood scales. The field study phase of the project, which involved interviews, questionnaires (Sattayakorn et al. 2023), observation and post-occupancy evaluation (Durosaiye et al. 2022) in KT, identified three clusters of prevailing livelihood activities:

- (1) service (e.g. minimart, salon, garage, laundry, tailor),
- (2) cooking (e.g. restaurant, mobile cart/delivery), and
- (3) stocking or storing (e.g. garbage collection, stocking goods).

The study also proposed three key recommendations:

- (1) Housing for low-income older people should be designed based on live-work conditions. Specific requirements and qualities of housing depend on the prevailing livelihood activities.
- (2) Design, Health, Comfort and Adaptability are the key design domains for live-work housing that guarantee older people's overall satisfaction.
- (3) The domains of Comfort and Safety relate to satisfaction with living and working spaces, respectively.

The co-design phase of the project, the subject of this article, set out to validate the above recommendations and to establish how these and other emerging design requirements can be manifested through a co-produced design toolkit.

## 2. Co-design methodology

Co-design in architecture is an essential part of design research; it is referred to as research through design or research by design, co-creation, co-realisation or co-production, and has been a common approach in the field. Its manifestations depend upon 'the expertise and mindsets of its practitioners' (Sanders and Stappers 2008), and the timing of this: a front-ended approach can have a positive impact on the process and outcome. More recently, co-design has become a popular method that employs a range of tools and techniques such as frameworks and toolboxes to inform and guide participation and co-creation (Sanders, Brandt, and Binder 2010). Co-design also employs probes (Mattelmäki and Taideteollinen 2008), prototyping (Buchenau and Suri 2000) and 'design seeds' (Botero and Hyysalo 2013, 43), to enhance stakeholder participation.

A critical aspect of co-design is the extent of the participants' engagement. This should not be limited to the early stages but instead must be an integral part of the whole design process. A lasting model of co-design is one that engages with stakeholders throughout the design stage and beyond, by providing a platform for sustainability of the partnership (Botero and Hyysalo 2013, 38). Co-design is best implemented when roles are blurred – when participants are invited to act like designers, while designers play the role of facilitators. This helps with the

development of insights and ideas using tools provided by the designers, who will be responsible for converting these ideas into built forms (Sanders and Stappers 2008). These tools can be probes, generative toolkits or prototypes, which are design-led and help participants to fully engage with the design process and express their needs and ideas about the design problem (Sanders and Stappers 2014).

Participatory action research employs similar approaches and techniques and is considered to be within this group. We know that architectural design is guided by programming, client's needs, local context and budget. In relation to context, van de Weijer, Van Cleempoel, and Heynen (2014, 24) argue that research through design is also 'local and context-bound'. Likewise, Loeckx (2009, 25) defines research by design as:

An exploration of the spatial possibilities and limitations of the site; 'mapping' the spatial sensibilities, interests, agendas, and skills of various urban stakeholders; [and] exploring the spatial convergences that could suggest new forms of collaboration and open up new trajectories of development.

Design research also employs other approaches through user experiences to inform design decisions (Ho, Ma, and Lee 2011). However, Buchanan (2001) argues that such approaches raise new challenges with design research, for example how designers interpret and engage other disciplines to solve design practice problems.

Design research can be seen as participatory action research which involves collaborating with communities to create knowledge and solve real-life problems. Sanoff (2007) describes participatory action research as 'a family of research methodologies, which pursue change and understanding at the same time' (214). This method offers opportunities for constructive engagement of participants and an effective partnership between participants and designers/researchers, where the output can be both an answer to real-life problems and an intellectual outcome that benefits the academic world (van de Weijer, Van Cleempoel, and Heynen 2014).

Documenting design research is critical in understanding user behaviour and needs assessment. There are many studies that use observations through detailed drawings and photographic surveys to understand spatial tendencies and behavioural manifestations in a variety of contexts. This approach has been implemented as part of this project, and its results informed the co-design process used to co-produce a housing and livelihood toolkit for the KT population.

## **2.1. The role of the researcher or designer in co-design**

In the co-design process, the researcher or designer should play a facilitator role and not necessarily a translator role, as is often the case in traditional design processes. According to Sanders and Stappers (2008), for this, the researcher or designer will need to lead and guide participants to support creativity and help them adapt to the process from start to finish. An example of community participation in Hong Kong by Lee (2008) used the '3P process', which includes the 'Preference stage', 'Planning stage' and 'Processing stage'. In the Preference stage, participants express their preferences using purpose-made tools. In the Planning stage, participants are guided to develop their design brief. Finally, the Processing stage allows participants to experience design options by translating abstract ideas into more tangible designs such as physical models (Lee 2008). This aligns with the

creative approach and tools highlighted by Sanders and Stappers (2014) and the co-design method implemented as part of this project.

## ***2.2. The role of the user as co-designer***

Sanders and Stappers (2008) suggest that participants should become an integral part of the design or ideation process, given that they are ‘experts of their experiences’ (Visser et al. 2005), but that they will need appropriate tools to enable them to express their ideas effectively and contribute to the co-design process. It is known, however, that user contribution varies according to expertise in the matter at hand, but also in terms of the engagement, passion and creativity of the user. This often relates to people’s level of creativity, as suggested by Sanders (2006), namely ‘doing, adapting, making and creating’, which tends to vary according to the user’s expertise and interest in the design brief. That is why co-designing requires new forms of communication to support the collective creative endeavour, while the focus should be on the human experience and how to improve the people–environment fit (Lawton 1980; Sanders 2006).

## ***2.3. Ageing together design strategies***

Ageing together design strategies present an interesting approach concerned with ageing and co-design (Botero and Hyysalo 2013) that was implemented as part of this study. This approach suggests starting the co-design activity in other social settings beyond the formal ‘workshop’ environment. This enables participants to develop in other roles such as design and strengthen their belief in the project’s aims through an alignment of agendas. At the beginning, design activities should be small, tentative and incremental. Participants will need to understand and feel what design engagement entails. Likewise, it is important to manage short- and long-term expectations and have clarity about the goals of the co-design exercise. The co-design process should also aim to ‘build scaffolds’, create a sense of belonging and ownership, and effectively engage with the local community, preferably on site (Botero and Hyysalo 2013). This study applied these aspects during the co-design workshop, as explained in the next sections.

## ***2.4. Co-design in the context of low-income housing***

This article is concerned with co-design in the context of low-income housing in Thailand. The beneficiaries of the outcomes of this research are low-income older people who rely on their housing for livelihood. Undertaking a co-design initiative with them is essential in understanding their living and livelihood challenges, and in co-producing design tools with proposals for live–work housing.

Most of the extant literature on co-design is concerned with Western economies (Jagtap 2022). However, a few recent studies have been identified that highlight co-design as an approach to solve low-income people’s housing and livelihood in the developing world. Argenton Freire, Levänen, and Bonvoisin (2022) refer to public participation in the design process as ‘open design’, and stress that this approach faces significant challenges in terms of its ‘replicability, substitutability and adaptability’. They argue that ‘putting emphasis on DIY aspects throughout design processes may help to



overcome some challenges that Open Design faces when applied among low-income communities' (304). Another study by Jagtap (2022) used interviews with designers in India to identify barriers and enablers to co-designing with low-income people in the developing world. They highlight a variety of factors can support or hinder co-creation activities such as the chosen co-design method, extent of collaboration, and organisational issues. Additionally, Brysch and Czischke (2022) argue the need to consider product and process as inseparable dimensions, which contribute to an effective design process that is 'collectively organised and managed' (1817). Other studies such as Diep et al. (2022) used co-design workshops employing nature-based solutions to engage interactively with residents in an informal settlement in East Africa in order to resolve their needs using design tools and sketches. These studies highlight the importance of working collaboratively to achieve a collective design endeavour. Increasingly, co-design is being used when end users' input is crucial in developing a lasting and inclusive solution to social challenges, such as housing for marginalised communities.

### 3. Methods

Co-design was the final phase of the AgeingHood project which explored the intersection of housing and livelihood of low-income older people in KT, and the contributions these two domains make to their welfare. The co-design stage is crucial because it required the research team to engage with residents and other stakeholders to co-produce housing and livelihood solutions that guarantee livelihood security, adequate housing forms and community cohesion. The co-design process explored live-work design options for both the home and neighbourhood settings and led to the development of a design toolkit. The purpose of this toolkit is to serve as a catalyst, with practical guidelines for design research development, design options for live-work housing and neighbourhood design alternatives for flats and houses. The study's remit was within architectural design in relation to housing environments and how these impact on the livelihood opportunities of low-income older residents.

This research was implemented to identify residents' needs, create the opportunity to influence decision-makers and housing developers, contribute to protecting the livelihood and welfare of this vulnerable group, and to offer lessons to other similar cases worldwide. The co-design phase employed a workshop with KT residents to develop live-work housing design options and co-produce an accessible housing and livelihood toolkit for older people and women in KT. The aim of the co-design workshop was to validate the initial project recommendations and to establish how these and other potential design requirements for live-work can be manifested through a co-produced design toolkit.

Data that were collected as part of the project via fieldwork (the subject of other publications) – namely: (i) 12 interviews with low-income housing experts, community leaders and residents to understand the housing and livelihood situation of older low-income inhabitants of KT, and to assess the suitability of their physical environment and areas that could be improved to enable it to serve as live-work housing and to facilitate ageing in place; (ii) 45 questionnaires with residents to explore their housing challenges and preferences; (iii) observation of livelihood activities, and (iv) post-occupancy evaluation of 45 homes in KT – were analysed and triangulated to inform the co-design





**Figure 1.** View of an outdoor livelihood activity (cooking).

workshop. This led to the identification of household live-work conditions that are prevalent in the three studied communities in KT. These conditions are living alone or with a family and engaging in trade that is set up either outside, both inside and outside or inside the dwelling. The prevailing trade activities identified (service, cooking (Figure 1) and stocking or storing) and their setups have implications on spatial organisations, living conditions and space requirements, which the co-design workshop aimed to discuss and resolve to co-produce a practical, easy-to-use toolkit that can be used to guide future live-work housing development.

### **3.1. Sampling of participants**

The three-day co-design workshop was conducted with six low-income older people who are community leaders from three communities in KT (Walk-up flats, Ban-Mankong community and Ban-Kluay community) (Figure 2). They are part of the team that led this project initiative, contributed to other research and data collection activities via recruitment of participants (interviews, questionnaires, observation and POE), and agreed the process and implementation of the co-design workshop. Their contribution was



1. Walk-up flats



2. Ban-Mankong community



3. Ban-Kluay community

**Figure 2.** Views of the three case study communities in KT.

important in clarifying the close relationship between the housing environment and livelihood of the residents, and in offering insights on preferred live-work design options. Informed consent was sought at the outset following ethical procedures approved by the two universities.

### **3.2. Co-design workshop**

The aim of the workshop was to invite KT residents to express their needs and ideas about live-work housing, and to develop live-work design options and neighbourhood design solutions for flats and houses.

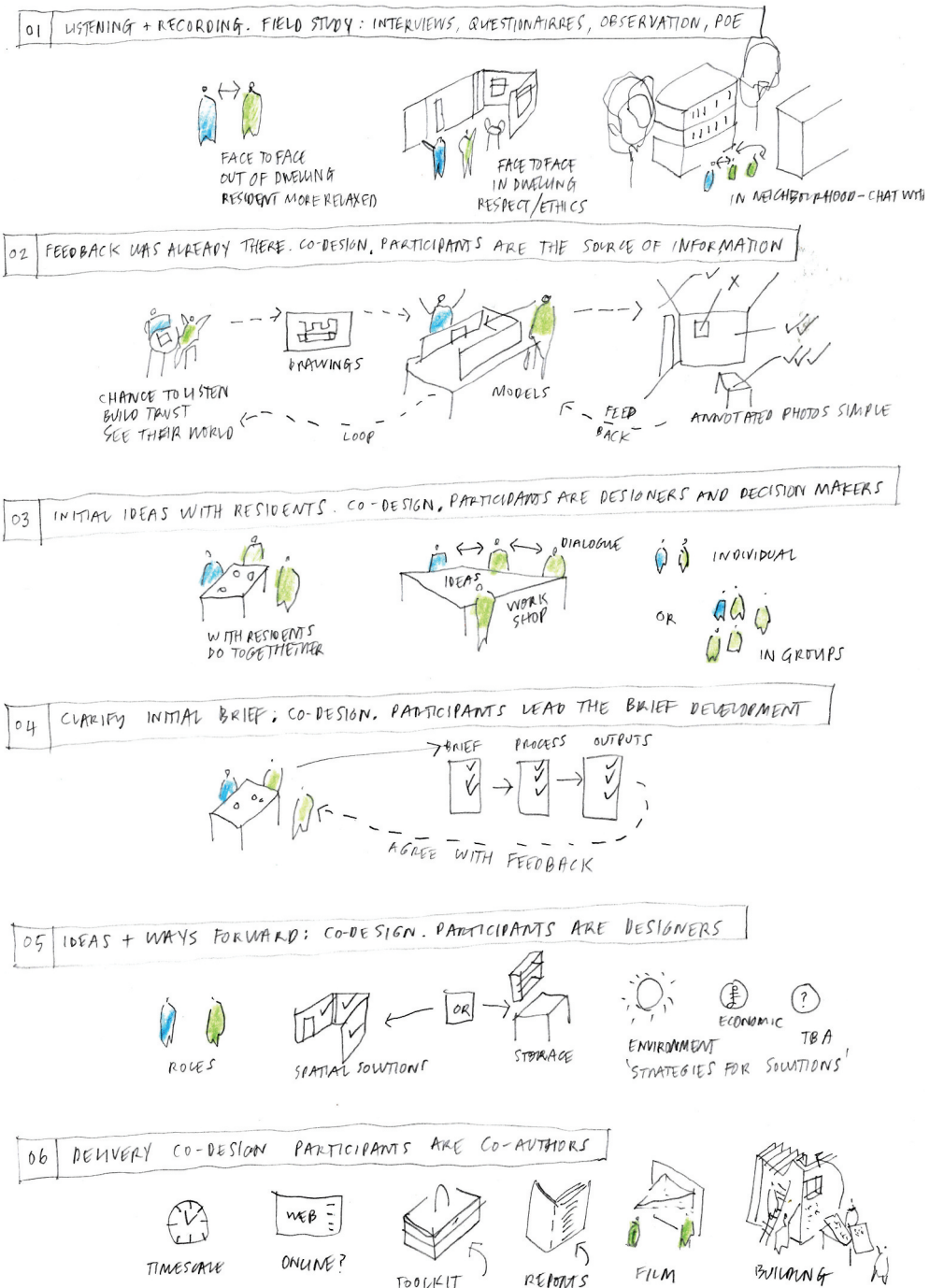
An outline of the initial co-design process was produced to agree the various steps, the workshop space setup and material and facilities that will be required for a hybrid activity (Figure 3). The co-design workshop is explained in the next paragraphs, and the final setup is illustrated in Figure 4.

As illustrated in Figure 3, a six-step approach was implemented to fully achieve the co-design process. Prior to the co-design workshop, the aim was to listen to participants and record their comments and suggestions as part of the field study, which was followed by identifying and recording what is already there in KT and to build trust with residents. This was done via the field study which included observation, interviews, questionnaires and post-occupancy evaluation of participants' homes as part of the research project. Then co-design work was implemented to develop initial ideas with residents and clarify the brief for the toolkit (brief, process and outputs). The next step involved agreeing design ideas and a way forward in terms of co-production and roles, and spatial solutions and the strategies for achieving these. Participants were introduced to the concept and process of co-design, collaborative work and design toolkit development. They were asked to role play as a specific group of community dwellers with different types of housing and livelihood activities and requirements. They worked together to define problems, limitations and/or opportunities, generate ideas and refine design solutions for a live-work flat and a house. Ideas and design preferences were generated, and flat and house layouts were conveyed through virtual 3D model visualisations. Finally the expected outputs were produced, namely the toolkit, drawings, 3D models, workshop report, and a film.

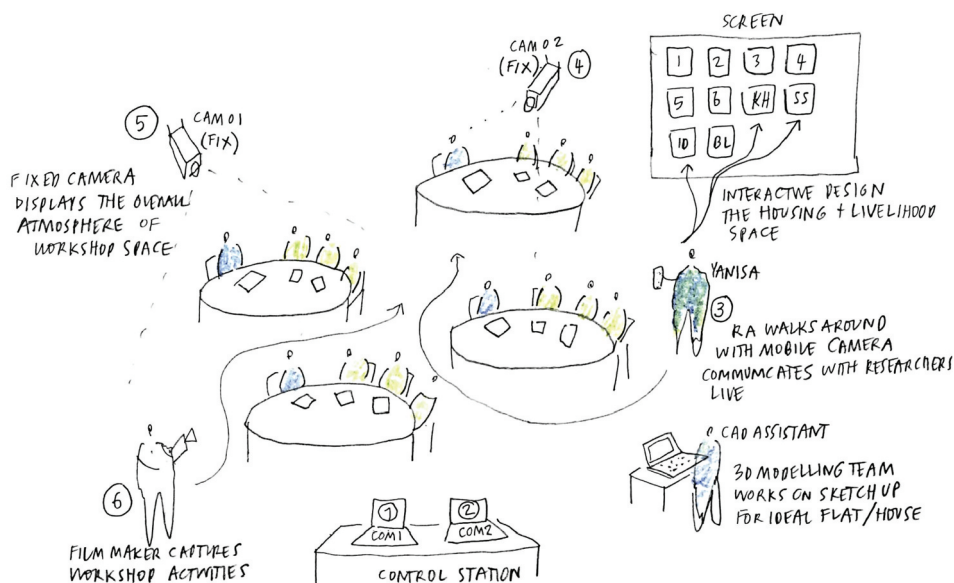
The sessions were facilitated by the local research team, who ensured that everyone had a voice and that all ideas were heard and considered.

Given that the workshop was organised during COVID-19 restrictions, the method of the co-design workshop used a blend of in-person and online activities. Participants were invited to gather at a community centre in KT together with co-investigators and research assistants from Kasetsart University. Other team members including those based in the UK at University of Sheffield communicated with them via Miro and Zoom online platforms. Miro is an online collaborative platform that allows members of a team to engage real-time in group work from different locations. By combining the real-time visual interaction enabled by Miro with the audio-visual connection provided by the Zoom application, researchers and participants were able to successfully interact, collaborate and co-create together (Figures 4 and 5).

The co-design workshop was spread over three consecutive days. The first day focused on the design options of the live-work flat, while the second day explored how the house



**Figure 3.** Outline of initial co-design process. Adapted from Botero and Hyysalo (2013, 48–49).



**Figure 4.** Workshop setup.



**Figure 5.** Workshop participants with co-investigators and research assistants.

could accommodate both living and livelihood activities. On the last day, the flat and house design alternatives were summarised, and a group discussion covered how neighbourhoods of each type should be designed in case of relocation.

The workshop activities were video recorded to assist with the transcription of conversations between participants. Two computer visualisation assistants were tasked



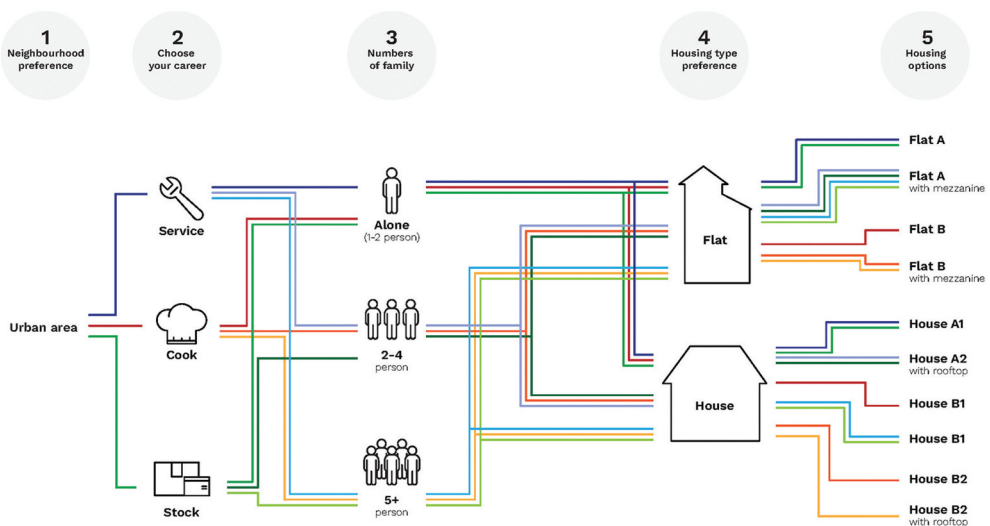
with producing 3D models of the proposals being discussed, while another research assistant took notes of the discussion. A film-maker was also present on site at KT to record the activities for the production of a short film about the project (Figure 4).

## 4. Results

Live-work conditions of older residents in the three case studies in KT can be summarised into three groups: service, cooking and stocking/storing. Service involves dry functional uses such as hair salons, grocery stores and laundry. Cooking accommodates food preparation activities and wet functional uses including dining spaces. Finally, stocking or storing is for jobs that involve storage, including recyclable waste and online selling.

Based on these three live-work conditions, the participants suggested that service and stocking can share the same design, and proposed options for flat and house design. For example, Flat type A and House type A (Figure 6) were proposed to support dry service and stocking, while Flat type B and House type B (Figure 6) accommodated cooking activities and incoming customers. However, house options were designed to be expandable according to household size.

Moreover, the participants emphasised that the storage spaces should be separated from habitable areas for hygiene reasons. They suggested that service facilities should be located on different floors of the building for easier accessibility. In addition, they proposed that communal spaces, such as rental storage, shops, playground, a community club and green space, should be provided at the ground-floor level of the building, alongside a community hall which should remain flexible for conversion into health care or other facilities in case of emergencies. The results of the co-design workshop revealed two additional design issues raised by the participants: universal design and social wellbeing.



**Figure 6.** Live-work housing and neighbourhood options proposed by the toolkit.

The first entailed participants' awareness of universal design principles to support older people, as they highlighted the required width of corridors; the need for the doorway and bathroom design to accommodate wheelchair access; and suggested an emergency alarm be installed within the night area.

The second highlighted how important social interaction and emotional wellbeing are to older people. Designs proposed by participants focused on providing a transitional space in front of the flat or in the older people's day space, with views from the front of the flat or house.

These two issues influenced the proposed designs to meet the older people's social wellbeing needs. In summary, the space in low-income housing should prioritise functionality, flexibility and accessibility, while also providing a comfortable living environment for residents. By designing space with the requirements of the older people in mind, low-income housing can provide a supportive solution to those in need.

The toolkit proposed design options based on flat and house conditions and in line with the prevailing livelihood activities and household size (Figures 6 and 7). It was developed as an accessible easy-to-use document to help co-produce housing and livelihood solutions for the people of KT. It is structured into five sections (Introduction, Housing and Neighbourhood Options, Flat Options, Housing Options, Neighbourhood). In the 'Introduction' section, the research project is presented stressing its purpose which is protecting the livelihoods of vulnerable residents in Bangkok, and the research methods used. It also presents the prevailing live-work conditions in KT and their spatial considerations. Then the purpose of the toolkit is clarified. In Section 2, 'Housing and Neighbourhood Options', participants are guided to develop their home based on their chosen mode of livelihood, their family size and the type of residence that they currently live in or wish to live in. Sections 3 and 4, 'Flat Options' and 'Housing Option's, offer residents opportunities to explore flat or house designs; there are four flat types and six house types proposed based on the livelihood activity and household size (Figure 6). There are design suggestions for room types and design of trade area, day space, night space and adaptable spaces including the use of a mezzanine, to allow customers to visit the place for services such as, hair salon, grocery store, laundry shop and sewing shop, as well as jobs that require space for products to be stored. Finally, it provided neighbourhood design ideas for new developments of flats and houses, where accessible design is



Figure 7. Toolkit sample pages.

implemented and other user requirements are met, such as a common rental area for storage or food cart parking, with the space divided into lots according to the types of occupation, e.g. collecting recyclable waste, selling goods or selling food.

Participants also asked for a first aid room, a community centre, a common area for older people's day care and an area for small children to play, as well as a hygienic common waste disposal area. The community should have a common area for older people to exercise and to meet neighbours. This area should focus on safety and consider inclusive design principles for mobility, such as having non-slip ramps and handrails.

## 5. Discussion

The study considered three interrelated aspects of the lives of older people in this area of Bangkok, namely ageing, housing and livelihood.

Firstly, ageing process is seen as an influential factor, given the emerging demographics in Thailand and elsewhere in the Global South (UN-HABITAT 2016), and also because the population group in the KT area that the study is concerned with comprises primarily older people.

Secondly, housing is a key determinant of healthy living, especially for older people (Sixsmith et al. 2014), and is critical for enhancing self-identity and independence (Wahl and Oswald 2010). Ensuring there is adequate housing available to low-income older people is a priority if we want to work towards reducing or eradicating the poor living conditions experienced by this group in the developing world (UN-HABITAT 2016).

Thirdly, livelihood is a crucial aspect of life and an important means of subsistence and food security (Allison and Ellis 2001; Ellis 2000). In many low-income settlements, people use their living spaces for a range of home-based enterprises to support themselves and their families; in KT, these currently consist of service, cooking or stocking/storing. Chambers and Conway (1992) highlighted the need to enhance livelihood capability, which will require the provision of enabling infrastructure and services as practical means that include education, health, livelihood choices, transport and communications, and flexible credits for small and medium-sized enterprises (SMEs).

These are the variables that the toolkit development considered by giving KT's residents a voice in describing their livelihood capability and in determining and shaping their own future housing and place-based livelihood. One of the central principles of the project was to enable its target demographic to co-produce their own living and livelihood environments: co-design was at the culmination of the research programme that delivered the toolkit, involving the older people it sought to partner with at every stage. This included organising initial meetings and consultations, designing and setting up the research programme, undertaking project activities, developing the toolkit and evaluating its suitability for end users. The participants were given the opportunity to determine and create visions of future housing that would help them maintain their way of life, their mode of livelihood and their self-identity and wellbeing. The co-design methodology aimed to enhance stakeholder participation through constructive engagement that enabled the co-production of 'design seeds', probes and prototypes of designs that can be easily understood by our participants. This effective partnership between participants and researchers was key to providing solutions to real-life problems as well as a tangible intellectual outcome in the shape of a design toolkit. Additionally, the co-design process



allowed researchers to initially act as facilitators by providing participants with a positive and safe environment where they can voice their housing and livelihood concerns and future needs; and as translators to decipher participants' needs and wants, and to help produce design options for live-work settings that informed the toolkit.

The toolkit provides a platform for everyone involved with the housing and livelihood needs of the people of KT to engage in meaningful dialogues with relevant stakeholders around live-work housing options that should lead to long-lasting and acceptable solutions for all. It is the outcome of 12 months (03/2020–02/2021) of co-production activities led by the older residents of KT, as well as community, professional and policy-making stakeholders. It is also an intuitive tool, and offers customisable live-work housing solutions to end users. Housing and neighbourhood options can be selected based on the resident's chosen mode of livelihood, their family size and the type of residence they currently live in or wish to live in.

The toolkit can also be used to identify the housing needs and livelihood priorities of KT residents and offers an inclusive platform from which they can advocate for improvements and solutions to their living and livelihood conditions as an alternative to displacement and relocation. It can be used by all relevant stakeholders – including KT residents, landowners and developers, policy-makers, designers and community organisations. The toolkit also helps stakeholders to identify, understand, discuss, propose and action inclusive solutions that are acceptable to all. At the outset of its implementation, a community organisation should be appointed to facilitate the process and mediate between the stakeholders. The greater the participation, the more long-lasting and cohesive the outcome will be.

Reflecting on the methodological choices and the use of co-design as a design research method for the toolkit development, it can be said that this approach was driven by real-life problems and a participatory approach that examined user behaviour and needs assessment, and informed the development of a range of design alternatives. Overall, this endeavour led to an intellectual contribution that benefits a range of stakeholder including KT residents and academics and non-academics (van de Weijer, Van Cleempoel, and Heynen 2014), both in terms of outcomes and design research methods.

## 6. Conclusion

This article examined the co-design process which was the final phase of a housing research project implemented to support an initiative led by low-income people in Klong Toey, Bangkok. The project led to the co-production of a design toolkit aimed at guiding the development of live-work housing for a low-income group.

Design research through co-design was employed to engage with local stakeholders in developing the toolkit. A three-day workshop was held with residents to explore design alternatives for the prevailing live-work activities that were identified as part of the field study.

The toolkit was inspired by the unique housing and livelihood needs of the older people of KT, and emphasised that ageing, housing and livelihood are interrelated aspects of the lives of older people in this area of Bangkok. It is a useful tool to help identify the housing needs and livelihood priorities of KT residents, while simultaneously providing

a platform to foster advocacy for enhancing and raising awareness regarding their living and livelihood conditions.

Participants in the co-design experience found that the co-creation activities and design process gave them the opportunity to imagine and recreate their own living and working space within their flat or house, therefore ensuring process and product are inseparable and that the design process is a collective endeavour as highlighted by Brysch and Czischke (2022). This collective effort enable them, through interactive methods, to better understand the characteristics of low-income live-work housing, and in particular, how a 'flat' or a 'house' that offer livelihood opportunities should be represented in the context of low-income communities (Diep et al. 2022; Sanders and Stappers 2014). Residents participants being 'experts of their experiences' (Visser et al. 2005), used the co-design process to express their ideas effectively and to be a key contributor to this creative process. Moreover, participants understood that the toolkit gained from the co-design method provided them with a formidable instrument that can be used in advocacy and while negotiating with the local authorities and other stakeholders as suggested by Sanders (2006) and Albright et al. (2011).

Finally, ageing together design strategies implemented as part of this study provided a robust approach to engage with older people through co-design (Botero and Hyysalo 2013). In considering the future, the aspect that poses the greatest challenge in this collaborative design endeavour is the transformation of the design proposals into concrete outcomes. There is no doubt that more collaborative actions are needed to implement the toolkit and to explore its potential impact on low-income communities in KT.

Initial efforts with the dissemination of the toolkit in Bangkok led to impacts, namely supporting the residents' live-work needs assessment and more constructive engagement with various local stakeholders, including the National Housing Authority.

The toolkit will require leadership from a local community organisation to facilitate the implementation process and mediate between the various stakeholders. This will ensure greater participation and positive shared outcomes.

There are limitations in terms of the toolkit's universality and transferability which can be challenging as pointed out by Argenton Freire, Levänen, and Bonvoisin (2022). This will be the subject of future research.

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