Incremental Housing Development; An Approach In Meeting the Needs Of Low Cost Housing In Indonesia

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Abstract. As a country with a rapid population growth, there is a very high shortage of homes and need a quick solution to build houses for the community. The emerging solution is mass housing with industrialization system. As time goes by, this mass housing solution raises a new problem, the mass housing users are not satisfied with the existing home. Incremental development approach is considered as one of the solutions for solving the mass housing problem. Incremental development is a constructive approach that allows the separation of dwellings to be built, altered and dismantled without disturbing others. With this approach, dwelling is not seen as a finished product, but it’s a process where residents can participate in designing their own house according to the needs and economy capabilities. Furthermore, Housing provision is built according to minimal needs and it’s designed as a ‘permanent longlifef and adaptable base. This paper will discuss the criteria of incremental house for low-income communities provided by the government. Literature studies and case studies are used to find the criteria for incremental house. Some criteria can be used as a reference for incremental house construction as a housing solution in Indonesia.

1. Introduction
The lack of occupancy level (backlog) in Indonesia is still very high. The data from BPS demonstrates that the estimated number of houses built per year is only about 400 to 500 thousand of housing units. On the other hand, the demand for community housing per year reached over 800 thousand housing units.

John F. C. Turner claims that the user involvement from procurement process until the finished product is interrelated with the level of user satisfaction. In the process of building a house when the user is not involved in, this will probably lead to a massive problem for the finished product does not match the expectations of its users. Dwelling/housing as a design product will achieve a great success when the potential users are involved in the design process [1].

There is a simple concept that can perform as a solution for the mutual benefit of future society and the government. This particular solution is called the incremental housing. Incremental housing concept is a housing system that is designed for the occupants to be able to develop their own house in the future. The earliest stage of the house will start with the most crucial rooms such as bathroom, bedroom, and kitchen which are provided by the government beforehand. Later on, the house will be developed in accordance with the needs and economic conditions of the residents so that the incremental house has a very participatory design approach. This particular concept is actually not a new concept, some countries including Indonesia have applied this concept. Moreover, this concept
has also been written in the agenda of the RPJM (Rencana Pembangunan Jangka Menengah) Technocratic Plan sub-Division Housing for the year 2015-2019 [2].

This paper aims to identify which aspects that need to be considered in designing an incremental housing in order to meet the demand for community housing in Indonesia.

2. Methodology
The methodology used in this paper is comparative study. It will comparing a several projects that are considered to have successfully implemented the concept of incremental housing. Design criteria from literature are used to compare the projects.

3. Design Criteria
According to Wainer (2016), incremental house is not the same as build a complete small house. Incremental House provide some homes that can be developed by the residents themselves. The main purpose of this approach is to ease the burden of development costs at the earliest. So that the dwelling can be built in a location that is really desirable [3].

Aravena (2016) on an Elemental project, said that in planning a dwelling with the concept of an incremental house must pay attention to some ideal conditions [4], including:

- Good location: dense enough projects able to pay for expensive well located sites. The text should be set to single line spacing.
- Harmonious growth in time: build strategilly the first half (partition structure and firewalls, bathroom, kitchen, stairs, roof) so that expansion happens thanks to design and not despite it.
- Urban layout: introduce in between private space (lot) and public space (street), the collective space, not bigger than 25 families, so that social agreements can be maintained.
- Provide structure for a final plan growth.
- Middle-class DNA: plan for a final scenario at least 72m$^2$ or 4 bedrooms.

According to Greene & Rojas (2008), incremental house process is divided into 3 stages. Each stage has an opportunity for the residents to create an efficient and equitable adjusting to their character [5]. These three stages are:

- Search for location; Residents are given the opportunity to choose a site that suits their needs. So they can have an opportunity to work in the city.
- Basic building construction; From the residents’ point of view, the primary function of the house is to provide protection against cold, rain, sun, wind. This is a priority after getting a land or location.
- Residential development; After having a house, the occupants begin to develop their dwellings with potluck material, especially if the need is very urgent such as the need for space for family members.

Based on literature study, it can be concluded that design criteria for incremental housing is location, core house, expansion posibilities, building type and allotment of residents.

4. Case Study Data
Case studies to be taken are incremental house projects that are considered successful implemented. Here are 3 incremental house projects that have been built and 1 project concept for vertical dwelling.
4.1. Quinta Monroy Housing

These modules will be able to hold up to five families and come with two different types. Here is the explanation of both units:

The housing type; which is shown blue on above picture, has got direct access from the front door. The space growth only happens to sideways and backward. This kind of type provides the possibility for the occupants to open a business in order to help their economy. In one designed module, follows two types of the housing unit.

The Duplex type; which is shown orange, blue, and red on above pictures. This type is located right above the housing type, this causes each of the units has got their own stairs. The space growth is not limited to sideways and backward, but also upward. Therefore, each of the units is provided with stairs. In one designed module, follows three types of the housing unit.

![Figure 1. Before & After Post-Habit QM housing](image1)

![Figure 2. Dwelling Types In Design Module](image2)

4.2. Villa Verde Housing

Villa Verde is a housing project owns by Elemental that collaborates with a forestry company named Arauco. This company desires housing for their labours. The location itself is not in downtown. This is because they want the labours to stay close to them, so they choose a site that is just nearby the workplace.
With landed housing type, the ownership of land in each unit looks more clear and also create a larger built area. The space for expansion can hold up to 2 bedrooms and 1 family room. In total, Villa Verde can hold up to 4 bedrooms including the dining room, family room, and also a terrace to host some guests. Identical to the previous design, the service area is provided on one side to ease the piping works and one staircase for the vertical access. Therefore, when it comes the time for the occupants to develop their house, they will not need to think about the circulation of stairs.

![Figure 3. Before & After Post-Habit VV housing](image1)

![Figure 4. Before & After Post-Habit VV housing](image2)

4.3. *Tila Housing block*

The Tila housing block possesses 39 apartment units with all of them facing south. The circulation that is used is a single loaded corridor located on the north side. With a 5 meters height of each story and
beams as the support system provided beforehand, the occupants can surely add another mezzanine level. The occupants are free to fill the interior with whatever they like with a help of partition wall as the infill system. This kind of design sets the boundary so that the expansion will not happen outwards, but inwards instead. As a supporting system besides structural, the architect provided one bathroom for 50m2 unit type and 2 bedrooms for 102m2 unit type. The supporting system and infill will not give any chance to the occupants to identify their dwellings from outside. In contrast to the outgrowth design where the residents are able to design their facade as they please, the entire facade is already designed beforehand. Therefore, this design is intended for the upper middle class.

Architects as providers of support system only provide a free space which can be designed by the residents as an infill systems. The advantages of this concept are not expensive for build and residents will be more satisfied with their residence because they can desaing their own interior. Infill systems not only put the furniture in space, but also set the layout of space on the unit. Such as putting the bedroom, work space, stairs, mezzanine, family room, and others.

Figure 5. Before & After Post-Habit Tila housing

Figure 6. Tila housing Before & After Plan

4.4. Weston Williamson Concept

British Weston Williamson Studio brings the concept of incremental house in vertical dwellings to solve the problem of shortage of homes in Palestine. The idea of a n incremental house is inspired by Chilean architect Alejandro Aravena, where people can add some space according to their economic capabilities. According to a survey conducted by the Israeli-Palestinian mediation organization Quartet and World Bank offices, the need for homes in Palestine is not met by the market. It is estimated that 70 percent of households can not afford the average house price and many of them do not require the size of the house that is generally offered. The apartments will be built with cores in the middle and each unit will have a large balcony. The residences are designed to provide long term homes that "grow with its residents". Residents are allowed to extend out onto balconies using prefabricated panels. Pre-fabricated panels allow a variety of different configurations to create attractive shapes. This apartment has a variety of sizes and layouts, ranging from one to three bedrooms. While the communal space is designed on the ground floor. The expansion can only add 3 rooms and it can be done on the balcony that deliberately designed large enough.
5. Analysis
The analysis will be done through the case study comparison table adjusting to the design criteria.

| Project’s Name       | Quinta Monroy    | Villa Verde    | Tilla Housing | Weston Williamson |
|----------------------|------------------|----------------|---------------|-------------------|
| Location             | Chile, Urban     | Chile, Urban   | Finland, Urban| Palestine         |
| Type                 | House & Duplex   | House          | Loft          | Apartment         |
| Core Area            | 36 m²            | 43.5 m²        | 50 m²         | 25 m²             |
| Expansion Area       | 72 m²            | 76.6 m²        | 50 m²         | 37.5 m²           |
| Expansion Types      | Sideways         | Up & Sideways  | Ingrown       | Sideways          |
| Main Function        | Toilet, Kitchen, Multifunctional Room | Dinning Room, Kitchen, Toilet, Bedroom | Toilet & Multifunctional Room | Toilet, Kitchen, Bedroom, Living Room |
| Additional Room      | Bedroom, Dinning Room, Workspace | Terrace, Bedroom, Living Room, Workspace | Dinning Room, Bedroom, Kitchen, workspace, Living Room | Bedroom |
| Floor to Floor       | 2.34 m           | 2.48 m         | 5 m           | 3 m               |

Location: Three of the four projects chose locations in urban areas. It is because the incremental house is a long term occupancy, so when the residents decide to settle on the dwelling then they will not move to another place again. In addition, the presence of supporting facilities on site also be considered, such as near the workplace, close to educational facilities, health, shopping, and others.
Building Type: two of the four projects are low-rise resident. It considers the ease of community participation when developing their dwellings.

Core & Expansion Area: three of the four projects have an expansion area nearly 2 times from the core house. While in high-rise resident, the expansion area is ingrowth the unit or just give a little space behind the unit.

Expansion Type: two of the four projects have expansion areas aside from the unit because it is considered to be the most balanced in development. This provides an opportunity for residents to be able to open a business in front of the expansion area but still has a privacy space behind it. Other expansion options include upward development or inward development. For inward development, the provider has to prepare a large empty space to be filled by residents.

Main Function: from the entire project, the bathroom becomes the most important space that has to be provided at the core of the house. Included with wet area for kitchen. Two of the four projects provide bedroom in the core space, two other projects provide multifunctional space which is more flexible for occupant.

Additional Room: from the entire project, the bedroom becomes additional space in the expansion area. This is related to the increasing number of family members. The other rooms adjust the needs of residents, such as, terraces, workspaces, and additional kitchens.

6. Conclusion
Based on the analysis of case studies that have been described, it can be concluded that the concept of incremental house should be concerned with several main things:

- Location, urban area are more appropriate to apply the concept of incremental house.
- Core house, the area of the core house depends on the standards that have been applied to each country. But at least, providers should prepare the initial shelter in the form of building structures, utilities and vital room (bathrooms and kitchens). These rooms are important considering the water plumbing is a part of building utility. The bedroom or living room can be an alternative choice of space in the core house.
- Expansion, side development has more advantages than other development directions. It can balance the benefit of forward and backward development.
- Building Type, incremental house is more appropriate to be applied on low rise residential. While in high rise residential, The designer can plan the expansion of the dwelling into the unit as in the example precedent.
- Participation, to achieve success on the concept of incremental house, communities should be a participant in the construction of their own homes. Residential provider can provide socialization in advance and control every home development.

7. References
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