Designing the Mitigation Model of Urban Sprawl Potential Impact in Suburban Denpasar, Bali

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Abstract. This study is aimed to list the impacts of urban sprawl in the suburban area in Denpasar City. The implications that force growth in suburban areas is responsible for undesirable pattern or process of urban growth. The consequences or the impacts of urban sprawl, whether negative or positive, are also necessary to be understood and evaluated towards achieving sustainable development. Urban sprawl means more growth than the usual and what makes it different from urban growth is this excessive nature. Cities tended to grow and planned extension reached while there is an appropriate proportion between urban growth and urban population. However, when the increase is more than usual, its pressure on the boundaries, suburban area will face new significant problems. Significant problems that occur in the suburbs of Denpasar include environmental, social, economic and mobility issues. The impact analysis of urban sprawl on these four dimensions forms the basis for determining comprehensive urban sprawl mitigation models in suburban areas.

1. Introduction
As a developing country, Indonesia's continuous and massive development of the region moves towards an urban nature. This phenomenon of change is known as urbanization. Urbanization as a process of transition from non-urban (rural) to urban, or a change from a lower level of urbanity to a higher level of urbanity [1]. The city as a center of activity has vast influence, both inward and outward-spacing. Development in the direction of the central business district, civic center, education center, and some cities show the majority of growth towards culture, tourism and health and sports — most cities with urban spatial planning, and urbanization. This phenomenon is because development in the city administration area has been thoroughly examined both concerning urban needs, problems faced by urban residents and the city's future targets.

A very opposite phenomenon is the urbanization that spreads out of town. Urbanization of this species is known as centrifugal urbanization. Centrifugal urbanization caused by the movement of the urban territory to the outer part of the nature of unity. Charles Colby’s Theory of Dynamic Power [2] mentions that centrifugal forces primarily determined by two forces, the pulling forces, and the driving forces. The pulling power is a force that draws the population or function towards the energy that located or that is at the destination of the movement. In centrifugal urbanization, this pulling force lies in the region of a uniform nature. While the driving force is the force of the movement or the origin of
the movement or origin of the movement, contrary to the forces of attraction, the driving force comes from the territory that has the urban nature. Various studies have demonstrated several factors that generate tensile strength and force in centrifugal urbanization, there are (1) low pollution, (2) low levels of crime, (3) least binding regulations, (4) low traffic density, (5) low land prices, (6) ensuring privacy, (7) better accommodating the need for socialization (Banai & DePriest, 2014; Habibi & Asadi, 2011; Yunus, 2010). While the cause of the emergence of the forces of attraction. In other words, city dwellers move out of town to live in non-urban areas.

The suburbs are the leading destination of the movement of urban dwellers. The morphology of the suburbs is the mixture of urban land use on the one hand, and the form of rural land use. Administratively, the suburbs are still within the administrative boundaries of the city and situated in the village territory adjacent to the city area. Suburban areas serve as a destination because city dwellers view to have a healthier family life, but can still live livelihood activities in urban areas without having to travel too far from the workplace. Based on that view, many urban dwellers are moving towards the suburbs and directly lead to an increase in the population in the suburbs. The suburban area of Denpasar, Bali Province is one of the suburbs that experience the phenomenon of centrifugal urbanization.

The population growth in the periphery in Denpasar City is in line with the population density and physical appearance of urban morphology. This growth is because population growth is always followed by increasing demands for residential space as well as space to accommodate new activities. Therefore, the open space of the population of urban areas [1]. The population of Denpasar increased from 649,762 in 2010 to 897,300 in 2017. The population growth of Denpasar City followed by an increase in population density of 5.085 inhabitants/km² in 2010 to 7425 inhabitants/km². The increase in population and the increase in population density directly affect the land use of the suburbs of Denpasar. Central Bureau of Statistics data of Denpasar shows the reduction of rice field farms from 2010 to 2017. In 2010 the land area of Denpasar City which used as paddy field was 2,693 ha and decreased to 2,444 ha in the year 2017 (Central Bureau of Statistics Denpasar, 2010; Central Bureau of Statistics Denpasar, 2017). While the reduction of agricultural land rather than rice fields decreased significantly, from 10,075 ha to 510 ha, in other words, some agricultural land in the suburbs of Denpasar City has transformed into a non-agrarian land. The existence of an increasingly large form of non-agricultural land use implies an outflow of urban land or known as urban sprawl.

Urban sprawl is a symbol of centrifugal urbanization that shows the city's growing strength and widespread, especially toward the suburbs. The urban spray arrives immediately and is brought directly by residents moving into the suburbs. On the other hand, many residents and functions in the suburbs are not ready to accept the arrival of the urban sprawl. Specifically, urban sprawl also defined as an uncoordinated development area [9]. The effect of rapid expansion and unpreparedness and mature maturity, urban sprawl can be a severe problem on the outskirts of Denpasar. The purpose of this paper is to design urban sprawl mitigation for suburban areas. Urban sprawl as an ongoing process, and impossible to complete in the suburbs of Denpasar to control, on the one hand, to reduce urban barriers, and on the other hand can reap positive opportunities from the existence of urban sprawl, both from the physical, socio-cultural and economy.

2. Methods
The specific objectives are to examine the impacts of urban sprawl and its mitigation model in the suburban area. The methodological procedure used is a qualitative approach via document and content analysis. This procedure includes an open-ended questionnaire, interviews and standardized observation schedules [10]. As to this study, the primary sources obtained by interview. A structured interview (questionnaire) used for selected informants, principally crucial government officials from the principal office and the offices of the heads of the sub-cities. They were chosen by using sampling. The observation was guided by a check-list that focused on the overwhelming situation of the growth of the city in the suburban area.
3. Result and Discussion

3.1 Urban Sprawl Threat in Denpasar Suburb

Consequences of urban sprawl may have both positive and negative impacts; however, negative impacts are generally more highlighted because this growth is uncontrolled or uncoordinated and therefore the negative impacts override the positive sides. The negative impact of urban sprawl in the suburbs of Denpasar as shown in Table 1.

| No | Aspects         | Negative Impact                                                                 |
|----|-----------------|---------------------------------------------------------------------------------|
| 1  | Environmental   | The extinction of *subak*; loss of valuable agriculture land; pollution          |
| 2  | Social Issues   | The entry of an unidentified person; reduced community ties; loss of rural heritage |
| 3  | Economic Issues | Consumerism lifestyle; materialistic; loss of occupation, primarily as a farmer  |
| 4  | Mobility Issues | Traffic congestion; accident by an inappropriate rider; lack of Parking          |

3.1.1 Environmental issues.

Farmers in Bali in general, and the suburbs of Denpasar, in particular, depend on *subak*. *Subak* is a cultural heritage associated with agricultural irrigation systems in Bali. Development and compaction of housing directly suppress and reduce the area of agricultural land, especially rice farming [11]. In addition to diminishing regarding quantity, concerning quality also decreased. The water that flows through this irrigation system has polluted by household waste and industrial waste. The secondary negative impact of this environmental issue is the decline in agricultural productivity. In another study, biologists claim that sprawling development causes degradation of natural habitats of several species [12], [13].

3.1.2 Social issues.

The entry of immigrants into the suburbs of Denpasar City is mostly only reported to bureaucrats so that the indigenous people do not know and know in detail about the identity and background of immigrants. On the other hand, many indigenous people, especially the productive age of the migrators or circular mobility out of the region. Migration and mobility were done with economic and educational motives. As a result of the movement of the population that is socio-cultural cannot be run properly. The secondary negative impact of this social issue is the degradation of the cultural heritage values of the ancestors. In another study, sociologists blame sprawl for spreading inequities among people by socially excluding residents of inner-city neighborhoods [14].

3.1.3 Economy issues.

Immigrants who live in the suburbs of Denpasar City still display the pattern of life that is urban. The migrant's lifestyle does not directly become a reference for the gradually transformed local people into townspeople. The local population grows a wasteful society and prioritizes consideration in various decision-making. The life of a glamorous immigrant population is also essential for locals called farmers. Selling agricultural land is a shortcut by farmers' families to follow lifestyles, or even search for children and families, which are not also needed by them. The negative impact of this economic issue is as a farmer. In another study, economists continue to be fanfare responsible for the loss of valuable agricultural land and a reduction in the value of land for agriculture where urban growth occurs [15].

3.1.4 Mobility issues.

Traffic congestion is a daily sight that can easily found in the suburbs of Denpasar. Traffic congestion occurs mainly in the early morning hours at work and at work hours in the afternoon. Traffic congestion resulted from road width unable to accommodate the number of vehicles. The number of
vehicles passing through the suburbs is not only from migrants but also from indigenous people vying to equip their children with vehicles, especially motorcycles — unfortunately, their child not equipped with knowledge of adequate traffic, and proper driving skills. Many traffic accidents have claimed the lives of minors in the suburbs. The secondary negative impact of this mobility issue is the number of children's motorcycle communities that endanger other traffic riders. In another study, urban sprawl makes traveling more expensive, particularly for the disadvantaged [16].

3.2 Urban Sprawl Opportunities in Denpasar Suburbs

Although sprawl describes and studies the negative impacts of sprawl, various opportunities are created as a positive impact. The positive impact of urban sprawl as shown in Table 2.

| No | Aspects           | Positive Impact                                                                 |
|----|-------------------|----------------------------------------------------------------------------------|
| 1  | Environmental Dimension | Drainage Improvement; adequate fresh water service; increase availability of public area |
| 2  | Social Dimension   | Knowledge transfer; family more planned; cultural diffusion                      |
| 3  | Economic Dimension | Taxes and Land rent; agglomeration; the growth of entrepreneurship               |
| 4  | Mobility Dimension | The use of public transportation; road Improvement; easier accessible             |

3.2.1 Environmental dimension.

The fact that the physical environment of the suburbs of Denpasar cannot be denied as a positive impact of urban sprawl. The improvement of the water supply and the adequacy of clean water is a clear proof of the advantages of urban sprawl. Household water waste previously only channeled through a small trench has now accommodated with large, well-drained gutters. On the other hand, meeting the needs of clean water for various purposes today is very easy to obtain. Residents no longer need to worry about water shortages during the dry season. The secondary positive impact is the establishment of adequate public space for the gathering of citizens. Another study by Downs (1994) mentioned the benefits of sizes and housing sizes.

3.2.2 Social dimension.

The local people are very layman for the advancement of science and technology, in the beginning, now more technologically literate and have a broader life insight. One program that successfully inserted due to urban sprawl is a family planning program. New families of residents in the suburbs of Denpasar City have consciously controlled birth rates, limiting the number of children to two. Thus there has been cultural diffusion leading to the creation of small, healthy and prosperous families as a secondary positive impact on the social dimension. In another study, Downs (1994) mentioned the benefits of urban sprawl as a range of lifestyle choices.

3.2.3 Economic dimension.

One of the lucrative economic opportunities for residents is to move in the field of house rental or store rental. This rental house is mostly occupied by migrants who work or attend school in urban areas. On the other hand, business opportunities in the suburbs are also getting more prominent due to agglomeration. Agglomeration provides various facilities, especially regarding facilities and logistics. The secondary positive impact of the economic dimension is the building up of entrepreneurial spirit among local people to be more creative and innovative in processing their various agricultural products or commodities in their area. In another study, Hartati, Budhi, & Yuliarmi (2017) indicated that technological progress had a positive effect on the welfare of farmers.

3.2.4 Mobility dimension.

Road improvement is another tangible proof of the opportunities created by the urban sprawl phenomenon. Broader, flatter and more traffic attributes facilitate the movement of local people, both
to meet their living needs and to carry out their various economic activities. The availability of a good road will also facilitate public transport services to enter so that transportation costs will be cheaper. The secondary positive impact is the increased coverage of the local population. In another study, Snyder & Bird (1998) considered the promotion of low-density residential lifestyles, easy access to open space at home and relatively short commuting times as positive impacts of sprawl.

3.3 Design of Urban Sprawl Mitigation Model in Denpasar Suburb

Mitigation in this study is related to the prevention view which states that the negative impact of urban sprawl poses a threat to the suburbs, and includes the inhabitants and the environment in it. This mitigation paradigm emphasizes the activity of identifying the steps to be carried out, and the prevention model implemented to avoid the threat of urban sprawl. The primary objective of this mitigation is the prevention of adverse impact events with the creation of structures that are resistant to specific threats, while the mitigation of vulnerable community behavior patterns done by relocation, socialization and education programs [20]. The activities that identify the steps to implement are as shown in Table 3.

| No | Phase       | Action                                                                 |
|----|-------------|------------------------------------------------------------------------|
| 1  | Phase I: planning | Finding the right strategies; organizing stakeholders; selecting strategies; identifying needs and establish partnerships; secure funding; looking out for typical challenges |
| 2  | Phase II: actuating | Preparing for the implementation program; coordinate with the stakeholder; reviewing materials related to the program |
| 3  | Phase III: caring | Commitment; monitoring; evaluation; reporting |

3.3.1 Planning phase.

Adopt the approach of "planning with the people" and not necessary "planning for the people" intending to collaborating the people's efforts with that of the government in their physical development bids. In the planning phase, identification and determination of essential aspects exist, especially about environmental, social, economic, health and population mobility issues. After the determination of these essential aspects, then a strategy is chosen that fits the needs of stakeholders and financing capabilities. Funding can be done by partnering with city agencies, other neighborhoods, and local non-profits (and identifies such organizations). In the planning phase is also taken into account in detail the challenges to be faced.

3.3.2 Actuating phase.

A key step in this phase is to prepare program implementation actions in a structured, pre-executed, implementation and after program implementation. Activities before execution include coordination with all stakeholders as well as materials that support the program. At the time of performance, the action taken is to implement the plan following the design that has been designed together in detail. For the post-program step, is the dissemination of information related to the implementation of the program to all residents who come from outside the region, especially residents of urban areas.

3.3.3 Caring phase.

This third phase focuses on strengthening the commitment of stakeholders in running the program consistently and consistently. Conduct periodic and transparent supervision to support program accountability. Conduct comprehensive evaluations and prepare program implementation reports, both monthly and yearly reports. The programs that can alternatively mitigate the threat of urban sprawl in the suburbs of Denpasar as shown in Table 4.
Table 4. Alternative Urban Sprawl Mitigation Programs in Suburban Areas

| No | Aspects          | Mitigation                                                                 |
|----|------------------|-----------------------------------------------------------------------------|
| 1  | Environmental    | Creating urban boundaries; protecting of lands; reusing vacant land         |
|    | Issues           |                                                                             |
| 2  | Social Issues    | Controlling the identity of newcomers or guest; providing community space;   |
|    |                  | preserving rural/culture heritage                                          |
| 3  | Economic Issues  | The incentive for the farmer; support entrepreneurship                        |
| 4  | Mobility Issues  | Controlling travels; ensuring the financial basis for public transportation  |

4. Conclusion

In this research by surveying urban sprawl negative and positive impacts, we designed mitigation model of urban sprawl in the suburban area. According to the results, the main negative consequences of emersion this phenomenon are environmental issues, social issues, economic issues, and mobility issues. But regardless of the effects of urban sprawl, this issue finally leads to some problems in the environment and social interactions, increasing consumerism lifestyle, traffic, and congestion. Therefore, according to these problems we should utilize proper actions. Participate in planning steps, actuating steps and caring steps that can be used as appropriate mitigation for the fixed problem. In the end, we have to indicate that regardless of alternate mitigation. Moreover, according to the suburban characteristics, we may do policy-making and apply appropriate strategies for urban sprawl control.

References

[1] Dubey P and Kumar D, 2013 Urban Sprawl and its Impact on Urban Environment J. Mech. Civ. Eng. 9, 5 p. 26–31.
[2] Colby C, 1959, Centrifugal and Centripetal Forces in Urban Geography, in Reading in Geography, Mayer and Kohn, Eds. (Chicago: University of Chicago Press).
[3] Squires G D, 2002, Urban Sprawl and the Uneven Development of Metropolitan America, in Urban Sprawl: Causes, Consequences, and Policy Responses, (Washington, DC: Urban Institute Press), p. 1–22.
[4] Yunus H S, 2010 Megapolitan: konsep, Problematika dan Prospek Yogyakarta: Pustaka Pelajar.
[5] Habibi S and Asadi N, 2011 Causes, Results and Methods of Controlling Urban Sprawl in International Conference on Green Buildings and Sustainable Cities p. 133–141.
[6] Banai R and DePriest T, 2014 Urban Sprawl: Definitions, Data, Methods of Measurement, and Environmental Consequences J. Sustain. Educ. 7, 1 p. 1–15.
[7] Statistics C B of, 2010 Denpasar in Figures 2010 Denpasar.
[8] Statistics C B of, Denpasar in Figures 2017 Denpasar.
[9] Nnaemeka-okeke R, 2016 URBAN SPRAWL AND SUSTAINABLE CITY DEVELOPMENT IN NIGERIA J. Ecol. Eng. 17, 2 p. 1–11.
[10] Gray M and Webb S A, 2011 Social Work Theories and Methods J. Community Pract. 19, 3 p. 326–328.
[11] Bytyqi V, 2018 The Impacts of Settlement Extension on Soil Resources : A Case Study in Drenica River Basin (Kosovo) 19, 1 p. 101–113.
[12] Boone R B and Krohn W B, 2000 Predicting Broad-Scale Occurrences of Vertebrates in Patchy Landscapes Urban Stud. 15, 1 p. 63–74.
[13] Calme S and Desrochers A, 2000 Biogeographic Aspects of the Distribution of Bird Species Breeding in Québec’s Peatlands Urban Stud. 27, 3 p. 725–732.
[14] Power A, 2001 Social Exclusion and Urban Sprawl: Is the Rescue of Cities Possible? Urban Stud. 35, 8 p. 731–742.
[15] Nelson A C and Duncan J B, 1995 Growth Management Principles and Practices Chicago: Planners Press.
[16] Horan T A and Jordan D R, 1995 ITS, Land Use and Sustainable Communities in Transportation and Sustainable Communities.
[17] Downs A, 1994 New Visions for Metropolitan America Washington DC: The Brookings Institution.

[18] Hartati G A R Budhi M K S and Yuliarmi N N, 2017 Analisis Faktor-Faktor Yang Mempengaruhi Kesejahteraan Petani Di Kota Denpasar E-Jurnal Ekon. dan Bisnis Univ. Udayana 6, 4 p. 1513–1546.

[19] Snyder K and Bird L, 1998, Paying the Costs of Sprawl: Using Fair-Share Costing to Control Sprawl.

[20] Wesnawa I G A and Christiawan P I, 2014 Geografi Bencana Jakarta: Graha Ilmu.