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# Housing Characteristic in the Densely Populated Area. A Case Study in Cigugur Tengah, Cimahi

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## Abstract

The most population density in RW 08 Cigugur Tengah reached 1000 inhabitants/hectare. However, it does not mean an area is said to be slum if it is only seen based on its population density. Another factor is the availability of adequate infrastructure and facilities and building regularity. As in RW 08, there is a land in the middle of a densely populated area with an area of 840 m2 and inhabited by 40 peoples who have a family relationship. The land was originally owned by the family which subdivided for its descendants. In this case, the minimum space requirement is achieved; however, in terms of infrastructure, facilities and building regularity are not achieved. A new strategy is needed to resolve this problem without relocation, Therefore, the objective of this research is to identify the appropriate local restriction or local criteria which used in the planning of housing design concept in criteria before designing or revitalizing the slum areas inhabited by the family and the environment surround in the densely populated area. This research used a quantitative and descriptive method. The results show that the specific characteristics such as geographical conditions and the characteristics of the community greatly influence the consideration in determining the appropriated housing design concept.

**Keywords:** slum upgrading, design criteria

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## 1. Introduction

The development of the city from time to time cannot be separated from the settlement itself. Settlements are an essential element in the city's civilization. As well Cimahi as one of capital buffer city that mostly consists of residential settlements. Unfortunately, the settlements in Kota Cimahi have not sufficiently to the population growth that increased every year. The rate of population growth reached 2.06% over about five years [1]. Also, the large number of industrial areas in the region attract numbers of industrial sectors in the region attract migrants from areas outside Cimahi to work and live in Cimahi, which creates urban problems, namely densely populated settlements. The lack of land is also a factor that exhausts families who can not meet the minimum needs

of the inhabitants. The condition of these settlements allows inadequate housing and many irregular homes, the quality of the houses does not meet health standards and feasibility, and lack of suitable facilities and infrastructure. In accordance with the Law of the Republic of Indonesia number 1 of 2011 on Housing and Settlement Area, article 1, paragraph 13 used Slums are unfit settlements due to building irregularity, high building density, and quality of buildings and facilities and infrastructure that are not qualified, and in verse 14 that slum housing is a housing that has decreased quality as a residence [2].

Based on the Decree of Mayor Cimahi number 653 / Kep68.PU / 2015 on the Location of Housing and Slum Areas in the city of Cimahi 2015 taken from a survey of data updating by the Ministry of Public Works, there are 176.77 hectares identified as belonging to slum areas. Cigugur Tengah is one of the urban villages in Cimahi which is included in the identification of slums and has a typology of settlements around an industrial area in the middle of the city. With the stipulation of the Decree, it is necessary to follow up the arrangement of the area.

Structuring slums area physically requires a design that encounters the criteria; however, most criteria have not yet accommodated the needs of building planning in densely populated urban settlements. Based on some previous handling, many of them are massive physical arrangement and displacement of the indigenous people or relocation. This is the main obstacle for people who live and work in the area for many years and even regenerate so much of the land is fragmented and become very densely populated. The characteristics and culture of the local community, especially in the heterogeneous Cigugur Tengah becomes another obstacle to the realization of the overall physical structuring. Therefore, it is necessary to design building criteria that can facilitate these needs and become a solution in structuring slum areas comprehensively.

## 2. Research Question

What are the local restrictions or local criteria which used in the planning of housing design concept in the slum areas inhabited by the family and the environment surround in the densely populated area?

# 3. Research Objective

To identify the local restrictions or local criteria which used in the planning of housing design concept in the slum areas inhabited by the family and the environment surround in the densely populated area

# 4. Research Aim

The aims of this research are:

- For the City Government of Cimahi, the results of this study are expected to provide recommendations housing criteria on the slum-setting policy plan in RW 08 Cigugur Tengah Urban Village,

- For the community, the results of this study are expected to obtain insight and increase the knowledge about the criteria of housing design

- For science, research results are expected as literature and if there is a shortage of research can be followed up to the next research related to the development of criteria of housing design.

# 5. Literature Review

## 5.1. The strategy of slums upgrading in Urban area

Strategy to improve the quality of the slums area can be done in several ways, namely rehabilitation, revitalization, and relocation. Restoration is an effort to improve the physical components that are degraded. Examples are settlements and improper housing improvements. Revitalization is an effort to dismantle or the entire environment in the same place and then builds appropriate facilities and infrastructure. The handling of revitalization includes land unification, land readjustment, resettlement, and vertical housing. Whereas relocation is a settlement program by transferring slum dwellers to more comfortable places [3].

Handling efforts need innovation along with the times. The definition of innovation in handling is a new idea or finding as a form of the reform process that has not been introduced before and combines several effective and efficient theories to be used in solving settlement problems that are triggered by the government or non- government so that it can be applied to the social environment [4]. The innovations to the handling of the slums area are as below:

| Short-term Infrastructure Water and Sanitation | Mid-term Secure Tenure | Long-term Housing Public Amenities |
|---|---|---|

**Figure** 1: Handling Innovation of Slums Area [4].

## 5.2. Slums upgrading in Cigugur Tengah, Cimahi

Handling slums in various regions has different characteristics and forms of handling, the factors that cause this difference are depending on the community itself such as the character, condition of the community, regional capacity, geographical conditions and the political will of each region [4]. The handling of the area in Cimahi is not only physical but also non-physical. Handling programs change over time depending on the current conditions, here are some programs that Cimahi government has done [2]:

1. Social, economic, cultural and community roles (2008-2010)

   • Works for physical areas such as paths and drainage system
   • Social, economic and cultural such as revolving funding for small economic actors and improve community responses to development

2. Handling of slum-based residential neighborhoods (2010-2012)

   • Determination of area and proposed priority area to the government (mayor)
   • Detailed plan (community)
   • Detailed Engineering Design (consultant)
   • Implementers include road improvement, roads, drainage, clean water, toilets, communal septic tank, meeting hall, TPS

3. The strategy of urban settlement and infrastructure development and Priority Area Development Plan (RPKPP) - (non-physical 2012-2013, physical 2013-2016)

   • Non-physical such as socialization of land acquisition planning
   • Physical such as settlement, drinking water, drainage, and environmental road, wastewater, and garbage.

In addition to the handling carried out by the city of Cimahi itself, several efforts to deal with slum areas have also been carried out by the Research Institute for Housing and Settlement slum area structuring through land consolidation. But in its development, this effort was constrained by the people who did not understand the concept of land

consolidation which made them worried about losing their ownership rights to their land. Also, the community is also not ready to be temporarily placed in a flat.

## 5.3. Housing criteria

The provisions of the housing environment based on SNI 1733 the Year 2004 [5] are as follows:

1. The location of housing should be by the land designation plan that is the local RTRW with criteria such as safety criteria; health criteria; comfort criteria; criteria of beauty/harmony/ regularity (compatibility); flexibility criteria; criteria for distance affordability; and environmental criteria self-identity

2. Planning locations should be on clear land ownership and comply with administrative, technical and ecological requirements

3. The integration between the order of activities and nature around it

Also, as for the criteria of healthy homes according to the Decree of the Minister of Health of the Republic of Indonesia No. 829 / Menkes / SK / VII / 1999 [6] with the provisions of residential health requirements are as follows:

1. Building materials

   Not made from the material that can release substances and can endanger health, among others:

   - Total dust less than 150 mg per square meter;
   - Asbestos less than 0.5 fiber per cubic, per 24 hours;
   - Lead (Pb) is less than 300 mg per kg of material;
   - Not made of materials that can be grown and developed pathogenic microorganisms.

2. Components and spatial arrangement

   - Waterproof floor and easy to clean;
   - The walls of the house must have ventilation, bathrooms, and washrooms are watertight and easy to clean;
   - The ceiling of the house is easy to clean and not prone to accidents;
   - 10 m of the householder and there is a lightning rod;
   - Space arranged by its functions and designations;

• The kitchen must have a smoke exhaust facility

3. Lighting

Natural and or artificial light directly or indirectly can illuminate the entire room with the intensity of light at least 60 lux and not dazzle the eyes.

4. Air quality

   • The air temperature is comfortable, between 18 - 30 °C;

   • Air humidity, between 40 - 70%;

   • SO2 gas less than 0.10 ppm per 24 hours;

   • Air exchange five times 3 per minute for each occupant;

   • CO gas less than 100 ppm per 8 hours;

   • Formaldehyde gas is less than 120 mg per cubic meter.

5. Ventilation

Area of permanent natural ventilation is at least 10% of floor area.

6. The disease vector

No flies, mosquitoes or rats nest in the house.

7. Water supply

   • There is a water supply facility with a minimum capacity of 60 liters per person per day;

   • Water quality must comply with the health requirements of clean water and drinking water according to the regulation from the Ministry of Health number 416 in 1990 and Ministerial Decree number 907 in 2002.

8. Waste Disposal

   • Household liquid waste does not pollute water sources, does not cause odors, and does not pollute the soil surface;

   • Solid waste must be well managed so as not to cause odors, not pollute soil and groundwater.

9. Density of dwelling

Spacious bedroom at least 8 square meters, and is recommended not for more than two people sleep.

# 6. Method

The method of discussion is done by qualitative and descriptive approach, which describes and explains the qualitative data [7], then analyzed to obtain a conclusion. Below are the research methodology processes:

1. Literature study with collecting all references and data related to slum settlement, and it will be a guidelines design;

2. A case study is comparing slum-dwelling settlements to find problems or constraints.

3. Site survey identifies the site by reviewing the site directly to find out the site's characteristics related to constraints and potential, with consideration of present and future conditions.

4. Collecting data collecting all data related to slums and its criteria then be analyzed.

5. Data analysis: analyze all data, such as literature and data existing, afterward finding space requirement, facilities requirement, and existing standards to be the right design for slum settlement areas.

6. Site Analysis Analyzing the site according to the data analysis that has been done above. Site analysis is performed on the site shape and location of the existing site architecturally.

7. Determining the housing criteria concepts: processing data that has been found from data analysis and site analysis to determine the housing criteria concept that will be the basis in designing the appropriated building.

# 7. Data Analysis and Discussion

## 7.1. General description

RW 08 is a priority slum area in Central Cigugur Village based on Decree of Mayor of Cimahi No 653 / Kep 68.PU / 2015 on Location of Housing and Slum Residential Area in Cimahi City 2015. Delineation of slum area in RW 08 reaches 4.5 Hectares and consists of 5 parts.

The survey results show some characteristics of RW 08 area [8], among others, are as follows:

**Figure** 2: Priority area in Cigugur Tengah (left), RW 08 area (right) [8].

1. Density of Area

The density of an area includes population, population growth rate, the environment of basic building coefficient (KDB), lot, environmental arrangement (building layout pattern), and green open space.

- The population of RW 08 are 1000 soul / Hectare
- Kecamatan growth rate of 0.79%;
- KDB environment is close to 100%;
- KDB lots reach almost 100%;
- The pattern of the building layout is 100% irregular;
- Green area < 10%.

2. Infrastructure service

Appraised infrastructure services include water supply systems (PDAM), environmental road widths, wastewater systems, sewage systems, drainage systems, and electrical systems. Based on that, then the existing condition in RW 08 is as follows.

- 38% of dwellings have used PDAM services;
- Most neighborhood roads have widths below 1 meter. Only 21% of neighborhood roads are over 1.5 meters wide;
- There is no particular wastewater system. Waste is directly discharged into the river;
- 19% have used collective garbage services collected from each dwelling. Most of the waste is dumped into the river;
- 46% have drainage system services; and

- 100% occupancy is affordable electricity.

  Assessment of the quality of the house based on the size of the house building on the residents, the fulfillment of clean drinking water equivalent needs, the reliability of structure and materials, the availability of household sanitation facilities, air circulation cross, and natural lighting.

- 71% of the house's occupancy of the occupants is 7.2 m / person;

- Fulfillment of clean drinking water equivalent needs to have an average value of 20-40 liters/person/ day. Only 3% can meet the needs of 60 liters/person/ day;

- In terms of structural and material reliability, 97% of buildings have roof, floor and wall conditions by technical requirements, mostly permanent;

- Availability of household sanitation facilities (latrines) is 91%;

- 50% - 75% of the need for cross air circulation;

- Fulfilling the demand for natural lighting in occupancy <50%;

3. Socio-Economic Condition

   Matters to be considered in socioeconomic conditions are the type of work, the level of income of the population/month to KHL (Decent Living Coefficient), the unemployment rate, and the frequency of the outbreak of the disease.

   - Based on the type of work, most of the population works within the area;

   - Only 40% of the income population <KH;

   - Unemployment rate 7% or above national standard;

   - Frequency of disease outbreak one times/year.

4. Location Growth

   Matters considered on the growth site include achievement of the source of economic activity and accessibility of transportation.

   - The distance to do economic activity <1 Km

   - Available> 2 choices of modes of transport on RW 08.

5. The Domination of Actors

   Assessment of the dominant actors includes migrants (settlers and commuters) as well as the behavior of landowners such as breaking up land, selling lots, and building rental rooms.

   - <50% of the population in RW 08 are migrants from factory employees;

• 2.> 50% Lot is the result of the splitting of the land area.

6. Spatial Formation

Spatial formation covers the large area which grows in the delineation of observation area) and its spreading pattern.

• The total area of the region reaches more than 75%

• The pattern of distribution is entirely concentrated within the region.

7. Growth History

Acceleration of KDB growth is or is between 2% to 5%.

# 8. Case Study

RW 08 chose as a case study due to its specific region as the most densely populated area in Cigugur Tengah which include the residential zone and suitable with RTRW. The building density of RW 08 reached 103 Units / Ha. The Coefficient of Basic Building of the shipping in Central Cigugur Slums area reaches 100%. This is evident from the majority of existing homes that have no yard, or most of the parcels of the land owned land is used entirely for house building or closed pavement. The entire building has an irregularity unit (See Table 1). The main factor causing irregularities is that only 10% of homes have access alleys of at least 1.5 meters. Therefore, most alleys have a width of fewer than 1.5 meters (See Figure 3).

TABLE 1: Total Unit of Irregularities Building [8].

| Total of Building **Unit** | 427 |
|---|---|
| Regularity unit **building** | 0 (0%) |
| Irregularity unit building | 382 (100%) |

Based on some considerations then selected one of the locations to be structured. The place is in the middle of densely populated settlements and no access to the main road, the only access just a small alley. The area of the site about 840 m$^2$ and inhabited by the family. Here are some characteristics of that location:

1. Secure Tenure

A number of the family: Consisting of 8 families with the total number of a family member is 40 people. Three people are active as factory employees. They are natives. A building permit does not exist, while the legality of land and registration on the process.

**Figure** 3: The Existing Area of Circulations [8].

2. Physical Buildings and the Environment

Water supply by artesian, septic tank only for families, residential electricity ranges at 1200 watts. The quality of occupancy is quite good but lack of natural lighting because of the alley width 1-1.5 m and covered with the roof as shown in Figure 4.

## 8.1. Local criteria concept idea

The idea of residential housing design is placed in this location which is like a shared house for some families and still has a blood relationship. Residents who have social closeness or are in a community can also become targets of this type of living arrangement.

From the results of the Focus Group Discussion with the residents, it was agreed that some land owned by different owners in one family could be combined into one so that a significant development area was formed. On this land, a residential area was built together with a maximum floor area of 4 floors. In addition to the revitalized existing building, rental housing is added as an effort to increase family income, as shown in Figure 5.
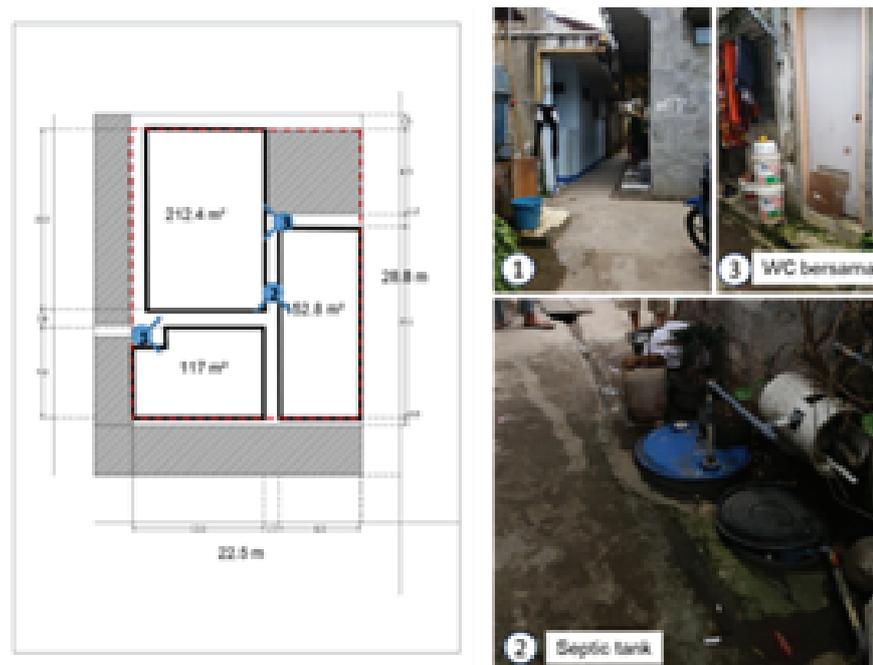
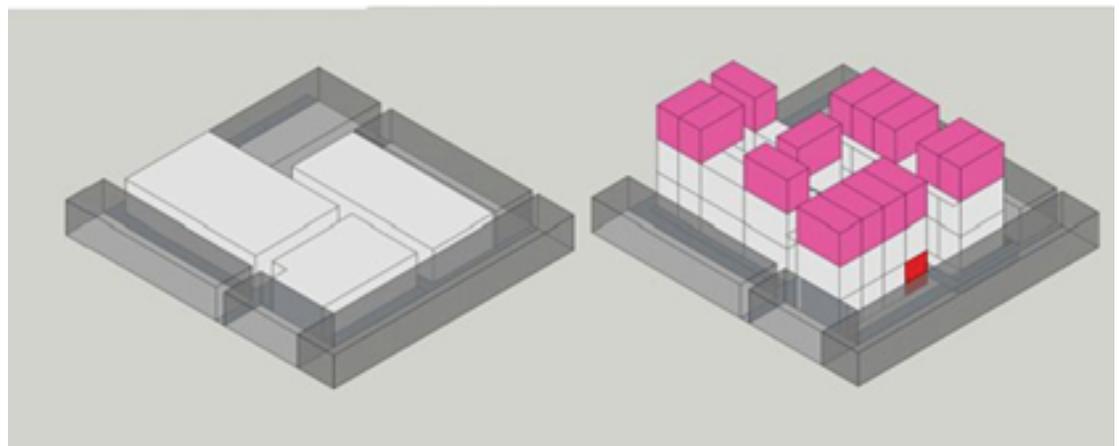**Figure** 4: The Utility Surround Area [8].



**Figure** 5: Housing Design Concept.

In this case study, it is necessary to design criteria according to existing conditions, especially in dense settlements. By the housing criteria [8], the idea of the proposed residential design concept should be suitable with the following local design criteria as below:

1. Location

- Allotment of land is a residential area by the spatial plan;
- Being in an area that is safe from possible disturbances, such as not near dangerous areas or not in disaster-prone areas;
- Land legality must be considered;

- Availability of adequate electricity and telecommunications networks; and
- Availability of a proper drainage network [9].

2. Safety

- Buildings made of building materials that are safe, strong and non-flammable;
- The buildings are built not attached to neighboring buildings, thereby reducing the potential for fires to spread throughout the area and avoid seepage of water on the walls;
- Plant electrical wiring on the walls of residential buildings to reduce the potential for a short circuit that will cause a fire;
- The building has several facilities as a means of rescue such as stairs, alarms, or emergency doors (static) and sprinklers, hydrants, fire engines (dynamic); and
- The alley is a minimum of 1.5m so a fire engine can pass it;

3. Health

- Buildings are built not attached to neighbors to avoid seepage of water on the walls that causes moisture;
- Buildings must have air ventilation as a condition of a good house; ventilation can be united with doors or windows or can be installed separately. Its function as the entry and exit of air flow so that the building has good air quality and is not stuffy;
- Buildings have good natural lighting, especially buildings in the alley should be designed using windows whose width is not less than 50cm. Also, between building units are given a minimum gap of 1.5 m so that light can enter freely;
- The drainage system in the building must be of good quality and function (the pipe is not easily damaged, the pipe connection is good);
- For buildings, more than one floor, need access up and down the floor using stairs. Stairs are given a landing to reduce fatigue when climbing or descending stairs. The size of the steps is adjusted to the standard requirements of the stairs;
- The minimum roof height of 2.8 m so that the room feels looser, so it is not stuffy and reduces the heat of the sun entering from the roof of the house;
- Waste treatment from residential buildings is processed communally (communal septic tank and biogas) which are placed in an undeveloped area, not only for residents but also for the surrounding environment; and

- The building has green open space as a source of oxygen intake, not only for residents of this building but also for the surrounding environment.

4. Comfortability

- Buildings have good lighting and ventilation in each room to provide thermal comfort, which is expected to be an energy-efficient occupancy
- The building has an adequate layout and area so that it can meet visual or architectural comfort - The building has enough green open space to meet spatial comfort
- Buildings are in a safe environment (optimized street lighting), safe from flooding and clean. c. Compatibility Criteria (Beauty, Harmony)
- Has a green open space with a choice of vegetation that matches the existing area (try plant as long as it's not revoked or removed)
- Buildings, not more than four floors to match the surrounding buildings [10].

5. Flexibility

- Buildings become part of stimulants for the surrounding environment so that in the future it can be developed into more extensive and integrated communal dwellings, as illustrated in Figure 6

6. Affordability of Distance

- Availability of shopping, education, health, and office / other work facilities
- Located in a strategic location, not far from the highway and by public transportation

7. Identity

- Housing design concept built while promoting the locality
- The building can still be traversed by residents of the surrounding environment so that the interaction of the residents of the urban village remains interwoven
- Open space as a place to interact with families (sub-communal occupants) with residents of the surrounding environment.

# 9. Conclusion

The local restriction or local criteria for house design in the middle of dense settlements must comply with the basic needs of residents. Special characteristics such
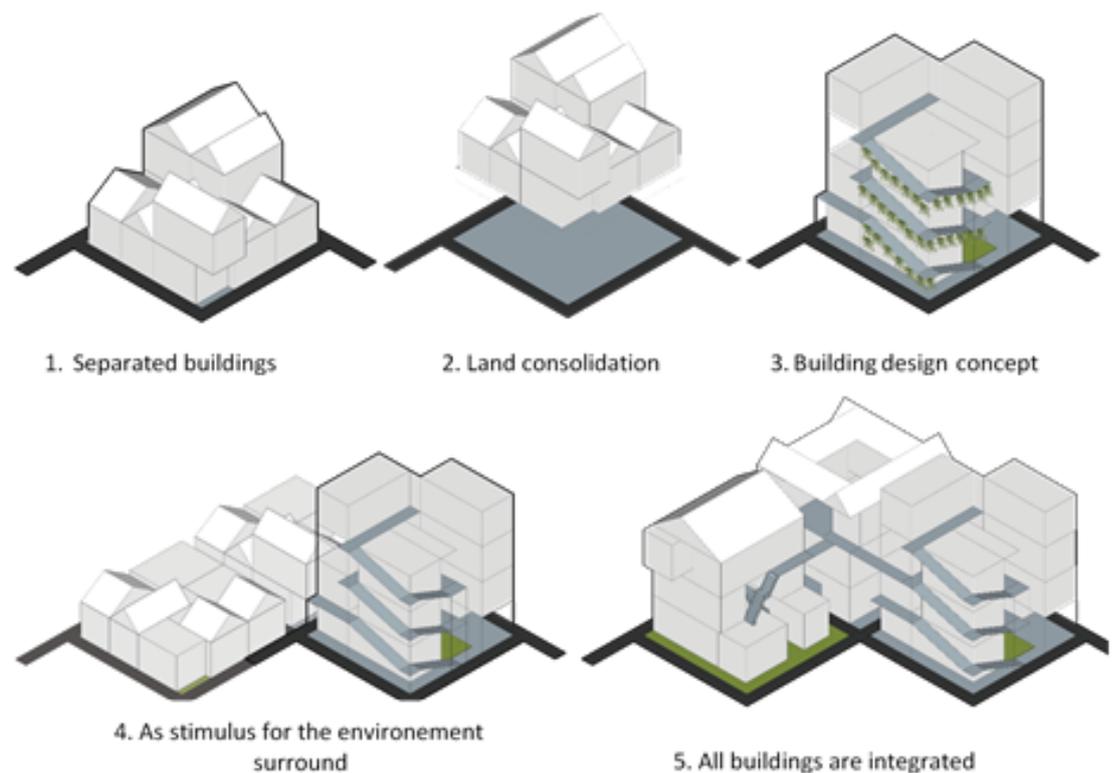
1. Separated buildings  2. Land consolidation  3. Building design concept

4. As stimulus for the environement surround  5. All buildings are integrated

**Figure** 6: The Flexibility of Housing Concept [8].

as geographical conditions and the features of the community greatly influence the consideration in determining the appropriated local criteria. The challenge in deciding these local criteria is how to find design criteria that can accommodate people healthily and decently without changing their locality.

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