

Mapping and projection of social development pillars of Sustainable Development Goals in Tomini Bay Region, Indonesia

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Abstract. This study aims to map and project the achievement of Sustainable Development Goals (SDGs) Goal 2 targets in the Tomini Bay region, Indonesia. This study analyzes seven main SDGs Goal 2 indicators across 11 districts/cities and employs a mixed-method approach, combining quantitative secondary data analysis with qualitative assessments of regional policies and programs. The results showed significant variations in indicator achievement among regions. The North Sulawesi and Gorontalo Provinces demonstrated better-projected achievements than Central Sulawesi. Indicators for the prevalence of undernourishment and stunting are critical in most areas. Data limitation is a significant constraint, with only 1-5 of the 16 identifiable and projectable indicators. The study concluded that strengthening data collection systems, focused interventions in low-achieving areas, and inter-regional collaboration are necessary to accelerate the achievement of SDGs targets. These findings can serve as a foundation for local governments to formulate targeted sustainable development policies in the Tomini Bay region.

1 Introduction

The Sustainable Development Goals (SDGs) have become a global commitment to improving societal welfare, emphasizing five main pillars: people, the planet, peace, prosocial, and partnership [1-3]. Integrating SDGs into national and regional development agendas is crucial for achieving Indonesia's global targets. Recent studies have shown that many regions in Indonesia need to align their development plans with SDGs targets [4, 5]. The Tomini Bay region in Indonesia is located at the equator and boundary of the distribution of Asian flora and fauna (Wallace-Weber). As an area crossed by the equator, this region has potential fishery resources and biodiversity of marine and terrestrial biota [6-10]. In addition, it is included in the Coral Triangle Initiative and World Coral Reef Triangle, and the fishing

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area is estimated to be 28,208 km² [11]. Tomini Bay has natural beauty with 1,031 hectares of coral reef area and 785.10 hectares of mangrove forest. This encourages the Indonesian government to create the world's most significant marine tourism areas [12].

However, the bonus of abundant and strategic natural resources in these three provinces has not been able to overcome the problem of poverty in various sectors in the Tomini Bay region. Data from [13] and [12] show that of the three provinces within Tomini Bay, each region (district) has a high poverty rate. At the provincial level, Gorontalo Province had the highest poverty rate, followed by Central Sulawesi Province; rural poverty in these two provinces was 23.45% and 14.69%, respectively. In North Sulawesi, South Bolaang Mongondow District in 2019 had a poverty rate of 13.27%, the highest among 15 districts/cities. The Boalemo District's 18.87% was the highest among the six districts/cities in Gorontalo. The Tojo Una-Una district has a poverty rate of .16%, the second-highest poverty rate in Central Sulawesi.

These facts highlight the need for targeted interventions aligned with SDGs. The novelty of this research lies in its comprehensive approach to mapping and projecting the achievement of the SDGs, specifically for the Tomini Bay region, with a focus on Goal 2 (Zero Hunger). In contrast to previous studies that have examined the implementation of SDGs at a broader national level or in an urban/rural context [14-19] this study provides a more detailed and region-specific analysis. In particular, a more comprehensive study of the Tomini Bay region is needed, especially in mapping social, economic, and environmental conditions, against SDGs pillar goal 2 indicators. The lack of baseline data for Goal 2 can hinder effective policymaking and program development tailored to the region's unique characteristics. By combining data from various sources (such as BPS, SUSENAS, PODES, and SAKERNAS), this research offers a unique perspective on the challenges and opportunities for achieving the SDGs in the coastal region of Tomini Bay, which covers several provinces.

The research questions were as follows: (1) What are the current conditions related to food security in the Tomini Bay region that affect the achievement of Goal 2 (Zero Hunger)? (2) What evidence-based recommendations can be proposed to improve development strategies related to the SDGs in the Tomini Bay region? Based on these questions, the objectives of this study are as follows: (1) to map the current state of SDGs indicators, with a particular focus on Goal 2 (Zero Hunger) in the Tomini Bay region; (2) to project the achievement of SDGs targets in the region by 2030; (3) to identify gaps and opportunities in current development strategies to achieve SDGs in Tomini Bay; and (4) to provide data-based recommendations to policymakers and stakeholders to improve the achievement of SDGs in the region.

2 Methods

This study seeks to provide a data bank of socioeconomic conditions based on the SDGs on the social pillar (Goal 2) in the Tomini Bay Region. The study location includes 11 districts and cities in the Tomini Bay region. This study used a quantitative descriptive method and primary data from published secondary data, mainly from the BPS [20]. The secondary data source maps used in this study were as follows:

1. Data on social, economic, and environmental conditions were sourced from routine BPS publications (region in figures, labor statistics, and people's Welfare Statistics).
2. Microdata in the form of raw data from several surveys, including the national social and economic survey (SUSENAS), village potential survey (PODES), national labor force survey (SAKERNAS), and other published sectoral data.

Using the Excel application, the data were analyzed using descriptive statistical techniques, such as averages, achievement ratios, and simple projections. Furthermore, the achievement of SDGs targets was determined by comparing the results of the SDGs indicator projections with global targets and targets based on Presidential Regulation No. 111 of 2022 [21]. The projection analysis method uses trend projections based on business-as-usual and scorecard methods. The scorecard method gives value to the achievement of SDGs targets resulting from projections of the baseline trends of selected indicators at the provincial level. The results of the SDGs indicator projections obtained are mapped based on the SDGs indicator achievement criteria consisting of five groups, namely:

1. Group A are indicators that are predicted to have a 100% achievement rate by 2030.
2. Group B are indicators that are predicted to have an achievement rate of at least 90% of the target by 2030.
3. Group C are indicators that are predicted to have an achievement rate of at least 75% of the target by 2030.
4. Group D are indicators that are predicted to have an achievement level of at least 50% of the target in 2030.
5. Group E are indicators that are predicted to have a level of achievement below 50% of the target in 2030.

The research procedure is illustrated in Figure 1.

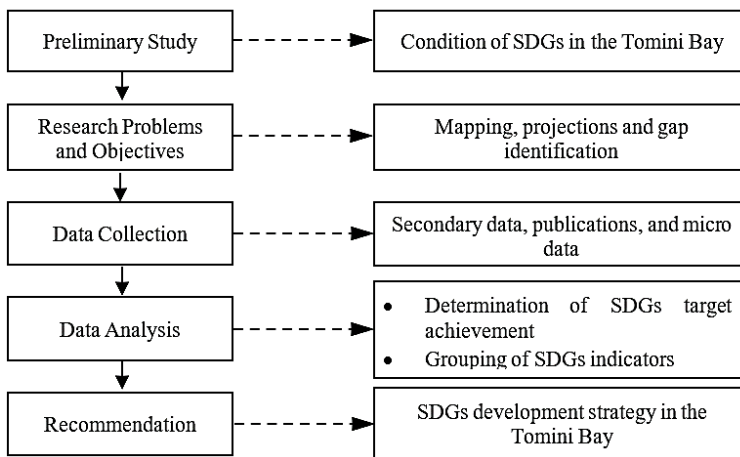


Fig. 1. Research procedure

3 Result and Discussion

3.1 Research results

Poverty is a problem faced by local governments in the Tomini Bay region, which is exacerbated by the COVID-19 pandemic, making it more difficult for the government to accelerate the achievement of SDGs [12]. While Indonesia is entering the "decade of action" period in the SDGs, each region has implemented the stages of SDG-based development. Therefore, each region must bounce back after the COVID-19 pandemic to restore the economy and social conditions of the community. One of the efforts that can be made is to make available data that portray regional profiles in the Tomini Bay region based on SDG indicators to effectively and efficiently formulate strategies and directions for sustainable development. One of the pillars of SDGs is the social pillar, which consists of five goals. The

social pillar focuses on fulfilling fundamental human rights in a fair, quality, and equal manner to realize community welfare sustainably by the targets of the five SDGs goals according to the 2020 edition II metadata published by the Ministry of National Development Planning/Bappenas [22]. SDGs Goal 2 (zero hunger) has eight targets and 16 indicators. The SDGs Goal 2 Indicators in Metadata Edition II are shown in Table 1 [23].

Table 1. SDGs Goal 2 Indicators

No	Indicator Code	Indicator Name
Goal 2		
1	2.1.1*	Prevalence of undernourishment
2	2.1.2*	Prevalence of moderate or severe food insecurity in the population, based on the Food Insecurity Experience Scale (FIES)
3	2.2.1*	Prevalence of stunting (height for age <-2 standard deviation from the median of the World Health Organization (WHO) Child Growth Standards) among children under 5 years of age
4	2.2.2*	Prevalence of wasting (body weight/height) in children under five years of age, based type
5	2.2.2.(a)	The quality of food consumption is indicated by the Expected Food Pattern (PPH) score.
6	2.2.3*	Prevalence of anemia among pregnant women aged 15-49 years
7	2.3.1*	Volume of production per labor by class of crop/livestock/fishery/forestry farming business
8	2.3.1(a)	Agricultural value added per labor by crop/livestock/fishery/forestry farming business class
9	2.3.2*	Average income of small-scale agricultural producers by subsector
10	2.4.1(a)	Proportion of agricultural land area designated as sustainable food agricultural areas
11	2.5.1*	Several plant and animal genetic resources for food and agriculture are stored in conservation facilities, either in the medium or long term
12	2.5.2*	Proportion of local livestock breeds at risk of extinction
13	2.a.1*	Agriculture orientation index (IOP) for government spending
14	2.a.2*	Total development assistance (ODA) and other aid are available to the agricultural sector.
15	2.b.1*	Agricultural export subsidies
16	2.c.1*	Indicator of food price anomalies

3.1.1 Baseline data analysis of SDGs social pillar Goal 2 in the Tomini Bay region

The Social Development pillar, especially Goal 2, shows that in North Sulawesi Province, only three indicators can be identified for achievement (2.1.1, 2.1.2, and 2.2.1) The South Bolaang Mongondow District recorded only three indicators that could be identified for achievement (2.2.1, 2.2.2, and 2.2.3), and no indicators could be identified for achievement. Other indicators could not be identified because of the unavailability of micro-and sectoral data for a more accurate projection of these indicators.

Three indicators of the SDGs of Social Development Goals Pillar 2 from Central Sulawesi Province can be identified based on available data in Central Sulawesi Province (2.1.1, 2.1.2, 2.2.1*). One indicator was identified as being achieved for Banggai district, Parigi Moutong district, and Tojo Una-Una district (2.2.1). For the Poso district, two indicators could be

identified as being achieved based on the available data (2.2.1 and 2.2.2(a)). Several indicators in Central Sulawesi, Banggai, Tojo Una-Una, Poso, and Parigi Moutong Districts could not be identified because of the unavailability of data from the BPS for a more accurate projection of the achievement of these indicators.

SDGs Social Development Goals Pillar 2 from Gorontalo Province, five indicators could be identified for achievement based on available data (2.1.1; 2.1.2; 2.2.1; 2.2.2; and 2.2.2(a), from Pohuwato District, Boalemo District, and Gorontalo District, one indicator could be identified as achieved (2.2.1). From Bone Bolango district, three indicators were recorded (2.2.1, 2.2.2, 2.2.2), and from Gorontalo city, two indicators could be identified (2.2.1 and 2.2.2). Meanwhile, other indicators cannot be identified because of the unavailability of both micro and sectoral data for more accurate projections of these indicators.

3.1.2 Mapping and projection of SDGs achievement by 2030 for SDGs indicators in Tomini Bay Region

The results of the search for SDGs indicators for each province/city in the Tomini Bay region based on the availability of data for Social Development Goals Pillar 2 are described as follows:

- a. North Sulawesi Province. Several SDGs indicators were identified and projected for achievement (Table 2).

Table 2. Projected Achievement of SDGs in North Sulawesi Province by 2030

Indicator	PR Target No. 111/2022	Achievement 2018 (%)	Projections 2024 (%)	Projections 2030 (%)	Achievement Status(%)	Category
North Sulawesi Province						
2.1.1*	Decreased	3.12	11.01	35.85	<50	D
2.1.2*	Decreased	10.08	2.27	-3.79	>100	A
2.2.1*	Decreased	15.70	7.24	4.05	>100 %	A
South Bolaang Mongondow District						
2.2.1*	Decreased	33.80	2.71	0.30	>100	A
2.2.2*	Decreased	11.	4.10	1.6	>100	A
2.2.3*	Decreased	0.062	5.26	9.48	<50	D
East Bolaang Mongondow District						
not identified						

- b. Central Sulawesi Province. Several SDGs indicators were identified and projected for achievement (Table 3).

Table 3. Projected Achievement of SDGs Central Sulawesi Province in 2030

Indicator	PR Target No. 111/2022	Achievement 20018 (%)	Projections 2024 (%)	Projections 2030 (%)	Achievement Status (%)	Category
Central Sulawesi Province						
2.1.1*	Decreased	6.95	13.97	19.76	< 50	D
2.1.2*	Decreased	13.57	2.95	-7.39	>100	A
2.2.1*	Decreased	32.30	8.28	2.62	>100	A
Banggai District						
2.2.1*	Decreased	31.90	9.34	3	>100	A
Tojo Una-Una District						
2.2.1*	Decreased	26.20	7.78	2.47	>100	A
Poso District						
2.2.1*	Decreased	26.20	7.78	2.47	>100	A
2.2.2 (a)*	Decreased	92.70	105.04	118.71	>100	A
Parigi Moutong District						
2.2.1*	Decreased	33.70	6.15	1.66	>100	A

- c. Gorontalo Province. Several SDGs indicators were identified and projected for achievement (Table 4).

Table 4. Projection Achievement of SDGs in Gorontalo Province in 2030

Indicator	PR Target No. 111/2022	Achievement 2018 (%)	Projection 2024 (%)	Projections 2030 (%)	Achievement Status (%)	Category
Gorontalo Province						
2.1.1*	Decreased	11.55	15.71	21.67	< 50	C
2.1.2*	Decreased	10.81	-1.09	-12.26	>100	A
2.2.1*	Decreased	32.50	23.27	18.40	<90	B
2.2.2*	Decreased	14.40	0.36	0.01	>100	A
2.2.2 (a)	Increased	79.40	116.05	165.15	>100	A
Pohuwato District						
2.2.1*	Decreased	23.6	11.65	-7.16	>100	A
Boalemo District						
2.2.1*	Decreased	44.8	32.86	27.04	>50	C
Gorontalo District						
2.2.1*	Decreased	34.6	29.22	25.15	>50	C
Bone Bolango District						
2.2.1*	Decreased	29.1	23.15	19.34	<90	B
2.2.2*	Decreased	9.24	1.56	-6.12	>100	A
2.2.2 (a)	Decreased	67.96	113.09	150.32	>100	A
Gorontalo City						
2.2.1*	Decreased	27.4	0.87	4.69	>100	A
2.2.2*	Decreased	0.11	3.50	5.59	<50	D

3.2 Discussion

3.2.1 Data availability and quality

Analysis of SDGs Goal 2, two indicators in the Tomini Bay region, reveals a complex landscape of achievements and challenges across multiple areas. Our study found significant variations in data availability and achievement projections, highlighting the need for targeted interventions and improved data management systems. An important finding of our study is the widespread problem of data availability and quality across the study regions. Of the 16 indicators defined for SDGs Goal 2, only 1-5 could be identified and projected consistently in most areas. These limitations pose significant barriers to comprehensive assessment and accurate projection of SDG achievement. There is a need for more reliable data points to address systemic problems in data collection, management, and reporting at both the local and regional levels. This lack of data is a fundamental technical challenge in data-driven policy-making and program implementation.

3.2.2 Regional variations in SDGs achievement

Regarding regional variations, North Sulawesi and Gorontalo provinces showed more promising achievement projections than Central Sulawesi. This disparity indicates the existence of various factors that affect the implementation of SDGs, such as differences in resource allocation, policy effectiveness, or socioeconomic conditions. Some districts and cities within these provinces, notably South Bolaang Mongondow in North Sulawesi and Bone Bolango in Gorontalo, had higher projected achievements. These areas are emerging as potential models for successful SDGs implementation, requiring in-depth case studies to identify replicable strategies and best practices. Success factors could include effective local

leadership, innovative policy approaches, successful community engagement, or efficient resource utilization [22, 24]. In contrast, some districts, particularly Central Sulawesi, show a trend of lower projected achievements. The stark contrast between high- and low-achieving areas within the same region emphasizes the need for a localized approach to SDGs implementation, considering specific geographic, cultural, and socioeconomic contexts.

3.2.3 Critical indicators and their implications

Among the indicators studied, 2.1.1 (Prevalence of undernourishment) and 2.2.1 (Prevalence of stunting) emerged as critical in most areas. These indicators, which are fundamental for assessing food security and nutrition, show varying levels of achievement and alarming trends in some areas. For example, in North Sulawesi Province, indicator 2.1.1 is projected to achieve less than 50% of the target by 2030, signaling significant challenges in addressing undernutrition. This alarming projection calls for immediate and targeted interventions for nutrition and food security programs. A deeper investigation is also required into the root causes of undernutrition in the region, ranging from food accessibility and affordability issues to eating habits and nutrition awareness. The prevalence of stunting (indicator 2.2.1) showed an alarming trend in some districts. Stunting, with its long-term impact on cognitive development and economic productivity, represents a critical challenge for human capital development in the region. Addressing this issue requires a multi-faceted approach, including interventions in maternal health, early childhood nutrition, sanitation, and access to health services [11, 25].

3.2.4 Achievement gaps and their significance

The study uncovered substantial achievement gaps in several areas, highlighting disparities in developmental progress and pointing to potential areas where focused interventions could yield significant improvements. These gaps represent challenges and opportunities. While they indicate areas that need attention, they highlight areas where targeted efforts could result in rapid improvements in SDGs indicators. For example, areas with low projected achievement, particularly some districts in Central Sulawesi, require tailored strategies to accelerate their progress towards SDGs Goal 2. These strategies may include improved resource allocation, increased capacity of local administrators, and programs designed to address specific local challenges such as geographic isolation or cultural barriers to improved nutrition [26, 27].

3.2.5 Implications for policy and recommendation

This study's findings have several important implications for policy and practice. First, there is a clear need to strengthen regional data systems. This includes improving data collection methods and increasing local governments' capacity to effectively analyze and utilize data for decision-making. Second, regional variations in achievement require a more nuanced and region-specific approach for SDGs implementation. Universal policies are unlikely to address the diverse challenges faced by the different regions. Furthermore, this study shows the potential benefits of learning and collaboration between regions. Regions with higher projected achievements can share their strategies and experiences with lagging regions, thereby encouraging a collaborative approach to SDGs implementation. This knowledge exchange can be facilitated through regional forums or partnerships [28, 29].

An integrated approach involving various sectors, such as agriculture, health, and education, is essential for addressing the complex challenges of food security and nutrition, as highlighted by these key indicators. This multi-sectoral approach should be complemented

by efforts to improve the capacity of local governments to plan and implement SDGs programs, especially in areas with lower projected achievements. Although this study provides valuable insights, it is essential to recognize its limitations, particularly the need for comprehensive data for all indicators across regions [29]. This limits the ability to conduct a thorough comparative analysis and generate accurate projections for certain indicators. Future research should address these data gaps and expand the analysis to other SDGs pillars to provide a more comprehensive picture of sustainable development in Tomini Bay.

4 Conclusion

This research aims to map and project the achievement of SDGs targets, particularly Social Pillar Goal 2 (Zero No Hunger), in the Tomini Bay region, which still faces challenges. This is due to two factors that become the research's limitations: data limitations, only a small number of SDGs Goal 2 indicators that can be projected consistently, and an exclusive focus on Goal 2 that potentially ignores the interrelationships between SDGs goals. These limitations may affect the depth of analysis and holistic understanding of sustainable development in the Tomini Bay region. Despite these challenges, this research has provided an initial picture of the condition and projected achievement of SDGs targets in the Tomini Bay region, particularly for Social Pillar Goal 2. The results of this study can serve as a foundation for local governments and other relevant parties to formulate more concrete and specific policies and action programs to achieve SDG targets. The data recording and reporting system should be strengthened to overcome current limitations, and the coordination between stakeholders should be improved. The prospect of further research development is to expand the focus on mapping and projecting the achievement of SDGs targets onto other pillars. This broader approach will provide a more comprehensive picture of sustainable development in the Tomini Bay region, address current limitations, and offer a more connected perspective on the SDGs.

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