

Design Adaptations in the Bathrooms for the Elderly Living in the Suburbs

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The suitability of the bathroom design for the user, in this context, elderly people (elderly) is urgent. This urgency exists because a degenerative process has occurred, a decline in the quality of the elderly's body, and the elderly population continues to increase significantly. This study aims to find out the bathroom design approach model suitable for the elderly who live in the suburbs. By using practice-based research, this study has developed a conceptual bathroom design for the elderly who live in suburban areas and concludes that adaptive design is a suitable strategy to implement this design. In the future, this adaptive design strategy can also be applied to create various other spaces in homes for the elderly who live in the same or similar living environment.

Keywords: design adaptation, bathroom, elderly, suburban

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INTRODUCTION

The increase in the number of elderly people globally clearly has implications for their living environment. One part of this environment is the bathroom. There are three reasons why bathrooms for the elderly living in the suburbs are important to study. Firstly, humans and especially the elderly, often use the bathroom 6-8 times per day. Secondly, the elderly have decreased physical body functions, so the bathroom must accommodate changing conditions and these new needs and must remain safe and comfortable when used by the elderly. And thirdly, the social, economic, and cultural context of the elderly living in the suburbs is an additional variable that must be considered when designing their bathroom. The socio-economic context, such as family conditions and daily income, has consequences for the bathroom design approach for the elderly in the area. Those are three things that encourage the importance of this research to be carried out.

Previous research has shown that the elderly and their living facilities, such as bathrooms, are the focus of study by some experts. Half a century ago, Kira (Kira, 1976) stated that the bathroom is an important space, but its design is often neglected. Meanwhile, related to bathrooms for the elderly, Shrawan ([Shrawan, 2008](#)) and Boge ([Boge, Callewaert, & Petersen, 2019](#)) said that changes in the physical body of the elderly require the presence of equipment that pays attention to safety and security factors when doing activities in the bathroom. In addition to that, Susenas, in 2020, stated that the number of elderly people continues to rise, which has a real impact on several aspects of society, especially in the provision of daily living facilities for the elderly. Factors that reduce the physical ability of the elderly affect all products, not only large rooms or products, but also small tools or objects, such as railings or applications on mobile phones, which also need to be adjusted to the real needs of the elderly ([Wiryan, Syarief, & Murwonugroho, 2022](#)). Therefore a study on bathroom design for the elderly is appropriate to be conducted now.

This study aims to find design strategies that can be applied to address the bathroom problems of the elderly who live in suburban areas. Changes in the elderly, both physical and non-physical, have consequences for changes in the needs and specifications of their bathroom designs. For example, decreased reflex power requires a rougher floor texture so it doesn't slip easily. In addition to

aspects of the elderly themselves, the design, in this case, must pay attention to the socio-cultural context of the user group, namely the elderly living on the city's outskirts. In the past, most of the elderly in this area worked as farmers or traders, so currently, they do not get a pension from their past work, and social security from the government is also small. Therefore the proposed bathroom design needs to take an appropriate approach both to the aspects of the physical changes in the elderly as well as to their social, economic, and cultural context.

The argument underlying this research is that a design is said to be successful if it can accurately answer the problems faced by the user group. For this reason, a certain strategy is needed. The strategy here is understood as certain ways that designers apply to achieve the goals that have been set and primarily to meet user needs. Design decisions are often taken not solely on functional and aesthetic considerations but also on the user's social, economic, and cultural factors. This tug of war between several factors is what designers consider in choosing their design approach. A successful approach is one that can place design choices according to the needs and in harmony with the socio-cultural context of the user.

LITERATURE REVIEW

ADAPTIVE DESIGN

The definition of an adaptive architectural approach is the capacity of buildings and humans to adapt and or other aspects that support dynamic interactions between buildings and their community contexts (Robert Schmidt, 2009). Other experts stated that adaptive design is an intervention that can unite with the environment (Widharto, SD. et al., 2015). Adaptive architecture is a building specifically designed to adapt to the environment, its inhabitants, or the objects contained therein (Schbnadelbach, 2010). Meanwhile, Konieczna ([Konieczna, 2018](#)) stated that this is related to adapting to spatial and functional changes and implementing new technology without disturbing the environment and human life. Furthermore, in architectural interiors, adaptive reuse is briefly interpreted as a design-based intervention with the aim of bringing new life to a building, which is neglected, and for various reasons, the building is considered more valuable than being destroyed (Lanz, F., 2018). Adaptive reuse is not meant for mere preservation but for the reuse of existing buildings for conversion to new buildings, which will have their own character (Davies and Begg, 2010).

Koneczna (2018) stated that adaptive architecture is divided into six levels: flexible, active, dynamic, interactive, intelligent, and smart. Almost the same division was conveyed by Wardana: adaptive architectural design strategies have six types that can be applied. The six are available, flexible, refitable, scalable, movable, and reusable. (Wardana, AW, et al, 2019). In architecture, adaptive design can be understood as a design that can adapt. The design pays attention to the surrounding environment by equipping itself with several kinds of items in that space. Efforts like this include integrating flexible, interactive, and responsive objects by utilizing architectural elements ([Kronenburg, 2007](#)). Meanwhile, Widharto SD (2015) understood adaptive design as an intervention that integrates with the surrounding environment. Related to the interior, it is interesting to see the concept of adaptive reuse of interiors which consists of ensuring programs for new functions, required structural interventions, and space allocation (Cordan, 2014).

ELDERLY BATHROOM

The important value of the bathroom is to directly support the release of human defecation (urination and defecation). It is related to the value of human hygiene and health ([WHO, 2018](#)). Kira said that the bathroom is an important facility for human daily life, but its design could be better and needs experts' attention (Kira, 1976). Furthermore, regarding bathrooms for the elderly, there is a decrease in the condition of the elderly body in the physical part, namely in terms of muscle strength, movement speed, flexibility, posture & balance, and locomotion ([Shrawan, 2008](#)). A study of safety/preventive devices stated that older people feel tired quickly because of decreased muscle strength, that the elderly will not be able to climb stairs as high as 30 cm without holding a handrail, and that they also have shoulder muscle weakness. Hence, they feel uncomfortable when they have to wash their hair (Kenny, 2005). Because the body is weak, the elderly often have accidents, such as falling. The frequency reaches 30-60% for those 65 years and over. These accidents can be fatal, such as injuries and even broken bones reaching 10-20% ([Sabatini, 2016](#)), ([Lord, Sherrington, & Naganathan, 2021](#)), ([WHO, 2018](#)), ([Swanenburg, de Bruin, Uebelhart, & Mulder, 2010](#)) and ([Rubenstein & Josephson, 2006](#)).

Boge's research ([Boge et al., 2019](#)) concluded that a bathroom for the elderly needs to have: a toilet that can be adjusted in height and low, a place for crutches and canes, a flushing mechanic, a soap dish,

and paper towels that are within reach from a sitting position, then a toilet which can be seen from the occupant's bed, good contrast, with multiple handles, adjustable sink and more than 70 cm between the toilet and the tub ([Boge et al., 2019](#)). Other disturbances are furniture that is not strong or easy to slide, improper placement, and stability ([Feldman & Chaudhury, 2008](#)); ([Gill, Williams, Robison, & Tinetti, 1999](#)). It was further said that the steps must be according to standards (width and height), handrails should be provided to maintain body balance and serve as directions, clear color contrast, with anti-slip ends of the steps, and there is sufficient lighting (Technical Report 4, 2008). Chuangchai emphasized that the bathroom for the elderly needs to pay attention to its location so that it is not too far from the bedroom, the floor material is not slippery, and there are benches and railings in the bathroom. Additional advice is that the floor does not use steps as well as good spatial lighting, including strong light, the direction of light, color contrast, and not dazzling ([Chuangchai, 2017](#))

SURROUNDING AREA AND ELDERLY CITIZENS

A brief definition states that a sub-urban area is an area close to the city or a separate area but within reach of commuters within the city ([Hemakumara & Rainis, 2015](#)). The term sub-urban is often referred to as *kampung* on the city's outskirts, and this term has many definitions and meanings. The term *kampung-kota* describes the conditions of residential areas in the suburbs, but this term can also be used for lower-class residential areas in the middle of the city. The understanding of *kampung-kota* in Indonesia is closely related to the historiographical context of settlements during the Dutch era, namely areas that functioned as settlements for indigenous people. In fact, some definitions actually conceptualize the village as a place for old-fashioned, *udik*, and a place for marginalized people to live. Even so, in the context of the village, it contains an attitude and space for modesty, simplicity, and innocence (Rendy; Dini Wulansari; Berlian Zarina, 2019).

In Indonesia, the process of sub-urbanization is mostly carried out by lower-class communities. Suburban area expansion is marked by the distribution of residential houses on agricultural land and massive land use changes ([Wagistina, Suman, Antariksa, & Yanuwidi, 2017](#)). Another study stated that the development of suburban areas had had several effects on land conversion. The existing agricultural areas were then turned into offices, residential and industrial, or other non-

agricultural functions. This conversion of agricultural land has had an impact on the economic and social life of the farmers. There was a change in the population's occupation from the agricultural sector to industry or trade, leading to changes in the perspective and ability to carry out social activities. The characteristics of the community as a communal society have shifted, becoming more individual (Harianto, S., et al., 2018, and ([Sosiawan, 2020](#)). Meanwhile, research in developed countries stated that the elderly in the suburbs carry out fewer social activities when compared to fellow elderly living in cities (Baernholdt, N., et al., 2012).

METHOD

The elderly are a group that needs attention, given the significant growth in their number. In 2020, 9.78% of the total population was elderly (from 270 = 26.4 million people), it is projected that in 2035, it will be 15% (from 305 = 45.75 million people), and it will be 20% (from 319 = 63.8 million people) in 2045 (Susenas 2020). This condition signifies aging in Indonesian demography. The increase in the number of elderly people has led to an increase in the number of homes occupied by the elderly, which has complex consequences. The aging of the population, among other things, results in the incompatibility of the homes for the elderly and the facilities in them with the requirements and design needs. One of the facilities in the house is the bathroom. Previous research found that the bathroom is an area at home that is prone to accidents for the elderly. Namely, 30-60% of the elderly have experienced accidents in this area ([Sabatini, 2016](#)). Therefore, the bathroom for the elderly needs to be researched.

This study uses a problem-solving approach in order to reveal the difficulties faced by the elderly when using the bathroom, identify the needs of the elderly for the bathroom and its facilities, and reveal the real problems related to the bathroom for the elderly. Research has led to a conceptual design for a bathroom for the elderly living in a suburb. This interior and product creation research uses the Double Diamonds design method from the British Design Council (2005). In this method, two diamonds describe an iterative process: exploring broadly and in-depth problems (divergent) and then taking focused action (convergent). The process is carried out through 4 stages, namely Discovery, Define, Develop, and Deliver. In the final stage, namely delivery, in addition to producing an initial prototype, steps are formulated to carry out the recommended adaptive design strategy.

The object of research observation is the bathroom of the elderly group living on the outskirts of the city of Yogyakarta. Sources of research information: the first is the library of books and journals, and the second is field observations and interviews with the elderly. The research location was in Panggungharjo Village, Sewon District, Bantul Regency. The research population is all the elderly in the village and the bathrooms they use. The Panggungharjo sub-district has 14 *Padukuhan*, and the sampling method is purposive by taking samples in 3 *Padukuhan*. The sample was 24 elderly, namely local residents from the lower middle-class economy. Determination of the number of samples 24 considering that the population of research objects tends to be homogeneous when viewed from the economic, sociological, and cultural aspects.

Data collection was done through a literature study, followed by filling out checklists, interviews, and photographing and documenting images of the bathrooms in the research location. Interviews, observations, and shooting in the field were conducted on the 24 elderly respondents and their bathrooms. Interviews were used to find out how the elderly do activities in the bathroom, the difficulties they face, and what the needs or desires of the elderly are with the bathroom and its facilities. This section must be done correctly because design success in function and usability can only be achieved by correctly understanding user behavior ([Hendriyana, Nurhidayat, & Handayani, 2022](#)).

In the process of analysis, the first diamond reads quantitative data using simple statistics, followed by identifying patterns of activity and use of the bathroom by the elderly. In addition to activity and usage patterns, equipment and tools in the bathroom were also examined. Identification was carried out through photos of each respondent's bathroom. Furthermore, the analysis was carried out based on empathy for the physical condition of the elderly and continued by formulating the needs of the elderly to use the bathroom using interview data. After thoroughly understanding the existing situation and the user's needs, the first diamond ended with determining the case design issues. The second diamond's next stage was to compile design concepts and develop ideas. One of the best design alternatives was selected in the form of a simple prototype bathroom for elderly people who live on the outskirts of town. The final stage is to develop a design implementation strategy in the form of a sequence of design adaptation processes for the bathrooms of the elderly who live in the suburbs.

RESULT**Table 1.** Physical and non-physical conditions of the elderly

Parameter		Mark
Age	Mean	77.61
	Standard Deviation	9.23
Gender	Female	66.67 %
	Male	33.33 %
Marital status	Married	41.67 %
	Widow or Widower	50 %
	Not married	8.33 %
Health status	High blood pressure	41.67 %
	Stomach acid	16.67 %
	Asthma	16.67 %
	Back pain/ <i>boyok</i>	8.33 %
	Diabetes	8.33 %
	Stroke	4.17 %
	Healthy	20.83 %

Source: Triatmodjo, Suastwiwi., Dewi, RS, 2022

The survey results showed that the average age of the elderly was 77.61, with a standard deviation of 9.23. Respondents who participated in the study were 66% women and 34% men. Furthermore, the marital status showed that 41.67% of the respondents were still married, 50% were widowed or widowed, and 8.33% were not married. The next thing is about health status. It can be said that the most common disease suffered is high blood pressure, 20.8%, followed by gastric acid and asthma, each 16.6%, back pain, and diabetes, each of which is 8.3%, strokes and cannot walk of 4.1%, and those who are still healthy are 20.8%.

The data above shows that the average age of the elderly is high, and there is a tendency for this life expectancy to increase. When compared with life expectancy in DIY and Bantul Regency in 2021, the figure is 77.61 years which is still higher, 75.04 years (DIY) and 73.89 years for Bantul (BPS DIY - <https://yogyakarta.bps.go.id/indicator/26/317/1/>). With this figure, more than half are living alone, while those who are still living with their partners are 41.67%. Changes in decreased body condition are recorded through the typical diseases of the elderly that many suffer from. Concerning the illnesses suffered by the elderly at research

locations, it was shown that 80% of the elderly had internal diseases (high blood pressure, acid reflux, asthma, lower back pain, diabetes, and stroke), but only 4.17% actually had to lie in bed. While 20% of healthy elderly people are mostly under 70 and can help work on the farms. As for the tendency to get sick, it seems that the number of those who suffer from illness will increase as they age.

The data above shows that the elderly have a fairly high life expectancy, but on the other hand, almost all of these elderly suffer from chronic diseases. It cannot be denied that increasing age has become the cause of a decrease in the physical quality of the elderly and their ability to carry out activities optimally. As stated in the 2020 census report, the increase in the number of elderly people will affect many aspects of their lives, including providing facilities that can help them in their daily lives. These facilities would include bathrooms, bedrooms, and dining rooms at home. The current physical condition of the elderly is different from the condition before when they were young, resulting in different needs for living facilities. Thus, re-designing the facility, in this case, the bathroom, is important.



Figure 1. Three Elderly Respondents and Their Bathrooms
(Source: Triatmodjo, Suastwiwi., Dewi, RS, 2022)

Table 2. The current condition of bathrooms

Parameter		Mark
Home Status	Owned house	75 %
	Rented house	25 %
House quality Number of occupants of the house	0	16.67 %
	1-4	33.33 %
	>4	50 %
Number of bedrooms	0	16.67 %
	1-4	33.33 %
	>4	50 %
Number of bathrooms	1	58.33 %
	2	37.5 %
	>2	4.17 %
Bathroom types	Water tub	95.83 %
	Shower and water tub	4.17 %
Type toilet	Sit toilet	4.17 %
	Squat toilet	95.83 %
Bathroom location	Outside the bedroom	79.17 %
	Outside the main house	20.83 %
independence	Yes	83.33 %
	No	16.67 %

Source: Triatmodjo, Suastwiwi., Dewi, RS, 2022

The welfare of the elderly can be seen in the data about their homes. That 75% of respondents said the house they currently live in is their own house, most of them live with their extended family, namely their children and grandchildren, 33% with 1-4 family members, and 50% with more than 4 family members. Furthermore, it is said that in their homes, 75% have 2-4 bedrooms and 12.5% have more than 4 bedrooms. Then regarding bathrooms, 58.33% have 1, and 37.5% have 2 bathrooms. The location of the bathroom is 80% outside the bedroom and 20% outside the house. From the toilet type data, it can be stated that 95% use squat toilets, and only 5% use sitting toilets. In terms of independence of the elderly when using the bathroom: 83% are independent, and 17% need help from others.

From the data, it can be said that these elderly people live together in large families (nuclear family and nuclear family). Things like this are often found in households in Indonesia. It is common to see the elderly living with their children, in-laws, and grandchildren. Therefore, the house they live in has many rooms, namely two to four rooms, 30%, and those with more than 4 rooms, 50%. 60% of the big houses have 1 and 40% have 2 bathrooms located outside the bedrooms and even outside the main house. Furthermore, almost all of these bathrooms (95%) are equipped with water tub and squat toilets, only 5% of which use showers and sitting toilets. As for the location of the bathroom, none of it is attached to the bedroom, almost all, or 80% of it, is outside the bedroom, and there are even 20% of it which are outside the main house.

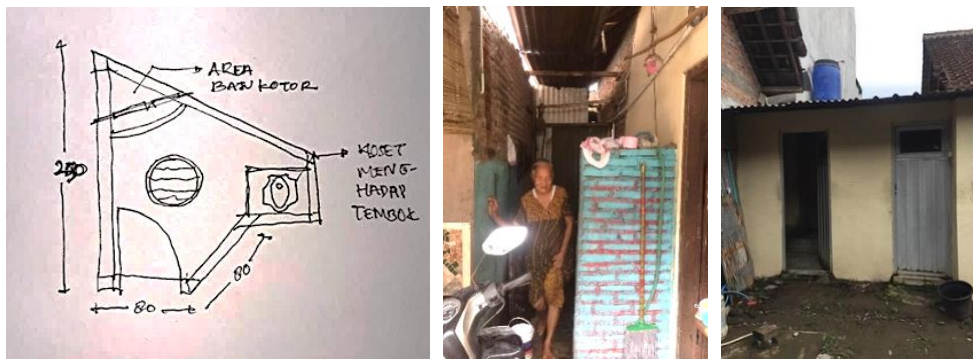


Figure 2. Layout, Situation, and Access to the Bathroom

(Source: Triatmodjo, Suastwiwi., Dewi, RS, 2022)

An additional explanation for the above data is that the bathroom in this house is shared by all or some of the family members. As is generally found in settlements on the outskirts of cities in Indonesia, the type of bathroom used is a water tub and a squat toilet. It is commonly known that cleaning the body uses a lot of water in Indonesian culture. Therefore, the bathroom floor is usually wet. Furthermore, the bathroom location, which is far from the bedroom, requires people to walk dozens of steps to reach it.

In the photos, it can be seen that the location of the bathroom is sometimes far behind the house, close to the well, and located at a corner, so it becomes rather difficult for the elderly to reach. The situation and conditions of the bathrooms found in the field, such as squat toilets, wet floors, and the bathroom location far from the bedroom, have created obstacles or difficulties for the elderly when using the bathroom in their home.

Table 3. Bathrooms and Supporting Equipment

No.	Observation items	Mark
1	Maintaining body stability	
	Railing	0
	Seat	0
2	Preventing falls	
	Carpet	4.17
	Lighting	37.5
	Contrast	37.5
	Level	87.5
	Objects scattered on the floor	33.33
3	Ease of movement	
	Sliding doors/curtains	29.16
	Room size	0
	Enough for a wheelchair	0
4	Ease of access/use	

	Place for soap, shampoo	62.5
	Water dipper	100
	Hangers	62.5
	Jet washer – faucet	0
	Shower	4.17

Source: Triatmodjo, Suastwiwi., Dewi, RS, 2022

The table above shows data regarding bathroom support equipment found in the field that is divided into 4 categories. The first category is equipment to maintain body stability of railings on the walls and bathroom seats that are unavailable (0%). The second category is bathroom fittings to prevent the elderly from falling while in the bathroom, 87.5% of the bathrooms use steps in the toilet or latrine area, while 95% of the floors are not covered with carpet or the floor material is not rough-textured. Light strength and color contrast in the room have the same value, 62.5%. There are objects scattered on the floor, 33.3%. In category 3, ease of movement, the data shows that the average bathroom size is between 0.70 m – 1.40 m wide while the length is between 1.00 m – 2.5 m. Bathroom door with cloth curtain of 29.16 %. In category 4, the availability of bathroom equipment that is easy to reach, soap dispensers, and clothes hangers can be found in 62.5% of bathrooms. Water dippers can be found in 100% of the bathrooms. Jet washers are 0%, whereas showers use only 5% of bathrooms.

Data on equipment to maintain body stability is in poor condition. The unavailability of railings on the

walls and seats in the bathroom is 0%. No bathroom provides this important tool. In the second category, the condition is still relatively bad. Namely, 87.5% of the bathrooms use steps, especially in the toilet or latrine area, while the floor is not covered with carpet or the floor material is not rough-textured. For lighting and color contrast in the room, 62.5% of bathrooms have bad and dimmed lighting. Most bathrooms do not have the equipment to prevent the elderly from falling. This condition can worsen because, in 33.3% of the bathrooms, objects are scattered on the floor, such as small buckets, dippers, water hoses, bathroom brushes, and other toiletries. While the category of ease of movement is also poor, the size of the bathroom is small, with a position that is often angled, so there is no access to wheelchairs. The use of a door with a type of cloth curtain provides convenience for the elderly, but the privacy side is lacking. In the category of availability of toiletries that are easily accessible to the elderly, all bathrooms have diapers. Most have clothes hangers and soap dispensers 62.5%, but their locations are hard to reach by hand. Finally, all bathrooms at this location do not use showers and jet washers.



Figure 3. Various Bathroom Supplies Found in the Field

(Source: Triatmodjo, Suastwiwi., Dewi, RS, 2022)

Changes in the physical body experienced by the elderly, such as reduced muscle strength and reduced body reflexes, mean that they require a grip on the wall to keep the body stable. The interviewees also mentioned that they fear falling, slipping, or tripping over small objects. The rough texture on the floor is needed so that one's feet don't slip easily, and a wide path is also needed so that one's feet don't trip over when walking to the bathroom. It is also often said that the bodies of the elderly are no longer flexible or stiff so that their bodies are difficult to move. They need to be accompanied by another

person to walk, or some even have to use a wheelchair. Conditions like this require leeway and freedom of movement space. That is, the size of the space is sufficient, and the path is not angular or has many turns that can hinder movement. Other things found in the bathroom were toiletries such as soap, shampoo, toothbrushes, and towels. These items must be placed in such a way as to be within reach of the elderly who have limited mobility. The unavailability of the four things mentioned above can cause difficulties, discomfort, and danger for the elderly who are active in the bathroom

Table 4. Socio-economic conditions of the elderly group

No.	Parameter	Mark
	Jobs in their youth	
	Farmer	62.5 %
	Trader	18.75 %
	Craftsman	12.5 %
	Teacher	6.25 %
	Their activities now	
	Just stay at home	33.3 %
	Social interactions around the house	50 %
	Working the fields	16.6 %
	Social Security	
	Have no pension	95 %
	Have a pension	5 %

(Source: Triatmodjo, Suastwiwi., Dewi, RS, 2022)

The last table is about the socio-economic conditions of the elderly group, three things are observed, namely jobs in their youth, current daily activities, and old age security. The data obtained shows that in their youth, the majority of the elderly worked as farmers, namely 62.5%, as traders with 18.75%, as handymen with 12.5%, and the least were as teachers with 6.25%. The second part shows the daily activities carried out by the elderly. They said that 50% of the elderly interact with people around their homes. There are 33.3% of the elderly who do not carry out meaningful activities and only stay at home. On the other hand, there are 16.7% of the elderly who work in the fields. The last part is about old age security. Of all respondents, 95% do not have a pension, and only 5% say they get a pension from the work they did. The three things mentioned above are parts that are intended to

provide an overview of the socio-economic life of the elderly group who live on the outskirts of the city.

Data on the respondent's occupations in their youth showed that the majority were farmers, namely 62.5%, while the rest were divided into traders 18.75%, carpenters 12.5%, and teachers 6%. The position of the majority of farmers is in accordance with the predicate of Panggungharjo village in the past, namely an agricultural area. It makes sense if the majority of the population are farmers. Furthermore, data on life activities that are carried out at this time most of them are interacting with neighbors, participating in social gatherings, recitations, mourning, *tahlilan* (religious activities). There is work that is still being done by the elderly here, namely working in the rice fields. The figure is

16.6%. If examined in more detail, it can be seen that those who work are young elderly people aged under 70. Furthermore, there are 33.3% of the elderly who live at home and do not carry out activities outside the home. It is important to note that data on old-age security or pensions for almost all respondents, 95% of them do not have a pension, and only very few, namely 5%, have a pension. This is understandable because the majority used to work independently as traders, farmers, or carpenters. These jobs did not have an old-age security scheme.

It is a fact that all the elderly who are respondents do not have an old age security deposit, so their lives depend on their families or their children. Their daily activities are increasingly limited, namely staying at home, having limited social interaction, or working in the fields if their bodies are still strong and they still have fields. Their former job as farmers with fertile rice fields that have been able to sustain their lives in the past, but now the land is no longer theirs. And these rice fields have changed their function to become office, industrial, and residential areas. Phenomena like this can be found in many suburban areas in Indonesia. In the interview, it was said that currently, the elderly only have a small piece of land which is the area where they live with their children and grandchildren. Thus it can be said that the elderly who live on the outskirts of the city no longer have land that generates money, and they also do not have a pension or old age security, so economically the elderly are very weak and have no purchasing power.

DISCUSSION

In summary, this study aims to find a suitable design strategy for the design and realization of a bathroom for the elderly living in suburban areas and has found that an adaptive design strategy is a good choice. This idea is based on the fact that the life expectancy of the elderly in the study area is high, but their body quality is decreasing. Furthermore, the current bathroom lacks the equipment to maintain body stability, so the "old" bathroom needs to be adapted to the actual conditions and needs of the elderly today. In addition to this, the elderly who live on the outskirts of the city no longer have regular economic income, while social security from the government does not exist, or if there is, the amount is small. Considering these two situations, the researcher believes that the bathroom design for this elderly group needs to adopt the concept of being safe, practical in use and maintenance, and inexpensive. A simple prototype has been made, and to make this design concept a reality, an adaptive design strategy is a choice that can make this

concept a reality. The adaptive concept in this research is defined as utilizing existing bathrooms, intervening in interior design, and equipping the space with a variety of new needs for the elderly so that they can carry out activities safely, easily, practically in maintenance, and inexpensively.

The adaptive design strategy above reflects a process of developing new products or bathrooms by utilizing what is already owned, using local raw materials and technology, and the process is carried out in stages. According to Lanz (2018), adaptive reuse is intended as a design-based intervention with the aim of bringing new benefits to existing buildings. In this case, the adaptive strategy is based on what you already have, namely the old bathroom, and it is not recommended to build a new bathroom because, as a building system, constructing a new bathroom in an old building is more complicated and expensive. When the processing of the space-forming elements is complete, the bathroom interior is equipped with components to maintain body stability needed by the elderly when doing activities in the bathroom, namely handrails, anti-slip rugs, and sitting closets. The development of bathrooms is carried out in increments per component, starting from the easiest without cost, then continuing with the most important components for the safety of the elderly, and then followed by other supporting components.

To create proper bathrooms for the elderly who live in suburban areas, this adaptive strategy is divided into 8 (eight) steps, namely; 1) cleaning the circulation path to the bathroom from clutter, 2) installing railings on the bathroom walls, 3) installing non-slip rugs on the floor, 4) providing sufficient lighting, 5) creating a clear color contrast between the surrounding environment and bathroom equipment, 6) providing a closet for the elderly to sit in, 7) installing a bathtub, a soap dish, and clothes hangers within arm's reach, and 8) installing curtains or doors to cover the room (See Figure 4). In addition, to providing recommendations for adaptation measures, this study has also produced simple prototypes in the form of floor plans and bathroom sections. A prototype with a 1:1 scale of toilet seats has been made for groups of elderly living in suburban areas. All designs are made from local materials and can be done by local craftsmen (See Figure 5).

The adaptive design strategy departs from a sense of empathy for the condition of the elderly who live in suburban areas, feeling changes in their physical bodies and new needs, as well as sharing the economic constraints they face. Design as a solution

to address the needs of modern human life, in the case of research, should not solely fulfill functions and aesthetics, but the design must accept other, more urgent and urgent requirements such as user safety and security (Kenny, 2005, Chuangcai, 2017) and price in the context of economical design (Widharto, SD., et al., 2015). This approach is certainly different from the bathroom design approach for homes in urban areas, in luxury residential areas that emphasize function, beauty, and image at a relatively high cost. This adaptive design strategy is also not suitable for implementation in nursing homes. The building was intended from the start to be a place to live for the elderly, so the design of the bathrooms and other facilities contained in the building had been prepared to meet the requirements and needs of the elderly (Boge et al., 2019). While the bathroom in the residence of the elderly, who is the object of study, is an old room and has been used since the users were young, strong, and healthy, so the

bathroom is no longer suitable for their current physical condition and needs.

Finally, as an approach or strategy, adaptive design does not require heavy or difficult requirements but is easy and light and can be done independently and assisted by local builders. There are six types of adaptation: flexible, active, dynamic, interactive, intelligent, and smart (Koneczna, 2018, Wardana, AW et al., 2019). The flexible category is the easiest to work with. Adaptive design is flexible in this case, can be done directly and intervened by the user with the help of local craftsmen, and can be done by using simple technology. Therefore, the adaptive design approach to bathrooms for the elderly can be done for those who live on the outskirts of cities, in villages, or in the suburbs in the city center. Bathrooms that are safe, practical, and inexpensive are needed by many elderly people, so as an adaptive design approach, it deserves to be popularized for the wider community.

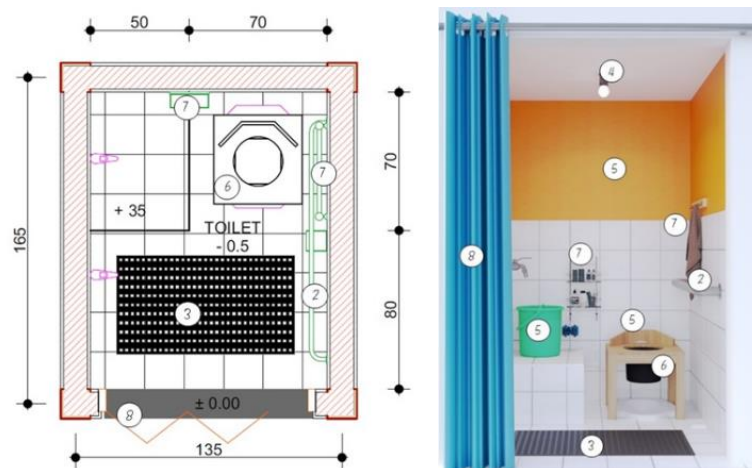


Figure 4. *Proposed Bathroom Design Plan and Perspective*

(Source: Triatmodjo, Suastwiwi., Dewi, RS, 2022)



Figure 5. *Portable Toilet Seat Design for the Elderly*

(Source: Triatmodjo, Suastwiwi., Dewi, RS, 2022)

CONCLUSION

This research has been able to formulate alternative bathroom designs for the elderly living in suburban areas and concluded that design adaptation is the most suitable approach to realizing this design. This suitability is demonstrated in two ways. First, the design adaptation approach can solve the problems encountered in the design of elderly bathrooms. Namely, the design meets the requirements for safe use, as well as practical use and maintenance. Second, this adaptive design approach can present low-priced designs, achieved by applying local materials and technology, and the designs can be done in phases, namely the implementation of construction can be paid in installments one by one per component according to the availability of resources for development.

Furthermore, the scientific contribution that this research can make is to reaffirm that adaptive design is the most appropriate choice of design approach for the bathrooms of the elderly who live on the outskirts of the city. However, the adaptive design approach, as used in this case, cannot be applied to the bathrooms for the elderly in nursing homes because the design starting point is different. In the future, it is possible that an adaptive design approach can be used to overcome the design problems of other spaces in homes for the elderly. Likewise, an adaptive design approach can also be applied to other residential groups of the elderly living in different areas, such as downtown areas or rural areas. This research has been able to enrich the description of adaptive design so that its application can cover spaces in the living environment of the elderly group.

The research conducted in this study still faced several limitations, such as the socio-economic homogeneity of the respondents, the number of respondents that was still small, and the inability to provide in-depth and complete socio-economic data regarding people living in the suburbs. This condition can occur due to limited time and information to obtain and process data in this field.

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