Sustainable Settlement of Pojok Tengah Village on Cimahi City as The Center of Spicy Cassava Chips Industry

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Abstract. Settlement Pojok Tengah Village on Kademangan Road of the Cimahi City is a residential food industry of spicy cassava chips, which has the potential to be processed and organized into the center of cassava chips industry, as technology develops, these settlements have good potential for future prospects so that the Mayor of Cimahi establishes these settlements as the Center of Cassava Chips Industry. Currently, the development of industrial center is still irregular, so it needs a necessary planning and design for the arrangement of Pojok Tengah Village on Kademangan Road of the Cimahi City. The purpose of sustainable settlement is to maximizing social, economic and environmental on humanitarian settings in Pojok Tengah Village. To achieve the suitability of the area, the pattern of mass order and mass typology found in Pojok Tengah Village on Kademangan Road will be identified, so that the origin of the cassava chips food industry center will be known with all the manufacturing process activities and also the supporting shopping facilities needed by visitors for the future.

The method used in this paper was qualitative method applying descriptive analysis. The data were taken from literature studies, relevant agencies, and community with local leaders in the settlement. The results of this analysis showed that an approach can be obtained and used in the preparation of programs and basic concepts of planning and design for the future. The arrangement of the area can be made dynamically and still maintain the elements of locality by adopting the formation of simple geometric buildings, on Kademangan Road of, Cimahi City and the locality of houses in the village area.

1. Introduction

Strategic areas are part of city territory of which spatial planning is highly prioritized as these areas have strong influence seen from economic, social, cultural and/or environmental perspectives. Bandung has 9 economically strategic areas scattered around the city in forms of city service centers and industrial centers, which on average start from home industries. The growth of home industries not only sprouts in the city of Bandung but also spreads up to its bordering districts. The city of Cimahi originated from one of the districts of Bandung Regency has shifted its status to an administrative city, resulting in rapid development in the region.

Pojok Tengah Village on Kademangan Road is one of the centers of food processing home industries producing cassava chips in Cimahi. This home industry area was started with the setting up of chip business by Riki around 1997. Over time along with the increasing market demand, through the period of 2007-2014 many other residents joined the business of spicy cassava chips in which up until present there are 36 persons in the chip business each with their own brand. In 2011 the City Government of Cimahi officially launched this area as the Center for Spicy Cassava Chips by forming
an organizational structure to oversee the activities taking place in the business. The rapid development of the home industry activities in the region results in the optimization of open spaces as parts of business area or even of manufacturing industry.

A sustainable settlement provides inhabitants with a high quality of life, but does not at the same time grow rapidly by attracting migrants from smaller settlements to the extent that they suffer decline. Sustainable development to be a process that enhances wellbeing by means of improvement in economic, social conditions and enhancement of environmental quality, while minimising environmental impacts elsewhere [1]. Sustainable housing development cannot be separated from a number of issues related to the discrepancy between development opportunities among the actors involved and inequalities in infrastructure services, urban services, housing as well as spaces for business opportunities. There are three aspects of sustainable development, namely the economy (the system must be able to produce goods and services in a sustainable way), social (the system must reach the activities of distribution flow, as well as the provision of adequate social services) and the environment (environmentally friendly systems must maintain stable resource bases, avoid excessive exploitation of renewable resource systems or environmental absorbing functions, and deplete non-renewable resources only as far as investments are made for adequate replacements) [2].

Sustainable housing development should measure the area developed according to sustainability criteria, particularly environmental, social, economics, site/land uses, and communication and transportation, and should include the assessment of building forms for housing performance [3]. The distribution pattern of sustainable settlements is influenced by climatic conditions, soil conditions, water management, topography and the availability of natural resources in the region. The settlement pattern related to its landscape covers longitudinal (linear), centralized and scattered/stretched settlement pattern [4].

Home industry or household industry is skilled activity to generate products carried out by humans (laborers) to sustain life into something that has higher selling value and is done in a house (generally in private or individual owned houses) [5]. The UMKM (Unit Mikro, Kecil dan Menengah/Micro, Small and Medium Units) program carried out by the government not only provides benefits to industrial owners but also opens up employment opportunities to local residents. Employing communities living around business area leads to optimization in time and energy as the result of reduction in costs, time and energy spent to get to and from workplace.

Further, the growth of economic activities of the residents of Pojok Tengah Village on Kademangan road has transformed various functions of building in the area into those related to the process of spicy cassava chip production. In regard to the pattern of spicy cassava chip production activities, home industries in food processing require facilities and infrastructure such as loading docks, storage warehouses and processing areas creating new architectural typologies of houses and its surrounding environment. The purpose of this research is to assist the development and sustainability of the home industry in Pojok Tengah Village in order to reduce the impact caused, given the medium density of local settlements.

2. The Research Method
The case investigated in this study is a residential-industrial area producing spicy cassava chips in Pojok Tengah Village on Kademangan Road of the Cimahi City. The research employed qualitative approach while data were gathered through field survey, documentation, observation, interview, literature study as well as institutional survey. Interviews with local leaders were conducted to find out changes in settlement layout before and after the cassava chips industries grown in the region. Comparative study to some home industries was conducted to identify patterns of home-based food processing industries. The variables investigated in the study were limited to settlement patterns, activity patterns as well as building massing typologies related to economic, environmental and social sustainability.
3. Result and Discussion

3.1 The Location of Spicy Cassava Chip Industry

The site of the research was Pojok Tengah Village located on Kademangan Road, Setiamanah Sub-district, Cimahi Tengah District, Cimahi City. (Figure 1).

Figure 1. The location of Pojok Village on Kademangan Road, Cimahi

Spicy cassava chip industry in Pojok Tengah Village on Kademangan Road started around 1997. At first the cassava chip industry was initiated by one of the residents with Riki Chips as his brand. Over time along with the increasing market demand, through a decade from 2007 to 2014 many of its residents joined the business of spicy cassava chips. In 2011, the Government of Cimahi City launched Pojok Tengah Village on Kademangan Road as the center of spicy cassava chip industry. An organizational structure was formed to oversee business activities taking place in the area. At present there are 36 businesses of spicy cassava chips in the form of home as well as manufacturing industries with various brands.

The rapid development of the food industry in the region results in the conversion of land owned by residents, the majority of which are residential houses into business places, or factory sites. The economic activity patterns of the residents of Pojok Tengah Village on Kademangan Road, have also changed the function of settlement houses and created a new typology (industry) in order to facilitate the function of the production process of spicy cassava chips.

3.2 Pattern And Element Formation Of Pojok Tengan Village On Kademangan Road

The building massing of the industrial area of cassava chips in the Pojok Tengah village on Kademangan Road forms a combination of linear patterns and diffuse patterns. The linear patterns are clearly seen on the main road, namely the Kademangan Road where the orientation of the buildings is perpendicular to the street. Meanwhile, the diffuse patterns are obvious in the building massing that tends to be random on smaller road corridors/alleys, namely Saluyu Alleyway and Swadaya Alleyway. (Figure 2).

Figure 2. The pattern of building massing in Pojok Tengah Village

Local Regulation No. 4 Year 2013 on Neighborhood Association/Council stipulates Pojok Tengah Village on the Kademangan Road in Cimahi City as a residential area with medium density [6]. The function of the buildings in this area is classified into four (4) categories; industry (1-to-2 storey
house-based industry and manufacturing industry), residential areas, and open spaces. 2-storey houses converted into commercial function are more commonly found on the corridor of Kademangan Road in the form of large and small-sized shops as it is the main access to the area (Figure 3).

**Figure 3.** The Pattern of Building Massing Based on Function in Pojok Tengah Village.

The main access to Pojok Tengah Village on Kademangan Road can be identified from a signage placed at the end of the corridor since 2011. The open space in this village is in form of a multifunctional main street corridor as an area for parking, circulation, playing football, wedding party as well as Independence Day celebration. (Figure 4, 5).

**Figure 4.** Signage of Pojok Tengah Village. **Figure 5.** Open Space of Pojok Tengah Village.

Vehicle circulation in Kampung Pojok village on Kademangan Road is classified into 4 hierarchies: secondary collector Street (Pojok Utara Street), neighborhood street (Kademangan Road), sub-neighborhood road (Swadaya and Saluyu Alleyways) and supporting passages [7]. (Figure 6).

**Figure 6.** Street Classification in Pojok Tengah Village on Kademangan Road.

Kademangan Road can be accessed by four-wheeled vehicles. However, the roads having hierarchy under it, namely Saluyu Alleyway, Swadaya Alleyway and supporting passages can only be accessed by two-wheeled vehicles. (Figure 7).
Figure 7. The circulation of two and four wheeled vehicles.

Pojok Utara Street is a secondary collector street with a width of 6 meters. This two-way street can be passed by four-wheeled vehicles in both directions. This street in which public transportation gains access has a medium vehicle-density. Meanwhile, linear channel drainage system is installed by the verge of the right and left shoulders. (Figure 8).

Figure 8. Pojok Utara Street.

Kademangan Road is the only access to the spicy cassava chips industry. With only 3 meters in width, this road is only fit to one (1) four-wheeled vehicle, without any channel drainage system and pedestrian walkway. The narrow road corridor results in congestion and makes it challenging for the transportation process, especially for the vehicles carrying raw materials for the industry, and garbage trucks. As it is a one way road, the corridor is used alternately. (Figure 9).

Figure 9. Kademangan Road.

Swadaya Alleyway functions as a sub road with 2.2 meters in width. This road corridor can still be traversed by one (1) four-wheeled vehicle. As the result of the narrow cross section of the road, motorists and pedestrians must take turns when travelling through the corridor. (Figure 10).

Figure 10. Swadaya Alleyway.
Saluyu Alleyway has a width of 1.25 meters and 2 two-wheeled vehicles can pass on both directions at the same time. (Figure 11).

The supporting passages are the sub road of the alleyways that can only be passed by one motorbike and used as pedestrian path. These sub alleys do not have official names because they are the circulation which is accidentally formed from the distance among dense, crammed housing. (Figure 12).

3.3 Activity Pattern
According to a comparative study conducted by a tofu processing factory in Nglongsor Village, there are stages in processing a product, it can be seen that the facilities and infrastructure contained in an industrial area [8]. The production process of cassava chips creates a space requirement in the manufacturing industry. The function of the space is adjusted to the production process of cassava chips which begins with the frying process, then followed by removal and draining, then seasoning process, packaging and lastly storage in warehouse for cassava chips ready for sale. Office space is provided to oversee the production process. (Figure 13).

The loading dock area provides relatively large dimensions with a building height of about 4 meters that transport trucks are able to enter to the area. Warehouse for storing cassava supplies and tools used in the production process of cassava chips is made adjacent to the loading dock area to
facilitate circulation flow. The frying and seasoning processes are executed in the dirty kitchen adjacent to the employee room and the packaging area. (Figure 14).

| Preparation Process of raw materials: cassavas are peeled & cut | Frying process: cut cassavas are fried and drained | Seasoning process | Packaging process |
|---------------------------------------------------------------|--------------------------------------------------|------------------|------------------|

**Figure 14.** Flow and space requirements for the process of making spicy cassava chips.

The concept of social sustainability in the home industry is achieved as the production process of spicy cassava chips from preparation to packaging creates an activity flow. The provision of social services is confirmed by the existence of a management organization structure to oversee ongoing business activities.

In accordance with the concept of sustainability in settlements, the maintenance of stable resources is applied by way of sustaining the existing cassava chip home business, started from Riki Chips to a profitable growing business.

### 3.4 Building Typology

The building massing typology in Pojok Tengah Village on Kademangan Road is featured by a different variety of forms and does not have any particular character or style. It is dominated by residential buildings with simple structures [9]. Residential buildings of which function has not transformed into industrial space usually retain their initial form. These houses are commonly found on small alleys. Having only one (1) floor, their basic shape is subtracted rectangle, topped by clay tile roof, shielded by painted brick walls with wooden doors and windows, and polished with 30x30cm ceramic tiles on the terrace floor. (Figure 15).

**Figure 15.** Facade of building massing functioned as 1 floor residential house.

Residential buildings of which function has been converted into cassava chip industries usually undergo changes in shape characterized by the presence of subtraction as well as addition of building mass. In Pojok Tengah Village on Kademangan Street there are as many as twenty three (23) 1-storey houses and eleven (11) 2-storey residential houses of which function has been converted into cassava chip industry. (Figure 16).
Changes in rooms’ function also occur due to space requirements of cassava chips industry. Residential houses commonly consisting of living room, bedroom and kitchen, have experienced addition and subtraction of functions. Living rooms and bedrooms that have been directly adjacent to the outside space are utilized as shops and production process areas. Meanwhile, living room and kitchen are converted into bedrooms [10]. (Figure 17).

On the other hand, 2-storey houses of which function have been changed, usually only sacrifice their 1st floors for industrial needs, while their 2nd floors are still maintained as residential areas. Shops, storage rooms and production process areas take place at the rooms which have previously been functioned as living rooms, family rooms and kitchens. (Figure 18).

Transformed 2-storey residential houses generally retain their original facade characters mainly featured by the use of tropical concept with their sloping roofs and canopies covered by clay roof tiles, terraces on the 1st floors and balconies on the 2nd floor, brick wall coated with paint as well as wooden window sills. (Figure 19).
Factory buildings are currently built specifically aiming at large-scale cassava chip production. The basic shape of the building mass is rectangular consisting of 1 floor. Adjusted to the activities carried out in the production process of cassava chips, this type of building consists of loading dock area, storage and cassava-cutting room, frying and seasoning room, packaging room, warehouse, employee room, office and toilet served as functional support. The facade of the building is quite simple in design with paint coated brick wall, metal roof and iron doors having relatively wide dimension. There is no window at the facade, but vent holes are provided at various places. (Figure 20).

In accordance with the concept of sustainable settlement, the preservation of stable resources is applied with maintaining residential buildings by optimizing the function of interior layout to fulfil industrial requirement.

4. Conclusion
The mass pattern of Pojok Tengah Village is the combination of linear and diffuse patterns. The linear patterns are found on the main access corridor of the spicy cassava chip industry on Kademangan road while the diffuse patterns are commonly found in inner areas, including Saluyu alleyway, Swadaya alleyway and supporting passages. These are natural / environmental resources that cannot be changed in the development of its sustainability.

The typology of mass form of Pojok Tengah village on Kademangan road is generally rectangular with various additive and subtractive adjustments. The shapes of the existing building mass are categorized into of which function is as residential houses and is as converted industrial buildings. The shift function happened to the converted industrial building mass was caused by the cassava chip production process ranging from the raw material preparation to packaging process. Moreover, some buildings also provide an area for sales. This notion supports the concept sustainability of
improvement in economic and social conditions, in a way that on average the people of Pojok Tengah Village do not need to change the physical structure of the buildings they have. They can still use them for different functions by optimizing the existing spaces to have multi functions so that the practice can reduce the negative impact of renewable resources. The additions to the layout of the residential house converted into industrial building have created new typology on the residents' settlement.

Launched as an industrial center, the area creates traffic congestion that occurs due to the narrow width of road corridors. It is a possibility to build a centralized loading dock area in the open space area that is directly adjacent to the main corridor (Kademangan road) so that it can reduce the accumulation of queuing motorcycles crossing Swadaya alleyway, Saluyu alleyway and supporting passages.

5. References

[1] Moles R, Kelly R, O’Regan B, Ravetz J and McEvoy D 2006 Methodologies for the estimation of sustainable settlement size
[2] Haris J M 2000 Basic Principle Sustainable Development (Tufts: Global Development and Environment Institute, Tufts University)
[3] Bakar A H A, Cheen K S and Rahmawaty 2011 Sustainable housing practices in malaysian housing development: Towards establishing sustainability index Int. J. Technol. 2 84–93
[4] Ekajati E S 2006 Masyarakat Sunda dan kebudayaannya (Jakarta: Girimukti Pasaka)
[5] Parker S R 2005 Sociology Of Industry (London: Unwin Hyman Boston Sydney Wellington)
[6] Anon 2012 Regulation of The City of Cimahi No. 4
[7] Anon 2016 Government Regulation of Classification Street NO. 34
[8] Irjayanti S 2019 PERAN HOME INDUSTRY TAHU DALAM MEMBERDAYAKAN EKONOMI MASYARAKAT DI DESA NGLONGSOR, KECAMATAN TUGU, KABUPATEN TRENGGALEK (Trenggalek)
[9] Funo S, Yamamoto N and Silas J 2002 Typology of Kampung Houses and Their Transformation Process--A Study on Urban Tissues of an Indonesian City J. Asian Archit. Build. Eng. 1 193–200 [crossref]
[10] Tutuko P 2017 Perkembangan Pola Spasial Kampung Pada Sentra Usaha Berbasis Rumah Tangga (Ubr) Mintakat J. Arsit. 18 39–52 [crossref]