Sustainable Development of Small Islands in The Border State Area Through Strengthening The Role as a Growth Center

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Abstract. The problem of small islands in the national border area related to development policy interventions is still lacking. Geographical position, raises problems in relation to regional accessibility. This is partly due to the remote geographical location, the economic scale of the business, inadequate transportation conditions, limited facilities and infrastructure such as electricity, roads, telecommunications, clean water and others. Small islands as an entity that has a size, special characteristics and vulnerabilities, so the planning and management of small islands require a different format from large islands. In connection with these problems, it is necessary to increase development interventions through the role of strengthening the role as a center for sustainable growth. Through a descriptive approach with scalogram analysis and clustering, determining the role as a growth center with a coverage area of influence can be done. Economic and socio-cultural. The center of growth and grouping of islands is an approach taken to provide direction for spatial planning for small islands.

Keywords: growth center, island grouping, sustainable small island

1. Research Background
An archipelago is mutually inter-dependent and needs a service center that is the center of the activities of various surrounding islands to be able to serve the various needs of the population, because in it there are various subsystems including economic, social/demographic, cultural, and ecological [1]. Small islands are no exception, which still has a relatively high inter-regional dependence. Its location is relatively remote, so it requires a service place to accommodate these remote areas so that they are connected to each other. For this reason, it is necessary to have a growth center role so that other islands/regions can be served, although to get it, it must be between islands.

Growth centers can be started from the concentration of development efforts in centers of growth with the hope that those growth poles will transform the hinterland of the lagging regions, which can have a spread effect on influencing the coverage area [2]. The concept of a growth center can be explained in two ways, namely functionally and geographically. Functionally, the growth center can be explained as a location of concentration whose relationship nature has dynamic elements so that it can stimulate economic life both inside and outside (the back area). Geographically, the growth center has various facilities and conveniences so that it becomes a center of attraction (pole of attraction), which causes various kinds of businesses to be interested in carrying out economic activities in that place and people are happy to come to take advantage of the existing facilities in the city, although it is possible
there is no interaction between businesses and growth center spread effects tend to extend economic activities to around area of growth center [3].

Strengthening the growth center is needed because it is hoped that the role of this growth center can influence growth with the surrounding area being affected and triggered to move forward and make sustainable development [4]. It needs to be followed by the development of infrastructure, transportation, communication and social institutions which can naturally increase investment attractiveness. The implementation of the creation of a growth center must be followed by a low impact (trickle-down effect) and the impact of spreading (spread effect) through harmonious activities between the growth center and the resource base in the surrounding area so that the activities of the growth center have an impact on the surrounding small islands.

Anambas Archipelago Regency is a district in the Riau Islands Province, a division of Natuna Regency. The activity center of the Anambas Archipelago Regency is in Tarempa Village, Siantan District, so it is used as the capital of the Regency. This district has an area of 590.14 km² which is divided into 10 sub-districts and 54 villages. The analysis used is the Guttman scalogram to examine the growth center of the Anambas Archipelago Regency as one of the islands in the national border area.

The development of border areas is one of the directions of national development policies outlined in the RPJMN 2020-2024, focusing on fulfilling basic services, increasing accessibility, and developing economies that support the growth centers of the surrounding areas. It is necessary to strengthen growth centers to maximize the potential of the archipelago to have a broad multiplier effect, to create jobs, income and foreign exchange if managed properly [5]. However, in the Anambas Archipelago RPJMD 2016-2020, there are strategic issues related to development issues related to regional connectivity so directions for the development of Regional Activity Centers (PKW), Local Activity Centers (PKL), Regional Service Centers (PPK), Development Programs for Environmental Service Centers (PPL) are carried out as well as the spatial planning program. In this study, it can be seen that there is a service center in the Anambas Archipelago Regency to strengthen the role of the growth center so that it can accommodate the surrounding area so that it is served. In relation to studying how this role plays, one modality approach flows from the center to the periphery, remote areas need growth centers for the regions within their scope.

2. Methods

2.1. Scalogram Guttman Analysis

Calculation of scalogram analysis requires indicators of completeness of supporting facilities. From the facility data collection, the distribution of facilities in 9 (Nine) Districts in the Anambas Archipelago Regency is educational, religious, health, economic, and transport. Based on the availability of these facilities, a scalogram compiled with an assessment of each component using the following formula:

\[ KF = \frac{JF}{N} \times 100 \]

KF is strength value of a region/functional completeness (%), and then JF is number of functions/facilities in an area and N is number of types of facility criteria in an area. Scalogram analysts calculate to identify the distribution of functions of social and economical service facilities as well as the hierarchy of development centers and infrastructure for the development of the Anambas Archipelago Regency, it is distributed based on regional groups. In the scalogram analysis, the facility data collection for each region was carried out and a description of the service facility scalogram code was examined in this study as follows.

| Service Facilities | Description       | Service Facilities | Description |
|--------------------|-------------------|--------------------|-------------|
| 1                  | Kindergarten education | 21                 | Bank        |
### Service Facilities

| No | Description                  | Number |
|----|------------------------------|--------|
| 1  | Elementary/MI education      | 22     |
| 2  | Middle school/MTS education  | 23     |
| 3  | High school education        | 24     |
| 4  | Hospital                     | 25     |
| 5  | Polyclinic                   | 26     |
| 6  | Public health center         | 27     |
| 7  | Auxiliary health Center      | 28     |
| 8  | Clinic                       | 29     |
| 9  | Midwife practice             | 30     |
| 10 | Pharmacy                     | 31     |
| 11 | Village medicine post        | 32     |
| 12 | Herb shop                    | 33     |
| 13 | Mosque                       | 34     |
| 14 | Mushalla                     | 35     |
| 15 | Protestant church            | 36     |
| 16 | Catholic church              | 37     |
| 17 | Temple                       | 38     |
| 18 | Monastery                    | 39     |
| 19 | Cooperative                  | 40     |

### Result

This research used scalogram and clustering analysis to identify service centers in the Anambas Archipelago by identifying the number of facilities in each region [6]. The categorization of each region in this study is within the scope of each sub-district in the Anambas Archipelago Regency. The higher the number of facilities, the higher the hierarchical level, so it is considered that the uppermost region has the highest service capability, while the calculation of the scalogram in the Anambas Archipelago Regency is as follows.

#### Table 2. Scalogram with Guttman Scale by District in Regency of Anambas Archipelago.

| No | District       | Total Pop. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 |
|----|----------------|------------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | North Siantan  | 1892       | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 2  | Palmatak      | 10862      | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| 3  | Siantan       | 12544      | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 1 |
| 4  | Central Siantan| 3679      | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 |
| 5  | East Siantan  | 3594       | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 6  | South Siantan | 3113       | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 7  | Jemaja        | 5785       | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| No District | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | Total Facilities (TF) | Completeness of Facilities (CF) (%) | Hierarchy |
|-------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------|---------------------------------|-----------|
| 1 North Siantan | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 18 | 43.90 | IV |
| 2 Palmatah | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 26 | 63.41 | I |
| 3 Siantan | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 31 | 75.61 | I |
| 4 Central Siantan | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 23 | 56.10 | II |
| 5 East Siantan | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 20 | 48.78 | IV |
| 6 South Siantan | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 22 | 53.66 | III |
| 7 Jemaja | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 27 | 65.85 | II |
| 8 West Jemaja | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 17 | 41.46 | IV |
| 9 East Jemaja | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 20 | 48.78 | IV |

Notes: Kute Siantan District is still included as part of the Palmatah District

In scalogram Guttman analysis, the results were obtained in the form of a hierarchy of each sub-district in the Anambas Archipelago Regency. Hierarchy number one (I) can be concluded to be the growth center of the surrounding area because there are more complete service facilities and more in number so that it can accommodate remote areas around it so that they are interconnected between sub-districts.
Figure 1. Anambas Archipelago District Urban System Map.

Anambas Archipelago Regency has 2 sub-districts with the position of the hierarchical urban system I, 2 sub-districts with the position of the hierarchical urban system II, 1 sub-district with the position of the hierarchical urban system III, and 4 sub-districts with the position of the hierarchical urban system IV. Based on the function/role of the service, the details of each village are as follows.

Figure 2. Anambas Archipelago District Service Function Analysis Map.

The results of the scalogram analysis are the service role of the Anambas Archipelago Regency, when detailed in each village there is an orde I located in Tarempa Village, Siantan District which has a service function as a Regional Activity Center (PKW). Furthermore, in orde II, there were 3 villages that had a service function as a Center for Local Promotion Activities (PKLp). In orde III, there were 20 villages that had a service function as Regional Service Centers (PPK). Last, in orde IV, there are 30 villages that have a service function as an Environmental Service Center (PPL).
With the resulting roles and positions, the regional growth propagation mechanism is able to increase the progress of border areas as evidenced by the speed of movement and transactions of economic activities that arise as a result of interactions between each growth center. Especially between the main economic centers and other small islands. Through the role of each growth center, a structure of relations and interactions is created as well as the mobility of the movement of goods and people, which in the end is regional growth.

The concept of a growth center was initiated by Francois Perroux's view that the growth pole is a driving force in the economic sector of a region that is able to influence the growth of existing activities both economically, socially and institutionally. Perroux stated that growth does not occur in any place and does not occur simultaneously, but that growth occurs at points that then act as growth poles. These growth poles have varying intensities with growth spreading along with a variety of channels with varying impacts on the region's economic activity [7]. In addition, Perroux also argues that the development of a region and economic development as a comprehensive development that includes various aspects of changes in the structure of the city both economically, socially and institutionally.

Associated with the scalogram and clustering analysis results, there are three main growth centers categorized as hierarchies I and II in the Anambas Islands Regency, namely Siantan District on Siantan Island, Palmatak District and Central Siantan District on Matak Island, and Jemaja District on Jemaja Island. The grouping of the main growth centers on three islands, namely Siantan Island, Matak Island and Jemaja Island at the same time also confirms that each of these islands has a nodal role with a wide area of influence over other sub-districts in one cluster.

The Matak Island system with a hierarchical center in the city of Tebangladan oversees the area of influence of the Palmatak District (including the expansion area of Kute Siantan District), Central Siantan District and North Siantan District. At the same time, the Siantan Island system with a hierarchical center in the city of Tarempa which also acts as the district capital covers the area of influence of Siantan District, South Siantan District and East Siantan District. The Jemaja Island system with a hierarchical center in Letung city covers the Jemaja District, East Jemaja District and West Jemaja District.

The island system that shows the relationship between the main island and the distribution of small islands around it is created as a form of interaction between the flow of goods and people [8]. These linkages are operationally driven by three mainstream approaches, including:

1. Existence of Leading Industries and Propulsive Enterprises
   The growth centers in each of the main islands have business activities and large-scale companies based on natural resources (oil and gas mining, fisheries agro-industry and tourism) that are propulsive. The company's activities are propulsive, i.e., a relatively large company creates a real growth impetus for the surrounding environment, has a high level of innovation and is included in a fast-growing processing business (industry). This company is a leading industries company that dominates other economic activities with the following characteristics:
   a. Relatively new, dynamic and supported by advanced technology that is able to encourage conducive growth into a high market elasticity.
   b. Having strong industrial links with other sectors to form forward linkages and backwash linkages.

   The existence of driving industries at the growth poles in each of the main islands has implications for a wide scale of services and tends to dominate other business activities that have a smaller scale, have a strong influence on inter-industry links and show strong growth capabilities. The Matak Island system is supported by oil and gas mining activities, the Siantan Island system is supported by fisheries and tourism agro-industry activities, and the Jemaja Island system is supported by agricultural and tourism activities.

2. Polarization Approach
   The fast growth of leading industries will push the polarization of other small island economic units to the growth poles. This polarization process is very beneficial for the industry which will eventually
form agglomerations that provide benefits in the form of agglomeration benefits both internally and externally to the company concerned. This advantage has an external scale for the industry but has an internal scale for the small island urban center hereinafter referred to as the small island urbanization advantage.

The advantages of small island urbanization include the development of the labor market, the ease of entering a larger market, the existence of a private and government sector that provides a wide range of services to residents and businesses. This agglomeration will lead to geographic polarization of the surrounding small islands by channeling resources to the concentration of economic activity in growth centers.

3. Spread Effect Approach

The dynamics of the growth center's propulsive efforts will disperse and enter the surrounding spaces. According to Myrdal and Hirschman [9], this scattering is in the form of a spread effect or trickling down effect, which is the opposite of the backwash effect or polarization effect. Based on the operational mechanisms of the three approaches above, the effect of strengthening the role of growth centers in performance can be seen from:

1. Growth Center Infrastructure, the availability of infrastructure in growth centers is intended to support the main economic and social objectives. In the context of public spending, it is limited to wide-scale service facilities. Mainly to support the function that connects the growth center with small islands around it in one cluster. For example, transportation infrastructure in the form of new development and improvement of transportation access that has been planned.

2. Economic Activity (Agglomeration), the concentration of economic activity in the growth centers of small islands is mainly on propulsive activities that have forward and backward links. This is influenced by the existence of investment flows that enter directly into growth centers and are associated with the exploitation of economic agglomerations. The concentration of economic activity or agglomeration is highly dependent on the complete infrastructure of the growth center.

3. Planned Poles Based on their Comparative Advantage, spatial policies to develop growth poles are based on aspects of comparative advantage, population, and economic performance of small islands. The strengthening of the role of growth centers gave rise to two different patterns, firstly changes in the spatial structure of small islands, especially in the planned growth centers, secondly, population redistribution and labor production factors with low salaries towards small island growth centers which have an effect on other sectors, namely trade and services. Changes in the spatial structure and redistribution of production factors will be able to attract investment into the growth centers of small islands and improve the economic performance of the surrounding small islands.

The island system by strengthening the role of the growth center will form a network system that must be developed as a collection and distribution site for the surrounding small islands. To support the implementation of this, there are three important elements that must be considered:

a. Hierarchy, namely the level of service from the low level found in the centers of the surrounding small islands to the high level of service found in the growth center of the main island.

b. Threshold population, namely the minimum population that can support service activities. So certain types of facilities require a different threshold population from other facilities.

c. The scope of the market, namely the maximum market distance that must be traveled by residents of a small island to a service center, if outside the service distance, residents will look for other service centers. The scope of the market can also be said to be the limit of the influence of a service center on the surrounding area or reflect the island cluster system.

Finally, to be able to realize the role of growth centers in the context of efforts to develop small islands in border areas, it is necessary to:
1. The strategy of integrating the entire economic system with the aim of achieving growth and equity, by providing the widest possible access to the economic growth of small islands. The aim is to directly increase productivity, expand job opportunities and increase the income of the majority of the population in the back area.

2. Decentralization of investment from the main growth centers that function as centers of service, marketing, distribution and transportation facilities to small island areas. This is intended so that small islands which are located remotely or on the outskirts have the widest possible access to be able also to develop. Thus, the growth center of the small island with the surrounding small islands is an integrated whole.

3. Spatial planning that places the pattern of settlement space on small islands as a system of service centers arranged in stages based on the characteristics of functions and roles based on service activities and scope of services. These roles and functions can be in the form of regional activity centers (PKW) or national border activity centers (PKSN), local activity centers (PKL), regional service centers (PPK) and local service centers (PPL).

4. **Conclusion**

Small islands in national border areas have problems related to development policies that are still lacking. In the form of an archipelago located in the border area of the country, it seems that the area is relatively remote, plus small islands, usually, the dependence between regions is relatively high. So it requires one place of service to accommodate these remote areas so that they are interconnected and strengthen the role of growth centers for sustainable development.

Anambas Archipelago Regency is a district in the Riau Islands Province that has an area of 590.14 km² and is divided into 10 sub-districts and 54 villages. The capital of the Anambas Archipelago Regency is in Tarempa Village, Siantan District, so it is used as a center of activity. The analysis used is the scalogram Guttman to study the growth center of the Anambas Archipelago Regency as one of the islands in the national border area.

The results of the study showed that Siantan and Palmatak sub-districts were in the hierarchical urban system I, Jemaja and Central Siantan were in the hierarchical urban system II, South Siantan was in the hierarchical urban system III, and North Siantan, East Siantan, West Jemaja, and East Jemaja were in hierarchical urban system IV. If each village is detailed, there is one village named Tarempa village which has a service function as a Regional Activity Center (PKW). Furthermore, in order II, there were 3 villages that had a service function as a Center for Local Promotion Activities (PKLP). In order III, there were 20 villages that had a service function as Regional Service Centers (PPK). Last, in order IV, there are 30 villages that have a service function as an Environmental Service Center (PPL).

Its existence as a growth center for small islands on the border through strengthening its role is to be able to accelerate the development of border areas as leading, remote and underdeveloped areas. Through strengthening the role, the growth center supported by propulsive activities will be able to attract other activities to revive the area through the multiple impacts that arise. Strengthening the role as a center for the growth of small islands must be supported by the existence of various infrastructures as a condition for meeting the needs of these small islands.

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