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The Scope of Adaptability Research to Social, Economic and Policy Changes

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Abstract

This paper discusses the research on adaptability that has been carried out due to social, economic, and policy changes. The dynamics of social, economic, and policy changes occur along with the development of people's lives. Many factors lead to changes in urban environmental conditions. These dynamics are responded to by the community by making adaptations, both building adaptations and behavioral adaptations. The ability to improve the outcome of existing buildings through adaptation is essential to improving the building environment sustainability. Thus, research on the phenomenon of adaptability is essential and relevant to be carried out, considering that changes in environmental conditions cannot be avoided. Hence, adjustment or adaptation of buildings is necessary. This study's objective is to establish the scope of the research discussion on the topic of adaptability that has been carried out. This research is literature review research with a comparison-content analysis as an empirical method. This study reviews 30 adaptability papers published between 1989 and 2020. The method of analysis is mapping the research literature with the adaptability topic by comparing the substance of the research based on the research focus, objectives, and adaptability research objects carried out. From this research, it can be concluded that research on adaptability can be categorized based on the scope of the research area, the typology of the building being studied, and the research locus. The research results hopefully could provide an extension of other research, specifically in building adaptation. It is recommended that further research on the phenomenon of housing adaptation can be carried out with adaptability research in suburban and rural areas. In addition, research can be developed on location settings with different characteristics, such as housing in coastal settlements or settlements in highland settlements.

Keywords: *Building Adaptation, Social, Economic and Policy Changes*.

INTRODUCTION

The dynamics of social, economic, and policy changes occur along with the development of people's lives, especially in urban center settlements. City life is influenced by three essential elements of the city, which consist of ecological, economic, and social. Ecological elements are related to the city's environmental conditions and urban communities, both the physical, social and cultural environment. The economic element is related to the economic and economic activities undertaken by the community, while the social aspect is related to the community's social life (Chase-Dunn and Babones, 2006).

Many factors lead to changes in urban environmental conditions, both social and economic changes in society. Industrialization of both the goods and service industries is considered an essential factor in social change through the emergence of various types of work that result in the differentiation of the socio-economic position of the society. The diversity of the socio-economic standing of the people can be balanced with changes in the socio-economic level conditions of the colony (Rury, 2004).

Social and economic conditions changes ultimately affect community activities and lead to the need to shift the scope, purpose, or accomplishment of community dwellings in other terms. Any interference to adapt, use again, or increase buildings to conform to current circumstances and requirements or adaptation of buildings (Douglas, 2006).

The community responds to the dynamic conditions of social, economic, and policy changes by making adjustments (adaptations), both building and behavioral adaptations. Some people respond to the dynamics of these changes by withdrawing from the environment to move to another location. According to Berry John (1980), there are three adaptation strategies: adaptation by reactions, adaptation by adjustment, and withdrawal. The community that responds by adapting the building is an adaptation by reaction effort. React by changing the building's capacity to respond successfully to the expanding requests of the contexture, thereby creating maximal value thru existence (Schmidt et al., 2010). Building adaptation can be in the form of changes in function, changes in capacity, or changes in building performance (Wilkinson, 2014).

Building adaptation can be triggered by changes in environmental conditions in the form of obsolescence, redundancy, and deterioration. Building obsolescence can be physical, social, economic, functional, legal, or policy obsolescence and architectural aesthetics (Douglas, 2006). Adaptations can become in the shape of transformations in space use (Adjustable), changes in space dimensions (Versatile), changes in space performance (Refillable), changes in building functions (Conversible), changes in room and building dimensions (Scalable), and location changes (Movable) (Schmidt III et al., 2010). The form of adaptation is influenced by several factors, namely regulations, policies and permits, government incentives, environment, risk, social, economical, cost, location, site, and the physical condition of the building (Wilkinson, 2014).

Building adaptation and residential environments cannot be avoided as a response to changes in environmental conditions in the predicate of socio-economic and policy facets. This opinion is in line with the opinion of Russell and Moffatt (2001). They stated that currently, the world is experiencing resource scarcity and an ecological crisis, and attention toward building adaptation is highly pertinent. Realizing a sustainable society is possible when resources can be managed sustainably. The above adapt buildings align with environmental sustainability (Bullen, 2007; Wilkinson et al., 2014).

Douglas (2006) states that adapting buildings is a more useful and practical approach, if possible, to realize building performance to an optimal level. Geiser (2005) states that the benefits of building adaptation contribute to increasing the functional life of the building. The two main problems related to building operations are the usefulness of the building and the period of the building, on the other hand. Many buildings were demolished before the end of their meaningful existence. That causes many economic and social issues consisting of waste of national property, devastation, and pollution of the environment (Saghafi and Ahmadi, 2011). The sustainability concept has been one of the main countershafts of adaptability appropriate to the idea of recycling buildings since the late 1990s (Ball, 2002). In addition, the ability to improve the outcome of existing buildings through adaptation is the most crucial facet of improving the building environment sustainability (Cooper, 2001).

So from the above background, it is necessary to conduct a study related to building adaptation due to the dynamics of social, economic, and policy changes in the community. Research on adaptability is very significant and relevant to do. This study aims to determine the scope of the research discussion on adaptability.

LITERATURE REVIEW

Adaptability

Adaptability is the capacity to adopt and adapt to changes by meeting various uses, enabling different spatial configurations, being coherent with socio-cultural trends and environmental changes, and updating technology without significant disruption (Kronenburg, 2007). Adaptation in the context of the building is a word widely read and specified by many researchers (Douglas, 2006; Bullen, 2007). Building adaptation comes from the Latin' ad' (to) 'aptare' (fit) which is taken to include any

work on the building maintenance in order to improve the function, capacity or performance of the building. Also including all activities to adjust, reuse or increase the quality of the building according to the conditions of new needs (Douglas, 2006). Generally the definition refers to the change of use, maximum use of the existing building and prolonging the operational life of the building (Bullen, 2007). Building adaptation can be happened 'within use' and across the use.' This adaptation means that, for example, an office can continue to function as an office after the adaptation is carried out (adaptation in use), or it can shift its function into housing (adaptation between uses) (Ellison and Sayce, 2007 in Wilkinson, 2014).

Meanwhile, similar to Kronenburg (2007), Adaptable can be interpreted as the ability of the building to adapt to changes in use, space, and use, accompanied by the use of the latest technology without damaging the environment and human life. Wilkinson (2014) mentions that building adaptation can emerge as "same use" and "cross-use." Schmidt et al. (2010) explain building adaptation as the ability of the building to effectively accommodate the demands of the latest needs to maximize the value of life.

Adaptation Characteristics

Schmidt III et al. (2009) stated that anything that is adaptable must have the following features: the power to shift, capability to stay suit for goals, maximize worth and period (rapidity of shift and thru cost of living), and Schmidt III et al. (2010) identified four characteristics of overarching adaptation:

Table 1. Characteristic of Adaptability

Characteristic	Definition	
Ability for Shift	Change the size or use of space (DCSF, 2010 dalam Robert Smith III et al., (2010)	
	Shift its rate, usage, or achievement (Douglas, 2006)	
	Deficient slender, further dramatic shifts (Leaman et al, 2004 in Robert Smith III et al., (2010)	
	Subsequent alteration (OECD, 1976 in Robert Smith III et al., (2010)	
	Modified, relocated (CSA, 2006 dalam Robert Smith III et al., (2010)	
Ability to remain"fit" for purpose	Degraded in mismatched midst the building and its occupants (Friedman, A., 2002).	
Worth	To make maximal usage (Graham, 2005),	
	Adapting the context of reuse and the will of the interested parties (Engel, Avner and Browning, Tyson R, 2008)	
	Minimum cost (Blue mountain, 2005 dalam Robert Smith III et al., (2010)	
Time	Rapidity of shift	Fast changes. (Juneja et al. 2007),
		Counter quickly (Kronenburg, D.,2007),
	Past the process of life	Prospective shift (Gorgolewski, 2005),
		Implemented in the long term (DCSF in Schmidt et al., 2010)
		Extenxion of use (Hashemian, 2005 dalam Schmidt et al., 2010)

Source: Adapted from Robert Smith III et al., (2010)

Based on these characteristics, adaptability is a proficiency to effectively provide changing contexts in its involving context, thereby maximizing the value of the building over the life of the building (Schmidt, 2009). These conditions include an improvement in the number of households, revenue, and changes in technique and the environment. The capability to reach this is a deliberate work to make homes that meet the requirement of current residents as well as their future needs in a sustainable manner at an affordable price (Friedman, 1997).

1. Convertibility: allows for shifts in the usage, economically, legally, and technically.
2. Dismantlability: can be disassembled safely, efficiently, and quickly - partially or entirely.

3. Disagreeability: materials and building elements of any demolished building should be wearable or reprocessed (e.g., recycled) as much as possible.
4. Expandability: allow an increase in volume or proficiency (which can later be achieved by including additional floors in the building, which do not increase the volume)
5. Flexibility: allows small space planning changes to reconfigure the layout and make it more efficient.

Adaptation Triggers

The cycle of maintenance, repair, and adaptation of buildings mainly depends on several factors (Douglas, 2006):

a. The purpose or function of the building (e.g. agricultural buildings generally have a lower standard of construction than residential buildings)
b. Quality of the building (e.g. condition and architectural importance)
c. The use, misuse and abuse of the building is subject to.
d. Legal requirements, particularly those relating to health and safety.
e. User/owner's requirements and expectations.

The utilization of each building varies because no two buildings have precisely the same utilization pattern. Nevertheless, in the end, the building will experience obsolescence and damage for a certain period (Douglas, 2006). Obsolescence is the process by which an asset goes out of use or is no longer helpful. Obsolescence determines the adaptation or demolition time of the building. (Douglas, 2006). The condition of obsolescence of buildings is based on the level of building utilization relative to the population of similar buildings in the neighborhood as a whole (Nutt et al., 1976; Douglas, 2006). 6 (six) types of obsolescence of buildings include Economics, Functions, Physical, Social, Legal, Policy, Aesthetics including Architecture (Douglas, 2006).

Redundancy means 'surplus for requirements' mainly determined by demand. The indices of obsolescence and redundancy may be pretty distinct, but the effect is similar; buildings become completely unused (Douglas, 2006). In addition, damage to buildings has important implications for building adaptation. The deterioration hypothesis states that the circumstances of the building lean to deteriorate with time if left ownerless. The decrease in the value of a building usually goes hand in hand with obsolescence. However, obsolescence is deficient foreseeable, and more complicated to supervise than damage, despite building adaptations. Building adaptations will always be needed to combat damage and obsolescence. Damage is avertable as the growing old process (Douglas, 2006). Damage is primarily a purpose of time and use but can be handled to some degree through keeping and adaptation (Ashworth, 1999 in Douglas, 2006). Failure to existing buildings is associated with one of the leading causes: humidity levels, biological decay processes, and movement (Addleson and Rice, 1992; Douglas, 2006).

METHOD

This study uses a qualitative descriptive method with a literature review method with a comparison-content analysis as an empirical method used in this research. This research is done by reviewing several literature sources from scientific journals related to adaptability research. This study reviewed 30 papers that published adaptability studies between 1989 and 2020. This study's purpose is to establish the research scope discussion on the topic of adaptability that has been carried out. The method of analysis is by mapping the research literature with the topic of adaptability. Mapping is done by comparing the substance of the research based on the research focus, objectives, and adaptability of research objects.

DISCUSSION
Findings and discussion

Adaptability Related Research

Many researchers have researched adaptability, and the results have been published in many journals. The results of mapping the literature on research on the topic of adaptability exist. Based on the research focus, research objectives, and adaptability, research objects carried out:

Table 1. Researches with the Topic of Adaptability

Researcher	Research purposes	Topic/ Focus	Object of research
1. Adaptability in City Context (Macro)			
Chen, C., Xu, L., Zhao, D., Xu, T., Lei, P., (2020)	Develop an urban resilience model by in view of adaptability, resilience, and restoration as the prime attribute factors of urban resilience.	Adaptability, resilience, and recovery are the main factors of urban resilience.	Disaster characteristics, disaster relief capability, resilience characteristics, urban system function.
Li, F., Uthes, S., Yang, X., Lai, YP., Gao, NN., (2019)	Build a two-dimensional adaptation-exigency circumstances model for cities countered to climate change to assess citing adaptation capacities to climate change.	The Urgency-Adaptability situation model	A model for evaluating the city's adaptability.
Baum, S., Horton, S., Choy, DL, Gleeson, B., (2009)	Investigate adaptation policies at the urban form and organizational level.	Climate change, Health Impacts and Urban Adaptability	Socio-spatial city.
Kadakia, Saloni H., (2004)	Analysing how architects apply traditional elements in their designs in a modern language that can be adopted in order to establish identity and relate to buildings under construction in Mumbai City.	City adaptability	Traditional Indian Architecture
2. Adaptability in Regional Context (Messo)			
Motealleh, P., Zolfaghari, M., Parsaee, M., (2018)	Exploring climate solvents and their benefit as ideas to be developed and used in currrently architecture to achieve sustainability.	Climate responsive solvents on vernacular architecture.	Characteristics of "Climatic design" Vernacular architecture in Bushehr City.
Zeng, Z., Li, L., Pang, Y. (2017)	Studying the affect of the spatial layout of the traditional village on wind conditions and the suitability of the spatial layout of the traditional village of Lingnan with the regional climate.	Adapt the layout of the traditional Lingnan village to environmental factors, especially the local climate and try to gather experience in outdoor activities.	The layout characteristics of Majiang Long village.
Ferrante, A., Mochi, G., Gulli, R., Cattani, E., (2011)	Studying the possible evolution of these buildings in urban areas, how residents will take over architectural roles in the future and will be able to transform their homes.	Adaptability and flexibility for urban renewal and typological recalification.	Residential typology
Kostourou, F., Psarra, S., (2017)	To understand how the three elements (Urban form, buildings, plots and street) adapt over time and which morphological characteristics determine their capacity to adapt, a property that can contribute to greater socio-spatial sustainability in the built environment.	Space configuration-Morphological shifts and their effect on solidity in low-rise mass housing .	Urban form, buildings, plots and street.
Ischak, M., Setioko, B., Nurgandarum, D., (2017)	Comprehend the socio-spatial idea of enclave native settlements as a form of adaptation to the pressures of the planned new settlements.	Environmental spatial system as a form of resilience of indigenous settlements in facing the pressure of new planned settlements.	Enclave native suburb settlement arrangement.
3. Adaptability in Building Context (Micro)			

3a. Adaptability to non-residential buildings			
Saghafi, MD., Ahmadi, M., (2011)	Studying the character of adjustable architecture in delaying destruction trends to upgrade the beneficial exixtence of buildings in Iran.	Adaptable architecture, economic probability and energy-environmental deliberations as key factors justifying adaptability.	Feasibility of Adaptable Architecture in Iran : Economic feasibility, Energy and environmental considerations
Hory, G., Major, Z., Mullner P., Benko, M., (2017)	Exploring spatial design problems at a backpacker hostel in the historic centre of Budapest.	Spatial Design Issues : Informality, density and adaptability.	Probationary building for dorm rooms as a response to spatial design problems.
Indrawan, IA., Faqih, M., Purnomo, H., (2012)	Establishing hospital building architectural design criteria that emphasize the need for handling changes that occur in it.	Flexibility and adaptability in hospital architecture.	Selected hospital plans.
Hudec, M., Rollova, L., (2016)	Finding adaptive sports facility design recommendations	Adaptability of sports facilities.	Common elements in sports facility architecture
3b. Adaptability in residential buildings			
Dwelling/ Residential in Rural Settlement			
Juan, X. et al, (2019)	Get a summary of the benefit and harm of the response of the physical environment of the dwelling to climate characteristics.	Comparing and simulating the thermal, luminous and ventilated indoor environments in summer and winter between two typical dwellings built with bricks and earth, respectively.	Characteristics of traditional dwellings and two typical dwellings built of brick and earth.
Lodl, KA. Combs, ER., (1989)	1. Identification of housing adjustment in rural households housing. 2. Explore factors related to housing adjustment resolutions. 3. Finding distinctions in complacency as a result of the housing adjustment decisions made.	To achieve great housing through the human life cycle, often individuals and families need to participate in some shape of housing adjustment behavior.	Characteristics of rural housing and housing satisfaction levels, types of housing adjustment decisions.
Piya, L., Maharjan, KL., Joshi, NP., (2012)	Micro-level argument of imprescriptible adaptive capacity and continual adaptation praxis based on information received thru direct interaction with Chepangs at the housewifery level.	Adaptive capacity and ongoing adaptation practices in Nepal.	Chepang Households in Rural Mid-Hills of Nepal
Dwelling / Residential in Urban Settlements			
Altas and Ovdoy (1998)	Focus on evaluating "dwelling space" in terms of occupancy satisfaction for its residents.	1. Occupancy satisfaction variable. 2. Adaptability and flexibility of space	4 (four) two-bedroom apartment units with different floor plans and physical attributes.
Agyefi-Mensah,S., (2013)	Explores the use of 6 (six) cases of general apartment design solutions in Cape Coast by 111 occupying households and evaluates how these are supported by space design attributes.	This research is designed as an ex-poste product evaluation study based on the Longevity Argument.	6 (six) public apartment buildings in Ghana.

Femenias, O., Geromel, F., (2019)	Contribute to an understanding of how residential layout designs can facilitate their adaptability over time.	Room composition - Two facets of adaptability were based to quantitative analysis based on spatial syntax presuming the random or polyvalence of space and physical factors of the floor plan.	313 modern apartment units that have been rearranged by the owners.
Huuhka, S., Saarimaa, S., (2018)	Examines how large-scale residential plans can be adapted to generate variations in flat sizes that currently do not exist.	Focusing on the lack of variation in the composition of space in the size of the dwelling as a factor of residential segregation.	Dwelling size, the building layout of mass housing built between the 1960s and 1970s in Finland.
Estaji, H., (2018)	Explores the role of flexibility and adaptability in the demolition process of traditional houses in the region.	Composition of space, Flexibility and Adaptability	Fourteen traditional houses in Sabzevar are listed in Iran's national heritage list..
Barada, W.P., Mutiari, D.,(2013)	Find a comparison of the level of space performance in the proposed design of flats that adopt the form of a village alley and compare it with the design of conventional flats which are the standard for government flats.	Space configuration – a comparison between the design of conventional flats and the shape of the village alley	Flats that adopt the form of village alleys and conventional flats.
Permana, AY., Wijaya, K., (2019)	Analyzing the configuration of space in student dormitory rooms in Bandung.	Space configuration analysis through calculation of total depth, mean depth and RA as well as descriptive analysis with the parameters of connectivity, integrity, inteligibility and axial line design of the existing cottage.	Student dormitory space in the Balubur-Tamansari Animal Park Area, Bandung.
Choudhary P., Adane V., Joglekar V., (2013)	To comprehend the discrepency in user selections of occupants in two selected locations in the developing city of Nagpur, India by studying the relation midst spatial cognition and spatial configuration.	Room configuration – to understand different user preferences in different locations	User preferences of residents in two specific areas of Nagpur.
Montellano, (2015)	Assessing the legality of uncertainty as an architectural reaction to social shift in Spain.	Layout/composition of space –*The indeterminate housing layout, flexible housing design.*	Diagrams and plan drawings showing the use of the Casa de Las Flores Apartments.
Manum, (2006)	1. Assessing the development of apartment layouts that were built from the 1930s to the early 1980s. 2. Examine different apartment layouts as residences for contemporary living.	Space configuration – development of apartment design.	150 apartments built in Oslo from the 1930s to the early 1980s.
Manum, (2009)	Assess the potential use of the dwelling.	Space configuration - link to the potential use of the apartment.	Norwegian apartments with different floor plans.

Lempoy, J., O., Waani, J.,O., Warouw, F., (2017)	Get a description of the adaptation of river settlements and building typologies that are adaptive to flood risk in Tubir Village, Manado City.	Typology of Adaptive Buildings to flood risk.	Dwelling in river settlements in Tubir Village, Manado City
Parliana, D., (2010)	To examine how the adaptation of the shape of the building occurs in the curved and sloping arterial road corridors, as a result of the construction of new arterial roads.	Adaptation of the form and function of residential buildings.	Residential areas in Samoja and Cibangkong villages affected by the construction of new arterial roads.
Mintiea, T., Pigawati, B., (2018)	To verify the relation midst forms of adaptation and aspects of the physical attributes of the environment.	The form of adaptation is related to aspects of the physical characteristics of the environment.	Occupancy in the Coastal Settlement Suburbs of Semarang City.

Source: Author Analysis, 2022

Scope of Adaptability Research

Analysis of research data described in the table above shows that research on adaptability can be categorized based on the scope of the research area, as follows:

1. Research with the scope of the study area on a macro scale, namely in research Kadakia and Saloni (2004); Baum et al. (2009); Li et al. (2019); Chen, et al. (2020).
2. Research with the scope of the study area on the meso scale of the research area Ferrante et al. (2011); Zeng et al. (2017); Motealleh et al. (2018); Kostourou dan Psarra (2017); Ischak et al. (2017).
3. Research with the scope of the study area on a micro scale (residential/non-residential buildings) in research Saghafi and Ahmadi (2011); Indrawan et al. (2012); Hudec and Rollova (2016); Hory et al.(2017); Juan et al, (2019); Piya et al. (2012); Lodl and Combs (1989); Mintiea dan Pigawati (2018); Parliana (2010); Lempoy, et al. (2017); Altas and Ovdoy (1998) Agyefi-Mensah (2013); Femenias and Geromel (2019); Estaji (2018); Huuhka and Saarimaa (2018); Montellano (2015); Barada and Mutiari (2013); Permana dan Wijaya (2019); Choudhary et al. (2013); Manum (2006, 2009)

In addition, the above studies can be categorized based on the typology of the building under study (subject of research), as follows::

1. Research with the building typology under study (subject of research) is non-residential, namely research Saghafi and Ahmadi (2011); Indrawan et al. (2012); Hudec and Rollova (2016); Hory et al. (2017).
2. Research with the typology of the building under study (subject of research) is residential and the surrounding environment (dwelling and neighborhood), namely Juan et al, (2019); Piya et al. (2012); Lodl and Combs (1989); Mintiea dan Pigawati (2018); Parliana (2010); Lempoy, et al. (2017); Altas and Ovdoy (1998) Agyefi-Mensah (2013); Femenias and Geromel (2019); Estaji (2018); Huuhka and Saarimaa (2018); Montellano (2015); Barada and Mutiari (2013); Permana dan Wijaya (2019); Choudhary et al. (2013); Manum (2006, 2009).

Based on the study of adaptability research discussed in the table above, categorization can be arranged based on the research locus:

1. Research with the locus of Rural Settlements, namely research Juan et al, (2019); Piya et al. (2012); Lodl and Combs (1989).
2. Research with the locus of Urban Settlements, namely research Mintiea dan Pigawati (2018); Parliana (2010); Lempoy, et al. (2017); Altas and Ovdoy (1998) Agyefi-Mensah (2013); Femenias and Geromel (2019); Estaji (2018); Huuhka and Saarimaa (2018); Montellano (2015); Barada and Mutiari (2013); Permana dan Wijaya (2019); Choudhary et al. (2013); Manum (2006, 2009).

Research with the locus of urban settlements has several research topics, namely research on the level of satisfaction of users of urban settlement housing conducted by Altas and Ovdoy (1998); Agyefi-Mensah (2013).

Research on space layout or composition was conducted by Femenias and Geromel (2019), Estaji (2018), Huuhka and Saarimaa(2018), Montellano (2015). In addition, research related to the configuration of residential space by Barada and Mutiari (2013); Permana and Wijaya (2019); Choudhary et al. (2013); Manum (2006, 2009).

From the research conducted, it can also be found that there is a gap in adaptability research. This research gap creates opportunities for further research on adaptability. Further research on the phenomenon of housing adaptation can be continued with studies that occur in other urban areas as well as urban fringe areas and rural areas. Studies on the adaptation of buildings can be developed in location settings with different characteristics, such as housing in coastal settlements or settlements in highland settlements so that they can develop a residential environment that leads to sustainable development by considering the local characteristics of the local community.

Research in the research area of the Adaptability Research Cluster is below:

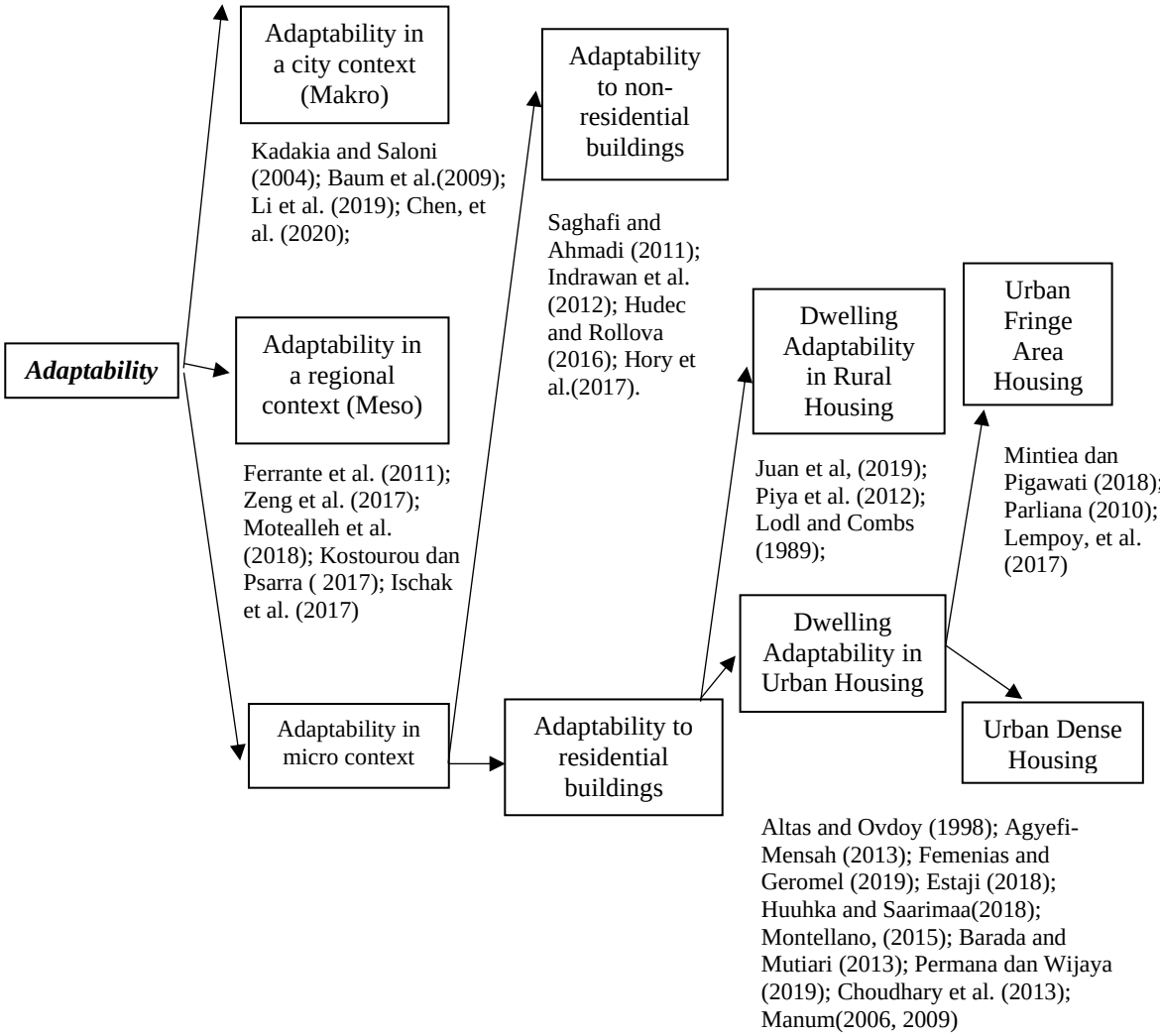

Figure 1. Scope of Research Discussion in the Adaptability Research Cluster
Source: Author Analysis, 2022.

CONCLUSION

According to the discussion in the research above, it can be resumed that the scope of discussion in adaptability research includes:

(1) Research on adaptability can be categorized based on the scope of the research area, as follows:
   a. Research the scope of the study area on a macro scale.
   b. Research the scope of the study area on a regional scale.
   c. Research the scope of the study area on a micro-scale (residential/non-residential buildings).

(2) Research on adaptability can be categorized based on the type of building being studied (subject of research), as follows:
   a. Research with the building typology under study (subject of research) is non-residential.
   b. Research with the typology of the building under study (subject of research) is residential and the surrounding environment (dwelling and neighborhood).

(3) Research on adaptability can be categorized based on the research locus:
   a. Research with the locus of Rural Settlements.
   b. Research with the locus of Urban Settlements.

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References

Agyefi-Mensah, S. *Functionality and adaptability of design solutions for public appartment buildings in Ghana: Towards evidence -based design for sustainable lifespan building performance.* Eidhovem: Technische Universiteit Eidhoven. 2013. https://doi.org/10/6100/IR762203

Altas and Ovdoy. "Spatial Adaptability and Flexibility as Parameter of user satisfaction for Quality Housing." *Building and Environment*, Vol.33, No.5 pp. 315-323, 1998.

Ball, R.M. "Reuse Potential and Vacant Industrial Premises: Revsisiting The Generation Issue in Stoke on Trent." *Journal of Property Research*, 19,93-110. 2002.

Barada, W.P., Mutiari, D. "Analisis Space Syntax Rumah Susun Berbasis Gang Kampung." *Simposium Nasional* RAPI XII 2013 FT UMS, ISSN 1412-9612.

Baum, S., Horton, S., Choy, DL, Gleeson, B. *Climate Change, Health Impacts and Urban Adaptability: Case Study of Gold Coast City*, Urban Research Program, Griffith University, Brisbane. 2009.

Berry, John, W. *Cultural Ecology and Individual Behavior in Altman, Irvin, Wohwill, Joachim*, Rapoport (Eds.), *Human Environmental and Behavior Advances in Theory and Research* Volume 4. Pergamon Press, New York. 1980.

Bullen, P.A. "Adaptive Reuse And Sustainability of Comercial Buildings." *Facilities*, 25(1-2), 2007: 20-31.

Chase-Dunn, Christopher dan Babones, S.J. *Global Social Change: Historical and Comparative Perspectives*, Baltimore – Maryland: The Johns Hopkins University Press. 2006.

Chen, C., Xu, L., Zhao, D., Xu, T., Lei, P. "A New Model for Describing The Urban Resilience." *Safety Science Journal* 128 (2020) 104756.

Choudhary P., Adane V., Joglekar V. "Spatial configurations and user preferences: Built environments in urban India." *Internasional journal of Scientific and Research Publications*, Volume 3, Issue 8, August 2013.

Cooper, I. "Post occupancy evaluation: Where are you?" *Building Research and Information*, 29(2), 2001: 156-163.

Douglas, J. *Building Adaptation* (2nd edition), London: Elsevier. 2006.

Engel, Avner and Browning, Tyson R. "Designing systems for Adaptability by means of Architecture options." *System Engineering*, 11 (2), 2008:125-146.

Estaji H. "A Review of Flexibility and Adaptability in Housing design." *International Journal of Contemporary*

Architecture "*The New ARCH",* Vol 4No.2(2017), 37-49.

Ferenias, O., Geromel, F. "Adaptable Housing? A Quantitatif Study of Contemporary Apartment Layouts that Have Been Rearranged by End-Users." *Journal of Housing and Built Environment*, 2019. https://doi.org/10/1007/s10901-019-09693-9

Ferrante, A., Mochi, G., Gulli, R., Cattani, E. "Retrofitting and Adaptability in Urban Areas." *Procedia Engineering* 21(2011) 795-804.

Friedman, A. *The Adaptable House: Designing Homes for Change*, New York: Mc Graw-hill. 2002.

Geiser, S. "Open building in Health Care Architecture: The Case of the INO Project in Bern, Switzerland." *Open House Internasional*, 30(1), 2005: 13-21.

Gorgolewski, Mark. "Understanding How Buildings Envolve." *The 2005 World Sustainable Building Conference Tokyo*, 2005: 27-29.

Hory, G., Major, Z., Mullner P., Benko, M. "Exploration of Spatial Design Issues at Backpacker Hostels in Budapest's Historic Center: Informality, Density And Adaptability." *Frontiers of Architecture Research* (2017) 6, 157-168.

Hudec, M., Rollova, L. "Adaptability in the Architecture of Sport Facilities." *Procedia Engineering* 161, 2016: 1393-1397

Huuhka,S., Saarimaa, S. "Adaptability of Mass Housing: Size Modification of flat as a response to segregation." *Internasional Journal of Building Pathology and Adaptation*, 36(4), 2018: 408-426. https://doi.org/10.1108/IJBPA-01-2018-0011.

Indrawan, IA., Faqih, M., Purnomo, H. "Title Flexibility and Adaptability as Architectural Approach in Designing Hospital." *Journal Basic Appl. Sci. Res.*, 2(9)8990-8994, 2012.

Ischak, M., Setioko, B., Nurgandarum, D. "Socio Spatial Adaptation as a Resilience From of Native Unplanned Settlement in Confrontation With New Planned Settlement Development Pressure (Case Study: Enclave Native Settlement in Serpong, Tangerang)." *IOP Conf. Series: Earth and Environmental Sciences* 99(2017) 012009.

Juan, X. et al. "The Comparative study on the climate adaptability based on indoor physical environment of traditional dwelling in Qinba Mountainous areas, China." *Energy and Building* 197 (2019) 140-155.

Juneja, P and Roper, KO. *Valuation of Adaptable-workspace over static-workspace for knowledge organizations in Construction an Building Research Conference of the Royal institution of Chartered surveyors*, Georgia Tech, Atlanta USA, 2007

Kadakia, Saloni H. (). *Tradisional Indian Architecture and its Adaptability to Mumbai City*, UNLV Retrospective Theses and Dissertations, 1709. 2004.

Kostourou, F., Psarra, S. "Formal Adaptability: A Discussion of morphological Changes and their Impact on Density in Low- Rise Mass Housing." *Proceedings of the 11th Space Syntax Symposium*. 2017

Kronenburg, D. *Flexible : Architecture that Responds to Change*, Laurence King Publishers. 2007.

Lempoy, O.J., Waani, J.O., Warouw, F. "Adaptasi Permukiman Sungai di Kampung Tubir Kota Manado terhadap Risiko Banjir." *Jurnal Arsitektur DASENG Universitas Sam Ratulangi Manado*, Vol. 6, No.1 (2017).

Li, F., Uthes, S., Yang, X., Lai, YP., Gao, NN. "Validating the usefullness and calibration of a two- dimensional situation model of urgency-adaptability for cities responding to climate change- Taking Shenzhen as case study.", ACEER 2019, *IOP Conference Series: Earth and Environmental Science* 351(2019) 012025.

Lodl, KA. Combs, ER. "Housing Adjustments of Rural Households: Decisions and Consequences." *Housing and Society*, Volume 16, Number 3, 1989.

Manum, B. "The Advantage of Generality." *In Proceedings of the seventh international space syntax symposium, 2009, Citeseer*.

Manum, B. *Apartment Layouts and Domestik life: The Interior Space and Its Usability: A Study of Norwegian Apartments built in the period 1930-2005*. Diss. The Oslo School of Architecture and Design. 2006.

Mintiea, T., Pigawati, B. "Hubungan Karakteristik Permukiman Dengan Bentuk Adaptasi Masyarakat Terhadap Rob di Pesisir Kota Semarang." *Jurnal Pembangunan Wilayah dan Kota* 14(3): 199, Oktober 2018. DOI: 10.14710/pwk.v14i3.20259.

Montellano, A., S. "Housing flexibility by spatial indeterminacy: The case of the Casa de las Flores in Madrid." *International*

Journal of Architectural Research, Archnet-IJAR, Volume 9- Issue 2, July 2015 (04-19)

Motealleh, P., Zolfaghari, M., Parsaee, M. "Investigating Climate Responsive Solutions in Vernacular Architecture of Bushehr City." *Housing and Building National Research Center (HBRC) Journal* (2018)14, 215-223.

Parliana, D. "Adaptasi Bentuk dan Fungsi Secara Pragmatis pada Hunian Kampung." *Jurnal Rekayasa, Intitut Teknologi Nasional, LPPM Itenas*, No.1, Vol. XIV, Januari-Maret 2010.

Permana, A., Y., Wijaya, K. "Analisis Konfigurasi Ruang Pondokan Mahasiswa di Kawasan taman Hewan Balubur-Tamansari, Bandung." *Arcade Jurnal Arsitektur* e- ISSN: 2597-3746 (2019).

Piya, L., Maharjan, KL., Joshi, NP. "Comparison of Adaptive Capacity and Adaptation Practices in Response to Climate Change and Extremes among the Chepang Households in Rural Mid-Hills of Nepal." *Journal of International Development and Cooperation*, Vol.18, No. 4, 2012, pp. 55-75.

Rury, John, L. *Education and Social Change: Themes in The History of American Schooling*, Lawrence Erlbaum Associates, Inc., Publishers 10 Industrial Avenue Mahwah, New Jersey, 2004.

Russell, P., Moffatt, S. *Assessing the Adaptability of Buildings, in Annex 31*, Energy- Related Environmental Impact of Buildings. 2001, IEA Annex.

Saghafi, M.D., Aahmadi, M. "A Study of Adaptable Architecture pertinence in Iran." 2011 *Internasional Conference on Green Buildings and Sustainable Cities, Procedia Engineering* 21 (2011)656-665.

Schmidt III, Robert, et al. *Adaptable Futures: A 21st Century Challenge in Changing Roles* - New Roles, New Challenges, Noordwijk A. 2009.

Schmidt III, Robert., Austin, S., Brown, D. "Designing Adaptable Buildings." *Harnessing the Power of Information*, Oct. 12-13, 2010.

Wilkinson, S.J. *Sustainable Building Adaptation: Innovations in Decision-Making*, First Edition, John Wiley & Sons, Ltd. Published 2014 by John Wiley and Son, Ltd.

Zeng, Z., Li, L., Pang, Y. "Analysis on Climate Adaptability of Traditional Villages in Lingnan, China-world Cultural Heritage Site of Majianglong Villages as example." *Procedia Engineering* 205 (2017) 2011-2018.