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Balconies as adaptable spaces in apartment housing

TERRI PETERS

SEPIDEH MASOUDINEJAD

**Author affiliations can be found in the back matter of this article*

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ADAPTABILITY

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ABSTRACT

New requirements for living, working, and learning at home due to Covid-19 have highlighted two fundamental needs in apartment housing: (1) *adaptability* to fit multiple functions in a limited area; and (2) access to *private outdoor space* to support residents' health and wellbeing, and to provide spatial and thermal variety in small units. The two needs may initially appear to be disconnected: when residents have a high demand for flexibility and adaptability in apartment housing, balconies tend to be overlooked as potential spaces to facilitate adaptability. An analysis of several international housing projects with innovative balcony designs and unit designs is the basis for the identification of several typologies of balconies. Typologies of adaptable balconies and examples are used to show how they may support housing adaptability within a dwelling. The 'adaptable balcony' concept is introduced in the context of multifamily housing design, together with a clear definition of active and passive adaptability by inhabitants.

PRACTICE RELEVANCE

Apartment balconies are often overlooked as design elements capable of influencing housing adaptability. This paper explores how adaptable balconies could support and improve residents' functional use of their dwellings. The ease of adaptability, how and to what degree residents can adapt their balcony spaces, are shown in built examples. The 'adaptable balcony' concept in the context of multifamily housing can provide developers, designers, and inhabitants with an enhanced, more flexible use of domestic spaces. Several typologies of adaptable balconies are identified and considered for how they may support housing adaptability within a dwelling. Two notions of passive and active adaptability in balcony design can help designers facilitate the desired levels of adaptability in a project.

CORRESPONDING AUTHOR:

Terri Peters

Department of Architectural
Science, Ryerson University,
Toronto, ON, CA

Terri.Peters@Ryerson.ca

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Covid-19 has highlighted the importance of adaptable homes. In particular, there is a need to support the various kinds of users, needs, and lifestyles. Dwellings must now accommodate multiple functions of living, working, schooling, socializing, and relaxing (Bettaieb & Alsabban 2021; Capolongo *et al.* 2020; D'Alessandro *et al.* 2020). Adaptable housing can also ease the adjustment to major and long-term changes such as changes in family size, as the family expands or contracts, or residents' physical needs, in particular as they get older or lose their mobility (Friedman 2002; Till & Schneider 2005). Moreover, adaptable housing can enable the variation of the ratio of outdoor–indoor spaces to meet residents' needs on a seasonal basis. While adaptability, flexibility, changeability, and modifiability have been studied in buildings generally (Gosling *et al.* 2013; Geraedts & Ruiterkamp 2017), these concepts need further study in multifamily apartment housing. Furthermore, apartment balconies should be considered as having a role in the unit's adaptability.

Recent research on housing adaptability by Pelsmakers *et al.* (2020) advocated the adaptation affordances at multiple scales including neighborhood-scale intervention. They argue for a mixed-use building approach that is 'loose fit' at the building scale, and the provision for flexible, multifunctional furniture in workspaces and residential environments for social activities. The present paper extends their study, focusing on architectural examples of indoor–outdoor connectivity by examining the role of balconies in housing adaptability. This focus is on two fundamental needs that are typically overlooked relating to residents' wellbeing in apartment housing: (1) the *adaptability* to facilitate the varied activities and multiple functions required by inhabitants in their increasingly smaller unit sizes; and (2) *private outdoor space*, *i.e.* balconies for access to nature, restorative views, and psychological benefits such as prospect-refuge.

Balconies are often too small to use, serving merely as horizontal facade elements introduced for visual variety in the building massing, rather than potential amenity spaces for resident use. Noting that future designs should focus on quality of life and health in these habitats (Peters & Kesik 2020), the present paper discusses the idea of the 'adaptable balcony', *i.e.* how more thoughtfully designed balconies can contribute to spatial adaptability in apartment housing.

This paper examines ways that balcony designs have been integrated with housing adaptability. First, challenges are identified in housing adaptability. Key terms and concepts in the literature are explored for their implications for balconies and adaptability. An analysis of several international housing projects with innovative balcony designs and unit designs is the basis for the identification of a number of typologies of balconies. These typologies are considered for their capabilities to support housing adaptability within a dwelling. The main contributions of this paper are the framing of the 'adaptable balcony' concept in the context of multifamily housing design, and the definitions and analysis of built examples in terms of balcony design and use.

2. BACKGROUND: BALCONIES AND ADAPTABLE APARTMENTS

Balconies are often a defining feature in new apartment housing, and their use and qualities vary greatly from unit to unit and building to building. Balconies can positively impact residents' health and wellbeing. Based on the restorative theory (Kaplan 1995), numerous studies have shown that contact with nature at home and natural outdoor living spaces in urban housing promote health and wellbeing in residents (Masoudinejad & Hartig 2020; Tennessen & Cimprich 1995; Kuo 2013; Kennedy *et al.* 2015). However, current urban apartment housing does not offer restorative experiences for residents (Peters & Halleran 2021) and the 'nature' aspects that people need for restoration are almost entirely missing. A study exploring the impact of housing and the built environment on mental health during the ongoing Covid-19 crisis revealed that those inhabitants without a usable balcony, limited natural light, acoustic and temperature comfort, and absence of plants displayed moderate-to-severe and severe depressive symptoms (Amerio *et al.* 2020). Balconies can improve quality of life by providing private or semi-private outdoor spaces by extending the living spaces (Smektała & Baborska-Narożny 2022), and by offering a chance to

have a view down the street and upwards to the sky. Depending on their design, balconies can also have negative unintended consequences, such as thermal bridging, loss of visual privacy due to their configuration, and relationship between exposure and enclosure. In most cases, balconies are static spaces that do not play a role in housing adaptability. Overall, the design qualities of residential balconies in apartment housing are understudied and warrant further investigation (Kesik *et al.* 2019).

The language around adaptability in buildings is challenging for architects to interpret and for researchers to build upon precisely. Olsson & Hansen (2010) found that terms such as ‘adaptability’ and ‘flexibility’ can mean one thing in one discipline or context, but something different in another. This was also evident in the literature review discussed below. The present focus is on adaptability. The study of designing adaptable housing and integrating outdoor spaces necessarily involves multiple disciplines and stakeholders.

3. METHODS

Studies are identified that consider the adaptability in an architectural way, *i.e.* where the balcony contributes to the overall adaptability and functionality of the unit. Two methods are used to collect and analyze data: a review of published literature, and the identification and analysis of housing cases.

3.1 LITERATURE REVIEW

At the beginning of the project, a literature review was undertaken to determine what kinds of relevant published sources are available on this topic. The goal was to locate key published studies, to identify gaps in the literature, and to give context to the architectural examples analyzed in the project. A scoping literature review was performed as described by Arksey & O'Malley (2007), rather than a systematic review. This method was selected because it is suited to finding key sources and pertinent questions in a research area. This is deemed to be appropriate given that the area of investigation has not been reviewed comprehensively before. Grant & Booth (2009: 97) describe some perceived weaknesses of (non-systematic) literature reviews as a method, in particular that this method lacks an explicit intent to maximize scope or analyze data collected. This may make the conclusions of this literature review open to bias due to the potential of omitting some relevant literature from this search, but since this is not the main contribution of the paper, the present authors think it was the right method to use.

The focus of the literature review search was apartment balconies and adaptability. The Scopus database was used together with a search of selected electronic architectural journals using a snowballing technique in two phases. The initial search yielded 80 relevant sources for title and abstract review. The review was limited to online journal articles, conference papers and e-books using keyword searches including: flexible balcon*; flexible hous*; adaptable balcon*; adaptable hous*; loggia; and balcon*. This initial search was carried out between April and July 2021, and restrictions from Covid-19 limited the authors to online resources. The intent was to find studies that reported residents' preferences for certain balcony designs, and examples of how balconies can improve indoor-outdoor connectivity, but the search failed to uncover much published literature on this topic. Some papers found in the initial search focused on personalization, resident initiatives, and building management policies, but they were not the focus of this study, so they were excluded in the next phase. The second phase in August–September 2021 was a full paper review of 30 sources, which were read and analyzed using annotated bibliographies and then assigned relevant thematic keywords. For this phase, only sources were included that foregrounded the architecture and design approaches, *i.e.* how the form, geometry, design, and material of the apartments supported adaptability with an emphasis on integrated indoor-outdoor space (*Figure 1*).

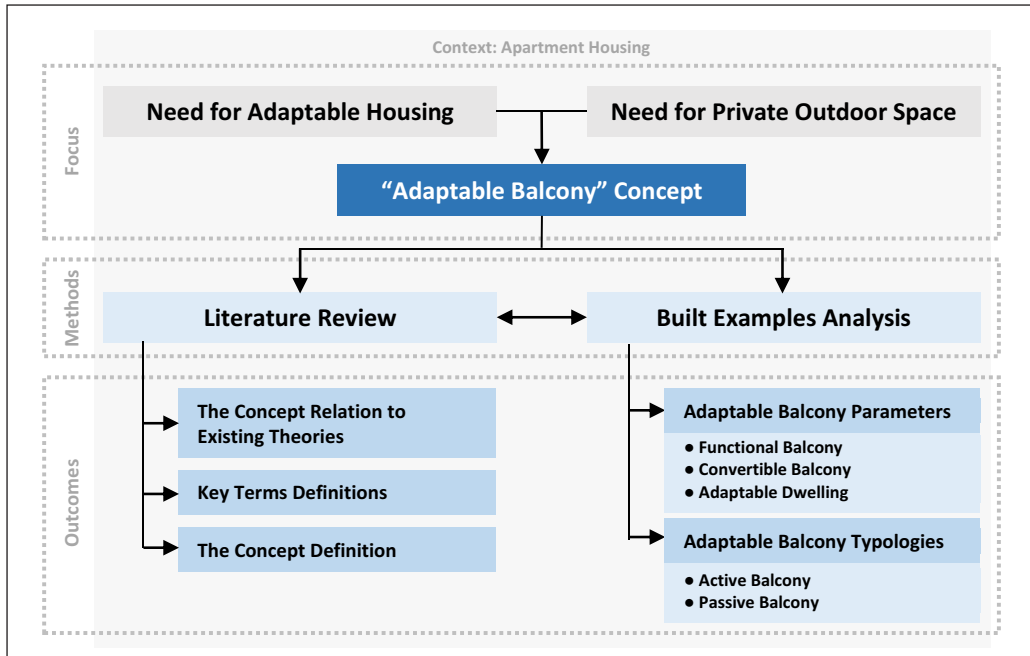


Figure 1: Flow diagram of the study.

3.2 IDENTIFICATION AND ANALYSIS OF ADAPTABLE BALCONIES




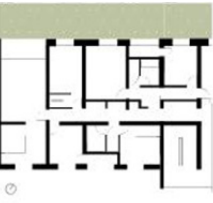


After the literature review, examples were sought of built, multi-unit residential housing that used balconies as a way to create adaptability and provide opportunities for outdoor space. Based on a web search of recent housing projects, including architect websites, aggregator websites such as Archdaily, and online publications sources including *Architect* magazine, *Architectural Record* and other professional publications, a pool of 40 global examples of multifamily housing that incorporate balconies were identified for consideration. This process took place between May and September 2021. All the selected projects had been described as adaptable or flexible by the architects in the project description. The authors then used a Miro board to collaboratively and visually sort the apartment unit designs using published floorplans and by consulting additional published determine how the designs were adaptable according to the definitions and concepts from the literature review.


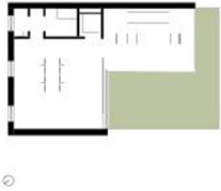
After this initial pool of examples was determined, a second round of sorting took place. Projects that were not yet built were excluded, and so were projects that were low-rise and had balconies that functioned more as terraces. At this stage projects were excluded that did not have an adaptability strategy at both the balcony and dwelling levels. Additionally, projects that had insufficient published information were excluded. The authors then redrew and annotated the floorplans to compare how the units were adaptable. From this selection of 12, four were excluded for being located in tropical climates. This purposely limited the examples of projects to non-tropical locales. Eight examples were then used to test the analysis parameters and typology categorization. The floorplans and building plans were analyzed to understand how the units were adaptable.

Balcony design features and details of adaptation phases were documented, then analyzed. **Table 1** highlights the specific qualities and design parameters of the adaptable balconies studied. Floorplans, photographs and text were analyzed to be able to describe the design parameters and the open and closed phases of the adaptable functionality in these cases. These built examples yielded results about specific design parameters for balconies that can:

- create a functional and comfortable balcony (functionality)
- allow a balcony to be adapted to residents' needs on a daily or seasonal basis (convertibility) and
- impact on the use of the dwelling, not just the balcony (dwelling adaptability).

The first group of parameters refers to the characteristics of the balcony as a functional space (including size and ratio, level of enclosure, orientation, and other comfort parameters); the second group refers to the convertibility strategy in the balcony (e.g. walls or doors that residents can fold, slide, open and close, and materials that change the sense of enclosure); and the last parameter refers to the adaptability strategy in the dwelling (at the level of both apartment and room, to expand or shrink, and for indoor-outdoor integration or segregation).

PROJECT	UNIT PLAN	ANALYSIS PARAMETERS			TYPOLOGY	
		FUNCTIONAL BALCONY	CONVERTIBLE BALCONY	ADAPTABLE DWELLING	PASSIVE	ACTIVE
Habitat 67 , Montreal, Canada Moshe Safdie, 1967		Size: 4 × 4 m Ratio: 1:1 Orientation: varies Connection: 1 wall Roof: no Access: living room	✗ Enclosure strategy: glazed walls	✓	✓	
59 Dwellings in Neppert Gardens , Mulhouse, France Lacaton & Vassal, 2015		Size: 1 × 10 m, 2 × 10 m Ratio: 1:10, 2:5 Orientation: northwest, southeast Connection: sliding glazed wall Roof: yes Access: all rooms	✓ Enclosure strategy: glazed sliding walls	✓		✓
Boulevard Ney Housing , Paris, France ITAR Architectures, 2020		Size: 2 × 14 m, 3 × 5 m Ratio: 1:7, 3:5 Orientation: varies Connection: glazed door Roof: yes Access: dining area, bedroom	✗ Enclosure strategy: glazed doors	✗	✓	
Grand Parc , Bordeaux, France Lacaton & Vassal, 2017		Size: 6 × 3 m Ratio: 2:1 Orientation: southeast Connection: sliding glazed wall Roof: yes Access: entry and living rooms	✓ Enclosure strategy: glazed sliding walls	✓		✓
White Clouds , Saintes, France Poggi Architecture, 2017		Size: 1 × 3 m, 3 × 3 m, 5 × 3 m Ratio: 1:3, 1:1, 5:3 Orientation: all but north Connection: glazed door Roof: yes Access: all main rooms	✗ Enclosure strategy: steel mesh	✗	✓	
ZAC Claud Bernard , Paris, France Dietmar Feichtinger Architectes, 2016		Size: 2 × 3 m, 1 × 5 m Ratio: 2:3, 1:5 Orientation: SW Connection: glazed door, Roof: yes Access: Living room	✓ Enclosure strategy: Glazed louvers	✗		✓

PROJECT	UNIT PLAN	ANALYSIS PARAMETERS			TYPOLOGY	
		FUNCTIONAL BALCONY	CONVERTIBLE BALCONY	ADAPTABLE DWELLING	PASSIVE	ACTIVE
NEXT21 , Osaka, Japan Yositika Utida, Shu-Koh-Sha, 1994		Size: 3 × 3 m Ratio: 1:1 Orientation: east Connection: glazed door Roof: yes Access: varies	× Enclosure strategy: varies by user	✓	✓	
Savonnerie Heymans , Brussels, Belgium MDW Architecture, 2011		Size: 3 × 3 m, 1 × 3 m Ratio: 1:1, 1:3 Orientation: southwest Connection: sliding glazed doors Roof: yes Access: all main rooms	✓ Enclosure strategy: glass-enclosed	✓		✓

4. RESULTS

4.1 FINDINGS FROM THE LITERATURE REVIEW

Many concepts about housing adaptability consider the envelope as a layer that can be adapted or changed, but often do not account for the unique benefits of modifying the balcony envelope. Alterations of the balcony envelope can do more than extend space: it can change the experience of existing spaces by varying thermal comfort, views, and light. Groak defines adaptability as capable of different social uses (Groak 1992) and the term ‘adaptability’ is used here as the ability to accommodate different functions or occupancies (e.g. bedroom–office or living room–bedroom or dining room–office).

Schmidt & Austin (2016: 76) define adaptability as a synthesis of:

the capacity of a building to accommodate effectively the evolving demands of its context, thus maximizing its value through life.

This definition can be applied to the adaptable balcony. This suggests adaptability should be measured by how well a balcony keeps up with the demands of its users, and how it enables them to modify and customize the indoor–outdoor relationships.

4.1.1 Adaptability and the convertible balcony

The strategies of growth (add-in) and division (Friedman 2002) and expanding within (Schneider & Till 2005). Schneider & Till (2005) emphasize the practicality of this idea for multi-occupancy and multi-storey housing where any growth has to occur within the original frame because of structural and legal limitations. This is achievable in a design with a separate support structure and infills/fit-out that facilitate prospect changes (Habraken 1972). Schmidt & Austin (2016: 107) refer to the concept of convertibility and versatility as important concepts within adaptable housing.

Could convertibility and versatility be applied specifically to balconies? The majority of published studies about balconies do not prioritize ease of user adaptability, or how often people want, or need, to adapt their homes, e.g. seasonal adaptability. For balconies, the notion of convertibility relates to being able to modify the level of enclosure, which could be achieved with sliding doors and retractable overhead shading devices. The affordance given to inhabitants to be able to open and close their balconies is named here as ‘convertible balconies’. Adaptable balconies can function as a useful part of the living space, rather than as a separate, non-integrated facade element. A further benefit is that a convertible balcony could provide for a varied range of indoor–outdoor connectivity (according to the season).

Table 1: Selected housing examples of the adaptable balcony concept: classified as passive and active balconies.

The concept of ‘slack space’ (Schneider & Till 2005) involves leaving an underused internal or external area empty to anticipate potential occupation or future enclosure (e.g. an area in the basement, attic, or a corner of the courtyard). Friedman (2002) introduced this idea as a ‘wide open space’ in order to provide extra spaces for future changes. According to Schneider and Till, changes in slack spaces are mostly hard changes lasting for a long time (Schneider & Till 2005). Their concept of slack space can be relevant to the adaptable balcony concept. The adaptable balcony has the potential to be convertible, adapting to seasonal and even daily intervals. In considering the slack space idea, the adaptable balcony intends to contribute to residents’ wellbeing by providing a functional and comfortable outdoor space, while such an intention is not defined for the slack space concept. The concept of convertibility and having agency over varying the enclosure of the balcony is important, and the authors therefore evaluated it as a parameter in the case studies.

4.1.2 Benefits to inhabitants: balconies and the adaptable dwelling

Besides the economic and environmental advantages of housing adaptability through extending the useful life of buildings (Askar *et al.* 2021), there is a question of how the residents benefit. Malakouti *et al.* (2019) found that the most influential component of flexibility in quality housing is accommodating multifunctional spaces and capacity for expansion. Residents’ desire for flexibility in their home might be due to a lack of quality in the original design, limitations in choosing a suitable apartment, or as a result of their changing needs (Femenias & Geromel 2020). During the pandemic, people reported higher demand for adaptability and spatial reorganization in their homes (e.g. Alonso *et al.* 2021). It is obvious that residents can use spaces for various functions by changing furniture layouts, but it is unclear how often they would actually do that. Considerations of affordability and practicality are important. Recent studies showed a strong correlation between (perceived) flexibility and resident satisfaction (Malakouti *et al.* 2019). Adaptability empowers residents in their living environment (Till & Schneider 2005) and facilitates accommodation of cultural diversity and even changing lifestyles due to particular circumstances such as the pandemic crisis. Affordability is another benefit of adaptable design when an unfinished/partially finished design can reduce the home selling price (Friedman 2000). As a relocation alternative, the capacity of the home to adapt to changing needs and varying size of the family supports residents’ safety and stability (Plaut & Plaut 2010). This is a certain aspect of housing adaptability that could help ageing people stay in the comfort of their homes longer. The literature on building adaptability tends not to address the specific challenges of certain program types, e.g. adaptability in multifamily housing.

4.2 ACTIVE AND PASSIVE BALCONIES

Through analysis of housing examples based on the three groups of parameters (functional balcony, convertible balcony, and adaptable dwelling) it is possible to define and categorize two types of adaptable balconies: active and passive. The classifications are determined based on how easy it would be for residents to adapt the balconies to suit their changing needs: the focus is on the inhabitant’s perspective. Overall, the more functional, convertible, and adaptable parameters that are fulfilled in a dwelling, the closer the balcony is to an active balcony. The less it meets these parameters, the closer the balcony is to a passive balcony. The classification of ‘active’ is connected to the convertibility, and indicates that an occupant can adjust the level of enclosure. This ability is important because it gives residents the choice and control over their home indoor–outdoor uses and space efficiency. They can create a private outdoor space if they need a connection to the outside or they can close it when they need to expand indoors or provide a buffer zone (*Table 1*).

4.2.1 Active balconies

Active balconies are those that allow higher levels of adaptability, where the balcony can easily be transformed to meet different uses or needs. The pushing, pulling, and sliding of facade elements can create new relationships between the inhabitant and the balcony, and facilitate new uses. The inhabitant can easily and quickly modify the level of enclosure on the balcony, and may do so

without costly renovations. With active balconies, the outdoor space can become an extension of the living or dining spaces to suit inhabitant needs. In many cases, the balconies have sliding doors that allow residents to open or close the space to meet their thermal comfort.

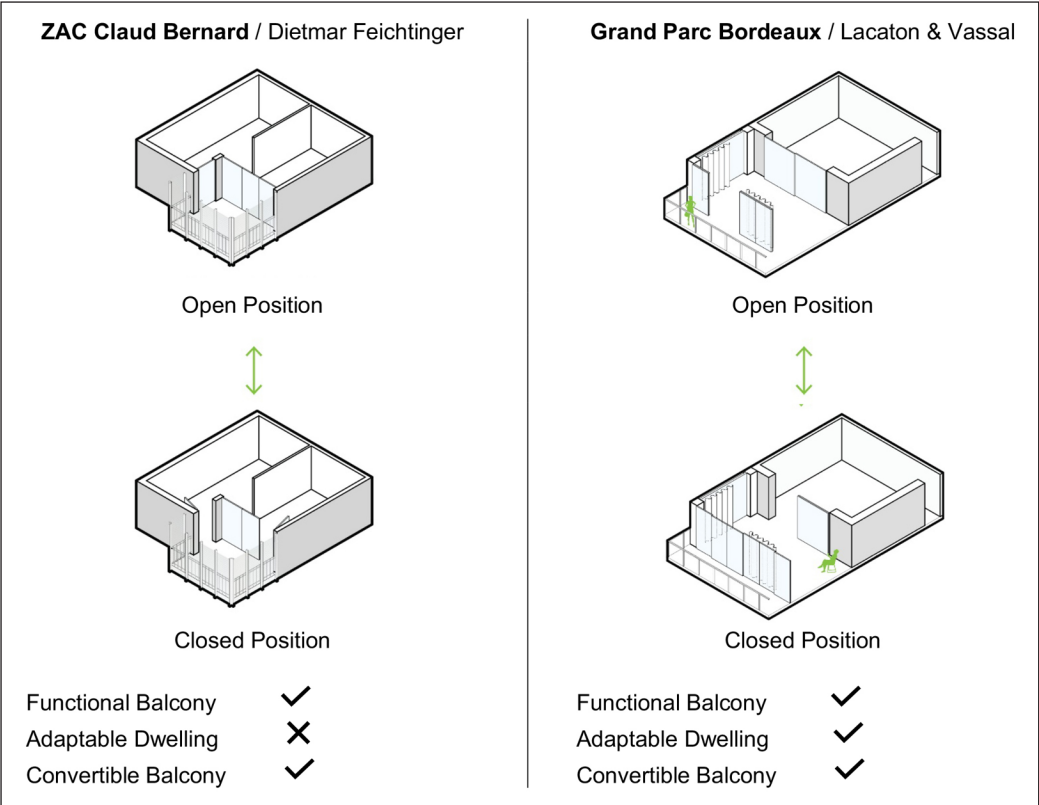


Figure 2: Examples of active balconies illustrating their convertible and adaptable properties for enabling an adaptable dwelling.

Several projects that exemplify the active balcony typology (Figure 2). For example, the ZAC Claude Bernard (2016) in Paris, France, by Dietmar Feichtinger Architectes has active balconies. This project contains a range of unit types from studios to four-bedroom units, and all apartments are dual aspect, allowing for cross-ventilation and light from two sides. Each unit has an outdoor space with either access to a balcony, roof, terrace, or loggia (Dietmar Feichtinger Architectes 2012). The outdoor spaces can be used to extend the living spaces and dining areas outdoors due to their size and placement. Residents can vary the degree of enclosure by opening up the indoor space to use the loggia, and can easily open or close the glazed louvers of the loggia. According to the architects, the inset balconies, or loggias, are about 10 m² and designed to accommodate the comfortable placement of a table for outside dining (Dietmar Feichtinger Architectes 2012). The balconies are part of the adaptability strategy in that they create enlarged indoor-outdoor dining or living spaces that can be accessed seasonally or at various times of the day as needed.

The Grand Parc housing (2017) in Bordeaux, France, by Lacaton Vassal, is a renovation to an existing multifamily housing building, and it also has examples of active balconies. The project has several kinds of balconies, small private balconies, and also balconies are used as new access to front doors for the units. The new access to units provides new indoor-outdoor balcony space added around the outside of the building (Lacaton Vassal 2021). The concept relates to the architects' design approach of 'plus' or 'more', meaning that they aim to renovate existing buildings by adding rather than subtracting from the building uses and from the physical building form (Druot et al. 2007). These are examples of active balconies because people use the space in the new covered walkway by opening their front door. This covered corridor space has a high degree of programmatic adaptability: it is a semi-public space that can be used to chat with neighbors, share a meal, or store bikes and shoes. It can function as a front porch or a shared terrace or courtyard space. It has a high degree of thermal comfort adaptability as the exterior walls can be opened or closed via sliding screens, and there is even a narrow outer balcony beyond the covered corridor.

4.2.2 Passive balconies

Passive balconies are defined here as those that restrict convertibility, or where adapting the enclosure to suit different needs would be more expensive or difficult have a lower degree of adaptability. As with active balconies, passive balconies can be personalized by the inhabitant, and can be re-designed and adapted to suit specific needs. A difference is that in passive balconies the changes would happen less easily and frequently. When the convertibility and adaptability is low, and changes by the inhabitant are less practical, these adaptable spaces are termed ‘passive balconies’ (Figure 3).

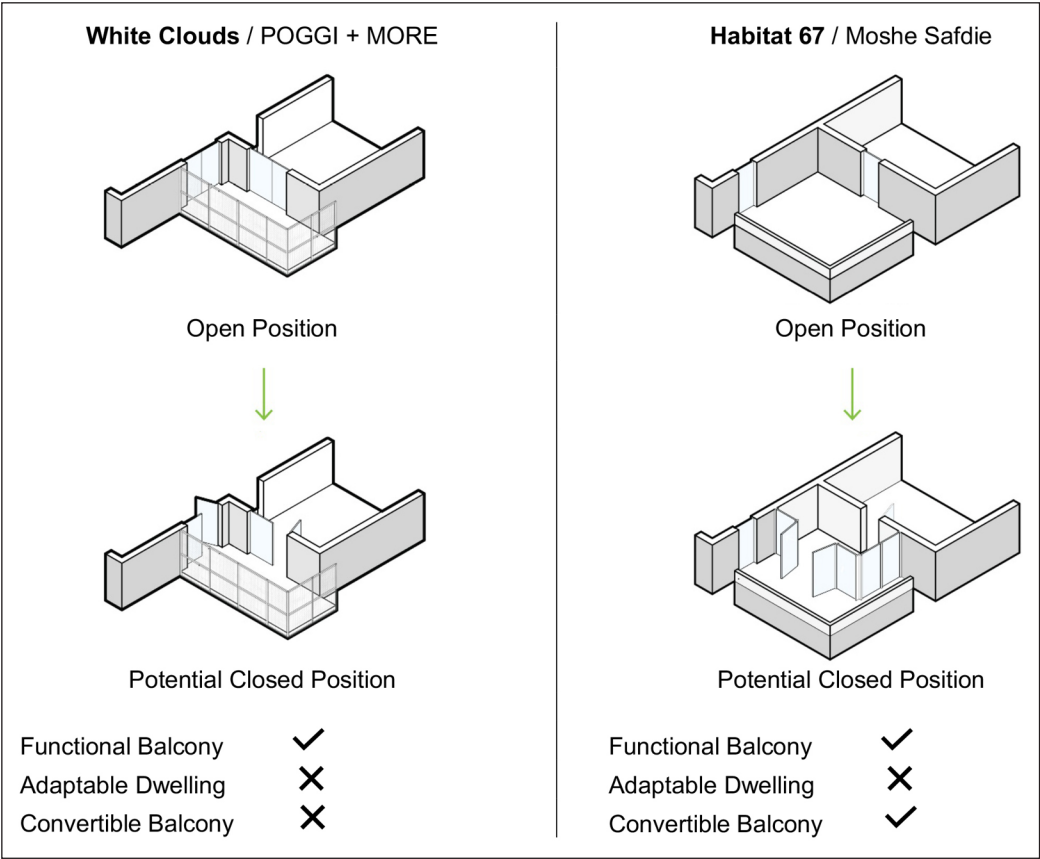


Figure 3: Examples of passive balconies illustrating their limitations for convertibility.

An example of a passive balcony is White Clouds (2017) in Saintes, France, by Poggi Architecture, which has balconies that protrude from the exterior, providing a semi-enclosed indoor-outdoor space. These can act as a multipurpose room and be used as a garden shed, greenhouse, sitting space, storage, or an extension of recreational indoor living spaces. The designers intended these ‘pièces supplémentaires’, or additional rooms, to be used in different ways by residents depending on the seasons, and to have sufficient depth, size, and proportions to be useful for people and activities, such as dining, not just storage (Poggi Architecture n.d.). The project does not have a high degree of adaptability in balcony space because the outdoor area can be adjusted programmatically, based on residents’ needs, but it would be difficult and impractical to adjust the level of enclosure of the balcony regularly. The protruding balconies and the metal mesh enclosures are a defining architectural feature of the building, and a way of creating a personalized or identifiable facade for each unit. The window-sized opening in the mesh indicates a view window, and adds to the experience of this being an outdoor room.

Another example of the passive balcony typology is the Habitat 67 (1967) housing in Montreal, Canada. This housing project was designed as an exploration in both construction and typological innovations where the traditionally ground-oriented courtyard could be combined with the multi-unit residential building. The result is a modular framework that takes advantage of the negative spaces in between, and on top of, units (Merin n.d.). These become residential terraces. The

terraces, on the other hand, are adaptable because of their loose fit to each unit. These terraces offer opportunities for residents to have personalizable space that is adaptable in use, although not in form. There are limited ways to vary the enclosure. The terraces have minimal open/close functionality, and are accessed via sliding doors from the living area (Merin n.d.). There have been some examples where residents have renovated the unit and added temporary and permanent enclosure outside in this space.

5. DISCUSSION

This framing of the adaptable balcony concept adds new knowledge to this area of housing research with a focus on analyzing the adaptability of indoor–outdoor connectivity in apartment housing. Reimagining balconies as dynamic environments in the scenario of home adaptability shows how they can contribute to the efficient use of space in apartment housing while also supporting residents’ mental and psychological wellbeing.

The examples given in Section 4.2 show how the balcony design can allow for user-driven adaptability. The following discussion highlights a series of areas of enquiry that relate to balcony design for adaptable housing.

5.1 WHAT MAKES A BALCONY MORE USEFUL FROM AN ADAPTABILITY PERSPECTIVE?

The first requirement for an adaptable balcony is to be functional, and the balcony should be a useable space. This relates to the functionality parameter. Important considerations are the size and proportions of the spaces. There has to be enough space for varying functions and activities. According to Aydin & Sayar, this should be considered the functional performance of the balcony and the qualities of the space relate to the usability of the balcony (Aydin & Sayar 2021). Considerations such as orientation, ratio and the relationship with the environment must be considered, along with understanding the purpose of the balcony, its role in daily life, and usage hours. Another consideration is the location and placement of the balconies in relation to the floorplan because this impacts on functionality. For example, some balconies are accessible only from the bedroom, and thus are unable to provide extensions of the living space. An important consideration around functionality is that the inhabitant of the space and their behavior are central to how indoor–outdoor spaces and balconies are used. All the examples in [Table 1](#) were considered in terms of their functionality. For example, the balconies at Savonnerie Heymans housing (2011) in Brussels, Belgium, by MDW Architecture are functional and the balconies are large, useable, and adaptable.

Convertibility is also a fundamental attribute of the adaptable balcony and it relates to how residents are able to vary the level of enclosure to suit their needs. Climate and weather are important factors in how and when a balcony will be used by residents. Balconies in a tropical climate such as Singapore may be more often arranged in an open position to provide shading or outdoor space year-round, whereas balconies in rainy Vancouver in Canada may be more often closed off from the weather. The analysis of adaptable balconies was unable to find clear evidence about which enclosure types, e.g. loggia style or open-air designs, promoted adaptability. The literature review sought papers that examined people’s comfort on balconies. However, most of the studies on this topic were related to evaluating how a balcony impacts the thermal or visual comfort within the dwelling, rather than the comfort of the person using the balcony. For example, researchers have identified design parameters such as a balcony’s size and enclosure design, its configuration and location, and its internal dividers as having a great influence on inducing air speed inside the building (Mohammadi *et al.* 2010), but no mention is made concerning the thermal comfort of those using the balcony. Visual and auditory privacy, feeling overlooked or overlooking others, and location of the balcony on the facade all impact how often and in which ways people use their balconies. For example, the Grand Parc housing by Lacaton Vassal has easily convertible, adaptable balconies. The indoor–outdoor spaces are functional and residents are able to personalize the space and put things outside such as furniture, and lighting. This ability is important for adaptability and comfort.

A dwelling should have a level of adaptability to facilitate the indoor–outdoor integration and division. The relationship of the dwelling to the balcony, e.g. ease of access, such as the number of steps up to get outside, or whether access is from a living room space or a bedroom, also impact comfort and ease of use. The literature review did not find studies on the relationship between the adaptability of dwellings and specific design requirements of balconies. However, some important practical considerations arose in the case studies of adaptable balconies. For example, a balcony space may be used differently when it is directly connected to relevant interior spaces. The ZAC Claude Bernard in Paris has balconies designed to provide an extension to the dining area. The balconies are therefore accessed via the dining room and aim to be integrated into the overall unit adaptability. The architects designed the balconies with this intention, rather than providing a smaller balcony designed to serve as a bike storage area or a small place in which to stand or sit (Dietmar Feichtinger Architectes 2012).

In terms of the framing of the adaptable balcony concept and its primary parameters (functionality, convertibility, and dwelling adaptability), there is a need for new methods and language relating to adaptable apartment housing that prioritizes outdoor spaces. According to De Paris & Lopes (2018: 90), housing must be regarded ‘as a constantly adaptable space that needs to possess flexibility to transform’. Not only are technical and material considerations important, but also cultural issues need to be investigated more deeply, and further research is needed on the consequences of space modification. De Paris and Lopes argue that there is a need for a new methodology to evaluate adaptability, which should consider the dynamics of spaces with their geometry, accesses, infrastructure, structure, proportions, partitions, and envelopes. Schmidt & Austin (2016) also argue that one should consider buildings as spaces designed to change over time, and in their theory of adaptable housing the authors reflect on many different kinds of changes that take place in buildings. There is a great potential to better use balconies, and to take greater care in the design of these spaces so that they support adaptability in apartment housing.

5.3 LIMITATIONS

This study is an initial step towards defining and reframing adaptable balconies in multifamily housing. It is a preliminary study to provide the necessary theoretical foundation and area of focus before incorporating future fieldwork to visit apartment units and interview residents about their balconies. The initial goal was to identify specific ranges for adaptable balcony design including size, proportion, direction, privacy, and amount of enclosure, but based on this small sample of analyzed designs, the findings are not generalizable given the wide range of balcony examples in different climates, suiting different user needs.

There are some limitations to this study. An understanding of inhabitants’ balcony preferences and how proximity to other buildings, views, and density impact people’s satisfaction is an area of research that could be further explored. This study did not tackle the question of whether and how balconies add value to dwellings. For example, the question of whether balconies should be counted by building owners or developers as ‘saleable area’ and marketed as living space is debatable. In some cities, enclosing existing balconies with glazing is a way to increase the marketable size of the apartment (Geller 2019). The present study focused on balconies and apartment units rather than the larger building and neighborhood context and therefore did not consider the role of balconies in the larger context.

6. CONCLUSIONS AND FUTURE WORK

In the wake of Covid-19 and the waves of stay-at-home orders, apartment residents have higher expectations of their dwellings to provide multiple functions. Additionally, there is a need for an immediate private outdoor space at home to support residents’ health and wellbeing. The adaptable balcony can contribute to both needs. In apartment housing, balconies can provide this outdoor space and contribute to a dwelling’s adaptability. This paper developed the adaptable

balcony concept as a way to understand more deeply the role of this indoor–outdoor space. Based on the analysis of built examples of balcony design and use, several balcony typologies were identified and discussed for their ability to support housing adaptability within a dwelling.

There is a need for more research into specific design strategies for improving indoor–outdoor connectivity in multifamily housing. In particular, future research must analyze how designers can play more of a role in amplifying positive and adaptable design strategies to better use balcony spaces.

Future work must also consider urban apartment balconies using an equity and inclusion lens, since the provision of adequate outdoor space should be a requirement for all housing, and this issue impacts certain resident groups more significantly than others. There is a need for more social science and building science research into which residents use which kinds of balcony spaces in the city, to inform design guidelines for more equitable access to outdoor space. Field studies and interviews will be an important next step for this project.

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AUTHOR AFFILIATIONS

Terri Peters  orcid.org/0000-0001-9029-3588

Department of Architectural Science, Ryerson University, Toronto, ON, CA

Sepideh Masoudinejad  orcid.org/0000-0002-1787-9547

Construction Research Centre, National Research Council of Canada, Ottawa, ON, CA

AUTHOR CONTRIBUTIONS

Initial draft, analysis, and literature review: TP and SM. SM undertook a more refined analysis. TP was responsible for managing the work, and both participated equally in revisions and production of the latter versions of this paper.

COMPETING INTERESTS

The authors have no competing interests to declare.

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