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Study of Environment Economics According to Depletion and Degradation Values of Utilization of Natural Resources in the Regional Economy

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ABSTRACT

Any resulting development uses natural resources. Every resource that is extracted as development input has a negative impact and can be quantified through depletion and degradation values. The research aims to analyze the value of depletion and degradation of natural resources as a result of regional economic growth which is prorated in gross regional regional income or GDP. The results of this research are important new information and discourse for the government to balance economic growth and a green economy with the sustainability of natural resources. The basis is economic growth without and/or minimizing environmental degradation. The result is that of the 17 sectors, there are 9 sectors that extract natural resources. Depletion and degradation values occur in the base and non-base sectors. The resulting total value of depletion and degradation exceeds the national average as reported by relevant studies.

Keywords: Environment Economics, Depletion, Degradation, Natural Resources
JEL Classifications: O1, O2, Q2, Q3, R

1. INTRODUCTION

Data from the UN in 2014 noted that around 54% of the world's population lives in urban areas. The World Bank predicts that in 2018, the world's population living in urban areas is estimated at 4.2 billion people or around 55% and is predicted to reach 62% in 2030 (Mulya et al., 2014). The World Bank estimates that the urban population in Indonesia in 2018 will reach 52%. with the city growth rate reaching an average of 4.1% (United Nations, 2012), it means that the growth of the urban population in the future will increase.

Experts position the fact that population growth continues to increase as a threat when aspects of fulfilling and using natural resources (are limited). The threat referred to is that there is an imbalance in the distribution of natural resources and difficulties in regulating world markets (Ibrahim and Ajide, 2021; and Shah et al., 2022). If it lasts a long time it can disrupt the ecosystem (ecology) which in turn causes an ecological disaster. These facts have been found in many parts of the world, ranging from hunger, drought, health problems, and climate change (uncertain climate), to agrarian conflicts, conflicts over resources, and so on.

Responding to this, the UN established a sustainable development agenda (from MDGS to SDG) into 17 goals (UNDESA, 2016; Ferreira et al., 2022; Hasddin et al., 2022a; and 2022b; and Kharas and Dooley, 2022). This agenda not only achieves food sustainability, issues of poverty, and climate, it even goes so far as to regulate the integration of the integrated SDGs agenda on energy issues (Yu-Ke et al., 2022; Ling et al., 2022; Hussain et

al., 2022; Huang et al., 2021; Mehmood, 2021), which controls human life both micro and macro. The target is that all countries and cities are able to achieve sustainable development by 2030.

The potential for achieving sustainable development based on a green economy for developing countries and entering developed countries is very likely. The basis for this statement refers to the World Bank (2022) report that the capacity of developing countries in terms of fiscal is stronger (about 2.4%) than developed countries. Then, developing countries have enough reserves of natural resources in the future, including the potential for using renewable resources and developing energy sources that do not originate from natural resources at this time (Fatima et al., 2021; Sahoo and Sahoo, 2022; Zhang et al., 2022; Mahalik et al., 2021; Pata, 2021; Anwar et al., 2021; and Usman et al., 2021). This position is an opportunity for Indonesia to play its role in the global economy. One reason is that developing countries have slightly more reserves of natural resources to survive.

Suweda (2011) reports that by 2025 Indonesia's population is expected to reach 65% concentrated in cities, with dominance in big cities such as Java, Sumatra, and Bali. The same thing was reported by the Indonesian government through the Ministry of National Development Planning/Bappenas, the Central Statistics Agency, and UNPF projecting that the urban population in 2030 is predicted to reach 63% (Ministry of National Development Planning (PPN/Bappenas, 2013).

As a UN member, Indonesia is committed to achieving the sustainable development agenda (SDGs) referred to above. Commitment is shown by issuing Presidential Regulation of the Republic of Indonesia Number 111 of 2022 concerning the Implementation of Achieving Sustainable Development Goals. This policy instrument is also a reference for implementing development to achieve the SDGs agenda in 2030.

Research on the green economy based on depletion and degradation values and green economic growth is sufficiently available as a reference and reference in reconstructing the position and novelty of research. For example, Anggraeni et al., (2017) analyzed the contribution of natural resources to economic prosperity in Indonesia with support from the study of Ambrey et al., (2016); Havranek et al., (2016); Shao and Yang, (2014); and Gaitan and Roe, (2012). Then Nawaz et al., (2019) analyzed the value of depletion and economic growth in Asian countries, with the support of studies from Khan et al., (2019); Zallé et al., (2019); To et al., (2019); Banerjee et al., (2019); Hepburn and Stern, (2019); Kamble, (2019); Mouël et al., (2018); Juma and Miraji, (2018); Katz and Pietrobelli, (2018); Tay et al., (2017); Cao et al., (2015); and Shahbaz et al., (2015).

Most recently, Shah et al., (2022) examine the economic value of natural resources and their implications for economic sustainability (green economy). Shah et al., (2022) constructed and complemented relevant studies such as Awosusi et al., (2022); Tang et al., (2022); Ayobamiji et al., (2022); Dagar et al., (2022); Wang et al., (2021); Simaremare and Noho (2021); Tablein et al., (2021); Bribena, (2021); Onifade et al., (2021); Zhang et al., (2021); Koondhar et al., (2021); Muhammad et al., (2021); Altinoz and Dogan, (2021); Hassan et al., (2019); Ali et al., (2021). It's just that their study is still limited, namely they haven't analyzed it together with the depletion of value due to economic development, especially in developing and/or medium-scale cities. A study on the value of environmental depletion and degradation on economic growth was conducted by Ali et al., (2021) but this research has not revealed the value of natural resource degradation as a cause of environmental degradation.

Finally, the state of the art was obtained from this research, namely the calculation of the value of the depletion and degradation of natural resources as a result of regional economic growth which is proportional to gross regional domestic income or GDP specifically in developing cities or medium-scale cities according to population. The results of this research are new information (novelty) in accordance with the focus of the study (state of the art) as well as creating new discourses that are important for the government to balance economic growth and green economy with natural sustainability in medium-scale cities that may experience rapid agglomeration so that impacts poor on the availability of natural resources and the sustainability of development. The basis is urban development and economic growth without and/or minimizing environmental degradation. The case of a medium-scale city that is currently experiencing developmental stretches with all forms of agglomeration is the city of Kendari. The uniqueness and novelty of Kendari City is a coastal city where until now there is no data presenting the balance of economic development achievements and resource degradation as a basis for environmental economic calculations. The hope is that it can become a reference for future urban planning that is environmentally friendly and can achieve a sustainable city (GDP-green).

2. LITERATURE REVIEW

Sustainable development is an effort to meet the needs of human life now without ignoring the needs of human life in the future. The implementation of sustainable development is basically an effort to maintain a balance between the natural environment (living and non-living) and the built environment (human and artificial), so that the nature of the interaction and interdependence between the two remains in balance (Hasddin et al., 2022a; and Priyoga, 2010), namely sustainable economic growth, socio-cultural sustainability, and environmental sustainability (Hasddin et al., 2022b; and Suweda, 2011).

Urban development in the future needs a paradigm reorientation where the city is a regional entity, which means the city is not only an "Engine of National and Regional Growth" but at the same time a city that is comfortable/livable, sustainable, and just. A sustainable city is an urban area that is able to compete successfully in the global economic battle and is also able to maintain cultural vitality and environmental harmony. Five basic principles of sustainable cities: environment, economy, fairness, engagement, and energy (United Nations, 2012). A sustainable city is characterized by: (a) people who care and carry out ecologically oriented activities; (b) being able to choose when to have a lot and when to have a little; (c) social equality in ecological aspects for

cities; (d) the crisis of the environment is a crisis of creativity; and (e) ecological sustainability is not only related to local issues but also harmonizes with global issues (Suweda, 2011).

Green Gross Domestic Product (Green GDP) is a measure of the value of nature other than goods and services that have been measured in GDP. The effect of current consumption on future consumption must be reflected in the gross domestic product (GDP). Current consumption cannot be seen as socially beneficial if it leads to reduced consumption in the future. Because of this, Green GDP must internalize adjustments to natural resource depletion, so biophysicists are needed who have the ability to make these adjustments (Mulya et al., 2014).

Green GDP measurement methods usually cover five costs of consuming natural resources, namely agricultural land, mineral resources, forests, water, and fish resources, and two costs of environmental depletion, namely environmental pollution and ecological degradation. Green GDP is GDP that includes elements of depletion and degradation of natural resources and the environment (Ratnaningsih et al., 2006). The inclusion of elements of depletion and environmental degradation into the GDP calculation is a step to correct the deficiencies of conventional GDP because the economy does not only produce goods and services but also produces pollution and damage. The results of taking natural resources for business activities only show a positive value in the national production balance but do not show the depreciation value of natural resource reserves and environmental damage (Ratnaningsih et al., 2006).

The UNEP study shows the beneficial results of a green economy, the study shows that world per capita income can be more than 16% (UNEP study, 2011). The calculation of green GDP in China has decreased by 1.8% of conventional GDP after adjustments have been made to the cost of reducing carbon emissions. Economic losses caused by environmental pollution on a national scale reached 3.05% of China's GDP in 2004 by Chinese Academy for Environmental Planning, (2010) in Yu et al., (2019).

Semi-Green GDP in Asmat District, West Papua Province shows that natural depletion activity ranges from 0.68% to 0.93% of the GDP value for the 2007-2009 period, except in 2009 it reached 4.95% (Setyarko, 2013). The application of Green GDP through economic valuation in Bogor City in 2016 shows that the use of water resources and degradation of critical land absorbs around 2.15% of Bogor City's GDP (Mulya et al., 2014). The study by Mulya et al., (2014); and Setyarko, (2013) became a reference in the interpretation of the results of this study because the focus of this study was to take medium-scale case cities (based on population).

3. METHODOLOGY

This study uses a quantitative descriptive approach by analyzing economic sectors along with depleted resource damage and degradation values. Calculating the degradation and depletion of natural resources uses the prevention cost method, the direct observation method, and the benefit transfer estimation method. The main object analyzed in this study is the economic performance of the GDP of Kendari City in 2019 (part of the 2018 data is used as a comparison). This year's GDP data was collected considering that there was an economic upheaval due to the Covid-19 pandemic that occurred at the end of 2019 whose impact was felt until the end of 2022.

Research data collection uses two approaches. The first is a document study which includes an inventory of all documents and economic data for Kendari City, including the types of related regulations (secondary sources). Second, a field survey to obtain information on the volume of natural resources used in business activities from the Kendari City economic sector (primary source).

Analysis of conventional GDP using Location Quotient (*LQ*) and Shift share analysis (*SSA*) tools.

LQ analysis with the equation:

$$LQ = \frac{Si / S}{Ni / N} \quad (1)$$

Si : Added value of sector *i* study area k (Kendari City)
S : Total GDP of all sectors in the study area *k*
Ni : Added value of sector *i* reference area *p* (Province)
N : Total GDP of all sectors of the reference area *p* (province)

From the calculation of the *LQ* of a sector produces criteria; $LQ > 1$, base sector; $LQ < 1$, non-base; and $LQ = 1$, regional specialization and reference are the same (Hasddin et al., 2022c).

SSA analysis with the equation:

$$Dij = Nij + Mij + Cij \quad (2)$$

i : The economic sector studied
j : Study area variable
Dij : Change of the ith sector in the j-th region (lower region)
Nij : Regional growth of the i-th sector in the jth region
Mij: Industry mix/proportional growth of the i-th sector in the j-th region
Cij : Competitive advantage/growth in the i-th sector share in the j-th region.

The Green-GDP Index uses the following equation:

$$Green\,GDP\,index = GDP - NRCC - EDC \quad (3)$$

NRCC : Natural Resources Consumption Cost
EDC : Environmental Depletion Cost

Green GDP is GDP that includes elements of depletion and degradation of natural resources and the environment, mathematically, can be expressed as follows:

$$Green\,GDP = CGDP - ENRD\,value - PRC \quad (4)$$

CGDP : Conventional GRDP
ENRD : Environmental Natural Resources Depletion Value
PRC : Pollution Reduction Costs

The calculation steps used in obtaining Green GDP are as follows:

1. Calculation of Semi-Green GRDP

Subtract the natural resource depletion value from the conventional GDP (or brown GDP). The depletion value is obtained by multiplying the volume of extraction of each type of natural resource with the unit rent or unit price.

$$D = Q \times U \quad (5)$$

D: Depletion value
Q: The volume of natural resources extracted
U: Rent unit

2. Calculation of Green GDP

Calculations in assessing environmental degradation can be carried out; identification of degraded environment; physical quantification of environmental degradation; as well as economic valuation of environmental degradation (Ratnaningsih, 2006). Several stages of calculating Green GDP currently being developed are (Putra, 2013):

a. Dividing the economic sectors according to the economic conditions of the observed region,
b. Calculation of added value in one year for each natural resource, and
c. Reducing the value of degradation and adding the value of environmental service benefits to the Semi-Green GDP.

4. RESULTS

4.1. Regional Economic Performance of Kendari City (Basic and Non-Basic)

The Gross Regional Domestic Product (GDP) of Kendari City is a portrait of the state of the economy which provides an overview of the situation and is a tool for studying and evaluating the economy of Kendari City in each sector (17 sectors). The results of the identification of inputs from business sectors in GDP that use natural resources (water and land) show that there are 9 out of 17 sectors identified as using natural resources in their role (contribution) to GRDP. Then, from the 9 sectors, a role analysis was carried out with *LQ*-producing sectors that are basic and non-basic as presented in Table 1.

Table 1: LQ of Kendari city economic structure in 2019

No.	Sector/field of business	*LQ*	Meaning
1.	Agriculture, forestry and fisheries	0.54	Non Base
2.	Mining and excavation	0.13	Non Base
3	Processing industry	1.75	Base
4	Electricity and gas	3.48	Base
5	Contruction	1.68	Base
6	Wholesale and retail trade, repair of cars and motorcycles	1.53	Base
7	Transportation and warehousing	2.51	Base
8	Real estate	1.43	Base
9	Services other	1.43	Base

Source: Analysis Results (2023)

It was found that in general the sector or field of business played a role as a basis, except for 2 sectors namely agriculture, forestry, and fisheries, as well as the mining and quarrying sector. This means that sectors whose input uses natural resources (proportioned to water and land use) act as a basis. The logical consequence is that the bigger the role it plays in the economy, the more likely it is to use natural resources. The proof will be reviewed in the next sub-discussion.

To carry out a shift-share analysis, data on the economic growth of the provinces of Southeast Sulawesi (regional) and Kendari City (region) are needed. The information referred to is presented in Table 2 below,

Kendari City's GDP contributes around 15% to the province's GDP. The largest sector or field of business in Kendari City's GDP is construction, while at the provincial level are agriculture, forestry, and fisheries; while the sector with the lowest contribution both in Kendari City and at the provincial level is electricity and gas.

Kendari City's economic growth (PDB) in 2019 was 5.24% lower than the provincial-level economic growth of 6.04%. The sector with the highest growth in Kendari City's GDP was transportation and warehousing (9.25%) followed by agriculture (8.44%), while the highest economic growth (GDP) at the provincial level was the processing industry followed by trade. The results of the *shift share* analysis are presented in Table 3 below,

4.1.1. Agriculture sector

The influence of the regional growth component (*Nij*) in Table 3 shows that Kendari City's actual economic growth in this sector is different from the trend of Southeast Sulawesi Province. The absolute change in GDP for Kendari City is Rp 10,338,800 compared to the expectation for Southeast Sulawesi Province of Rp 9,496,118.73.

The influence of the industrial mix component (*Mij*) has a negative effect, this causes economic growth in Kendari City to lag by Rp. 1,452,148.36 of the GDP of Southeast Sulawesi Province. The economic growth of this sector in Kendari City is relatively slower than the growth of the same sector at the Southeast Sulawesi Province level.

The influence of the competitive advantage component (*Cij*), shows the relative environmental support of a sector in the region compared to the region. Kendari City seems to provide a conducive environment for this sector with a positive regional share value. For the total number (*Rij*), this sector shows a positive number. This means that the GDP of this sector in Kendari City increased in 2019 compared to 2018 Rp 10,338,800,000.

4.1.2. Mining and excavation sector

The influence of the regional growth component (*Nij*) in Table 3 shows that Kendari City's actual economic growth in this sector is different from the trend of Southeast Sulawesi Province. The absolute change in Kendari City's GDP was Rp 2,307,350.0 compared to the expectation for the Southeast Sulawesi province of Rp. 2,131,404.95 or a surplus of Rp. 175,945.05.

Table 2: Southeast Sulawesi GDP and economic growth, Kendari city in 2018-2019

Sector/Field of Business	GDP of Southeast Sulawesi (Billion Rupiah)		Absolute Change (Billion Rupiah)	Economic Growth (%)	Kendari City GDP (Billion Rupiah)		Absolute Change (Billion Rupiah)	Economic Growth (%)
	2018	2019			2018	2019		
	Y in	*Y in*		*r in*	*Y ij*	*Y ij*		*r ij*
Agriculture, forestry and fisheries	20.554,63	21.587,17	1.032,54	5,70	1.638,04	1.762,18	124,14	8,44
Mining and excavation	18.529,90	19.824,35	1.294,45	6,73	358,79	376,47	17,68	5,82
Processing industry	5.493,39	6.089,05	595,66	8,83	1.534,06	1.597,04	62,98	2,26
Electricity and gas	44,45	47,51	3,06	4,21	23,02	24,76	1,74	4,55
Contruction	11.301,19	12.091,95	790,76	6,84	2.846,97	3.046,52	199,55	7,47
Wholesale and retail trade, repair of cars and motorcycles	11.139,87	12.003,55	863,68	7,19	2.579,20	2.756,54	177,34	5,85
Transportation and warehousing	4.204,13	4.388,42	184,29	6,57	1.513,28	1.653,06	139,78	9,25
Real estate	1.329,44	1.380,31	50,87	3,21	292,67	296,74	4,07	1,60
Services other	1.258,98	1.316,54	57,56	5,09	276,99	282,03	5,04	1,98
Total	73.855,98	78.728,85	4.872,87	6,04	11.063,02	11.795,34	732,32	5,24

Source: Analysis results (2023)

Table 3: Shift share analysis

Sector/Field of Business	Regional Effect (Million Rupiah)	Industry Mix Effect (Million Rupiah)		Regional Shares Effect (Million Rupiah)		Total
	N ij=Yij x r n	(r in–r n)	M ij=Y ij (r in-r n)	(r ij-r in)	C ij=Y ij (r ij-r in)	D ij=G ij+ M ij+C ij
Agriculture, forestry and fisheries	9.496.118,73	−1,04	(−1.452.148,36)	1,64	2.294.829,63	10.338.800
Mining and excavation	2.131.404,95	6,19	1.938.789,88	−5,63	(−1.762.844,83)	2.307.350
Processing industry	9.642.009,57	−0,42	(−596.389,37)	2,37	3.362.079,79	12.407.700
Electricity and gas	419.810,639	−5,47	(−337.546,52)	2,35	145.235,88	2.27.500
Contruction	17.485.391,1	−3,65	(−9.369.281,51)	−0,50	(−1.272.729,54)	6.843.380
Wholesale and retail trade, repair of cars and motorcycles	15.561.310,5	−,001	(−5.565,18)	0,81	1.844.904,67	17.400.650
Transportation and warehousing	17.247.541,4	0,73	(1.844.603,10)	1,64	4.151.955,44	23.244.100
Real estate	8.567.880,08	−2,34	(−2942.737,79)	2,11	2.662.327,71	8.287.470
Services other	142.86.683	−3,33	(−6.993.409,82)	0,32	664.646,79	7.957.920
Total	94.838.156,1		(−17.913.685,59)		12.090.405,58	89.014.870

Source: Analysis Results (2023)

The influence of the industrial mix component (*Mij*) has a positive effect, this causes economic growth in Kendari City to increase by Rp 1,938,789.88 from the GRDP of Southeast Sulawesi Province. The economic growth of this sector in Kendari City grew relatively faster than the growth of the same sector at the Southeast Sulawesi Province level.

The influence of the competitive advantage component (*Cij*), shows the relative environmental support of a sector in the region compared to the region. Kendari City does not seem to provide a conducive environment for this sector with a negative regional share value. For the total number (*Rij*), this sector shows a positive number. This means that the GRDP of this sector in Kendari City has increased in 2019 compared to 2018 of Rp 2,307,350.

4.1.3. Processing industry Sector

The influence of the regional growth component (*Nij*) shows that Kendari City's actual economic growth in this sector is different from the trend of Southeast Sulawesi Province. The absolute change in GDP for Kendari City is Rp. 12,407,700, compared to the expectation of the Southeast Sulawesi province of Rp. 9,642,009.57 or a surplus of Rp. 2,765,690.43.

The influence of the industrial mix component (*Mij*) has a negative effect, this causes economic growth in Kendari City to lag by Rp. 596,389.37 of the GDP of Southeast Sulawesi Province. The economic growth of this sector in Kendari City is relatively slower than the growth of the same sector at the Southeast Sulawesi Province level.

The influence of the competitive advantage component (*Cij*), shows the relative environmental support of a sector in the region compared to the region. Kendari City seems to provide a conducive environment for this sector with a positive regional share value. For the total number (*Rij*), this sector shows a positive number. This means that the GDP of this sector in Kendari City increased in 2019 compared to 2018 Rp. 12,407,700.00.

4.1.4. Electricity and gas sector

The influence of the regional growth component (*Nij*) shows that Kendari City's actual economic growth in this sector is different from the trend of Southeast Sulawesi Province. The absolute change in GDP for Kendari City is Rp. 227,500 compared to the expectation of Southeast Sulawesi province of Rp. 419,810, or experiencing a deficit of Rp. 192,310.00.

The influence of the industrial mix component (*Mij*) has a negative effect, this causes economic growth in Kendari City to lag by Rp. −337,546.53 from GDP of Southeast Sulawesi Province. The economic growth of this sector in Kendari City is relatively slower than the growth of the same sector at the Southeast Sulawesi Province level.

The influence of the competitive advantage component (*Cij*), shows the relative environmental support of a sector in the region compared to the region. Kendari City seems to provide a conducive environment for this sector with a positive regional share value. For the total number (*Rij*), this sector shows a positive number. This means that the GDP of this sector in Kendari City increased in 2019 compared to 2018 Rp. 227,500.

4.1.5. Contruction sector

The influence of the regional growth component (*Nij*) shows that Kendari City's actual economic growth in this sector is different from the trend of Southeast Sulawesi Province. The absolute change in GDP for Kendari City is Rp. 6,843,380 compared to expectations for Southeast Sulawesi province of Rp.17,485,391.1, or experienced a deficit of Rp.10,642,011.10.

The influence of the industrial mix component (*Mij*) has a negative effect, this causes economic growth in Kendari City to grow slower by Rp. 9,369,281.51 from GDP of Southeast Sulawesi Province. The economic growth of this sector in Kendari City is relatively slower than the growth of the same sector at the Southeast Sulawesi Province level.

The influence of the competitive advantage component (*Cij*), shows the relative environmental support of a sector in the region compared to the region. Kendari City does not seem to provide a conducive environment for this sector with a negative regional share value. For the total number (*Rij*), this sector shows a positive number. This means that the GRDP of this sector in Kendari City increased in 2019 compared to 2018 Rp. 6,843,380.

4.1.6. Wholesale and retail trade, repair of cars and motorcycles sector

The influence of the regional growth component (Nij) shows that Kendari City's actual economic growth in this sector is different from the trend of Southeast Sulawesi Province. The absolute change in GDP for Kendari City is Rp. 17,400,650 compared to the expectation of the Southeast Sulawesi province of Rp. 15,561,310.5, or a surplus of Rp. 1,839,339.50.

The influence of the industrial mix component (*Mij*) has a negative effect, this causes economic growth in Kendari City to grow slower by Rp. 5,565.18 of the GDP of Southeast Sulawesi Province. The economic growth of this sector in Kendari City is relatively slower than the growth of the same sector at the Southeast Sulawesi Province level.

The influence of the competitive advantage component (*Cij*), shows the relative environmental support of a sector in the region compared to the region. Kendari City seems to provide a conducive environment for this sector with a positive regional share value. For the total number (*Rij*), this sector shows a positive number. This means that the GDP of this sector in Kendari City increased in 2019 compared to 2018 Rp. 17,400,650.

4.1.7. Transportation and warehousing sector

The influence of the regional growth component (*Nij*) shows that Kendari City's actual economic growth in this sector is different from the trend of Southeast Sulawesi Province. The absolute change in GDP for Kendari City is Rp. 23,244,100 compared to the expectation of the Southeast Sulawesi province of Rp. 17,247,541.4, or a surplus of Rp. 5,996,558.60.

The influence of the industrial mix component (*Mij*) has a positive effect, this causes economic growth in Kendari City to grow faster by Rp. 1,844,603.10 from GDP of Southeast Sulawesi Province. The economic growth of this sector in Kendari City grew relatively faster than the growth of the same sector at the Southeast Sulawesi Province level.

The influence of the competitive advantage component (*Cij*), shows the relative environmental support of a sector in the region compared to the region. Kendari City seems to provide a conducive environment for this sector with a positive regional share value. Overall number (*Rij*), this sector shows a positive number. This means that the GDP of this sector in Kendari City increased in 2019 compared to 2018 Rp. 23,244,100.

4.1.8. Real estate sector

The influence of the regional growth component (Nij) in Table 3 shows that Kendari City's actual economic growth in this sector is different from the trend of Southeast Sulawesi Province. The absolute change in GRDP for Kendari City is Rp. 8,287,470 compared to the expectation of the Southeast Sulawesi province of Rp. 8,567,880.08, or experiencing a deficit of Rp. 280,410.08.

The influence of the industrial mix component (*Mij*) has a negative effect, this causes economic growth in Kendari City to grow slower by Rp. 2,942,737.79 from GDP of Southeast Sulawesi Province. The economic growth of this sector in Kendari City is relatively slower than the growth of the same sector at the Southeast Sulawesi Province level.

The influence of the competitive advantage component (*Cij*), shows the relative environmental support of a sector in the region compared to the region. Kendari City seems to provide a conducive environment for this sector with a positive regional share value. Overall number (*Rij*), this sector shows a positive number. This means that the GRDP of this sector in Kendari City increased in 2019 compared to 2018 Rp. 8,287,470.

4.1.9. Services other sector

The influence of the regional growth component (*Nij*) in the table shows that Kendari City's actual economic growth in this sector is different from the trend of Southeast Sulawesi Province. The absolute change in GDP for Kendari City is Rp. 7,957,920 compared to the expectation of the Southeast Sulawesi province of Rp. 14,286,683, or experiencing a deficit of Rp. 6,328,763.00.

The influence of the industrial mix component (*Mij*) has a negative effect, this causes economic growth in Kendari City to increase by Rp. 6,993,409.82 from GDP of Southeast Sulawesi Province. The economic growth of this sector in Kendari City is relatively slower than the growth of the same sector at the Southeast Sulawesi Province level.

The influence of the competitive advantage component (*Cij*), shows the relative environmental support of a sector in the region compared to the region. Kendari City seems to provide a conducive environment for this sector with a positive regional share value. Overall number (*Rij*), this sector shows a positive number. This means that the GRDP of this sector in Kendari City increased in 2019 compared to 2018 Rp. 7,957,920.

4.2. Depleted Resource Value

4.2.1. Depleted water resources by sector

The use of water in the agricultural sector is broken down based on the availability of standard water use data from SNI 19-6728.1-2002 concerning the Preparation of Resource Balances-Part 1: Spatial water resources. Based on these data, the use of water that can be calculated is in the sub-sectors of food crops, livestock, and fisheries. Water use in the food crops sub-sector uses the calculation basis of SNI 19-6728.1-2002 that the standard average water requirement is 1 l/s/ha. The number of days needed to grow rice is 120 days. Thus, the total volume of water used for food crops is 32,254,848,000 liters per year. The standard for water requirements for livestock uses reference from SNI 19-6728.12002. The results obtained are related to the volume of livestock water use of 86,957,162 liters per year per year. The pond water requirement standard uses references from SNI 196728.1-2002. The results obtained are related to the volume of water used for fisheries of 7,409,500 l/year.

The volume of water use in the processing industry sector is based on data on the volume of water distributed by the Regional Drinking Water Company (PDAM) to the processing industry, which is 1,368,922 l/year in 2019 (Central Bureau of Statistics for the City of Kendari, 2020). The volume of water use in sub the trade sector is based on data on the volume of water distributed by the PDAM of 2,598,289 m3 or 340 969,000 liters. The volume of water use in the hotel sub-sector consists of water use by hotel visitors and water use by employees. The results of calculating the volume of water depletion by hotel guests and employees in 2019 are 155,842,638 l/year. The volume of water used for restaurant business activities is calculated from the number of restaurant seats in Kendari City multiplied by the percentage of visitors multiplied by the standard water requirement for restaurants. The result of calculating the volume of water depletion in restaurant business activities in 2019 is 517,345,276.8 l/year.

The volume of water use in the transportation sector is carried out in the road transportation sub-sector. The use of water by public transportation is calculated based on the number of public transportation vehicles multiplied by the standard for water requirements for washing vehicles multiplied by the frequency of washing public vehicles per month. The standard for water demand used refers to the criteria of the Directorate General of Human Settlement, Public Works Office, 1998. Data on the frequency of washing motorized vehicles was obtained based on the results of direct surveys of public transportation with a total sample of 100 vehicles. The volume of water depletion in the transportation sector in 2019 was 54,345,600 l/year.

In other service sectors, the calculation of the volume of water depletion is carried out in 3 sub-sectors, namely government administration, social affairs, and entertainment and recreation. The volume of water depletion in the government administration sub-sector was obtained based on the availability of secondary data in the form of the volume of water distributed by PDAM to Government Agencies of 168,549,000 l/year (Central Bureau of Statistics for Kendari City, 2018). The volume of water depletion in the social sub-sector is obtained based on the availability of secondary data in the form of the volume of water distributed by PDAM to the social sector of 2,200,165,000 l/year (Central Bureau of Statistics for Kendari City, 2018). The volume of water depletion in the Entertainment and Recreation sub-sector was obtained based on the results of a survey of water recreation locations. There are 9 units of water recreation rides in Kendari City which are the target of researchers. Water use in water recreation areas is calculated from the number of water recreation areas multiplied by the average volume of water use per location of 1,005,575,000 l/year.

4.2.2. Calculation of unit rent

The approach used in calculating unit rent is the Basic Price of Water as stipulated in Kendari Mayor Regulation Number 11 of 2015 concerning Groundwater Acquisition Value. Based on these regulations, the Basic Water Price (BWP) is generated by multiplying the raw water price by the water value factor.

The water value factor is determined from the sum of the natural resource component values and the recovery compensation value. The value of the natural resource component is obtained from the sum of the index values of the natural resource component elements multiplied by a percentage of 60% for collection in the safe zone stipulated in Kendari Mayor Regulation No. 11 of 2015. Meanwhile, the recovery compensation value is calculated from the index value of each progressive volume group in the recovery component index value table as stipulated in Kendari Mayor Regulation No. 11 of 2015 Article 8 paragraph 3 multiplied by a weight of 40% for withdrawal in a safe zone. Based on the calculation method above. The following details the results of calculating the Basic Price of Water,

a. In the agricultural sector, the assumption used to determine the basic price of water in the agricultural sector is that the location of agriculture is in a safe zone. The function of water is used for irrigation so this function is included in the category of elements of class three and four water quality. Alternative water sources are assumed to have no alternatives. The element type of water used is shallow groundwater. The basic price of water for the agricultural sector is Rp. 12.72/l.
b. In the processing industry sector, the assumptions used to determine the basic price of water in the processing industry sector are that the location of the industry is in a safe zone. The function of water is used for raw water so this function is included in the category of first-class water quality elements.

Alternative water sources are assumed to have alternative water from Local water company (PDAM). The element type of water used is deep groundwater. The basic price of water for the processing industry sector is Rp. 37.23/l.

c. In the trade, hotel and restaurant, transportation, banking, government services, and social services sectors, the assumptions used to determine the BWP are that the business location is in a safe zone. The function of water is used for raw water so this function is included in the category of first-class water quality elements. Alternative water sources are assumed to have alternative water from PDAM. The element type of water used is deep groundwater. The basic price of water for the industrial sector is Rp. 27.47/l.
d. In the Entertainment and Recreation Services sector, the assumption used to determine the base price of water is that the business location is in a safe zone. The function of water is used for water recreation so this function is included in the category of first-class water quality elements. Alternative water sources are assumed to have alternative water from PDAM. The type of water element used is deep groundwater. The basic price of water for the industrial sector is Rp. 27.47/l.
e. In the Electricity, Gas, and Water Supply Sector, especially in the Clean Water sub-sector, the calculation of water prices in the Clean Water sub-sector uses a unit rent approach because PDAM in this case as a company engaged in the supply of Clean Water uses water resources as the main material for production activities. and selling clean water as the main commodity. The unit rent calculation is based on the financial statements of the Regional Drinking Water Company located in Kendari City. Calculations in units per unit are based on the volume of water distributed in 2019 by PDAM, which is 2,740 530 m3. In calculating proper profit, a loan interest rate of 12.25% is used as the loan interest rate in effect for the 2019 period (Source: Indonesian Economic and Financial Statistics, Bank Indonesia, 2018) multiplied by the total equity capital of PDAM Kendari City. The unit rent generated for the price of water in the clean water sub-sector in 2019 is Rp. 5.60/l.

4.2.3. Water resources depletion value

After knowing the volume of depleted water resources and the unit rent of water resources, the depletion value of water resources can be calculated in monetary units. The results of the analysis are presented in Table 4.

The total depletion value of natural resources (water) in Kendari City's GDP in 2019 is Rp 548,313.3 (million). The highest depletion value occurred in the agricultural business sector/field, which was IDR 410,204.2 (million), and the other service sector, especially social services, namely Rp 84,974.19 (million). Other services were obtained from government services in the amount of Rp. 4,629.7 then social services in the amount of Rp. 60,434.13 and entertainment and recreation services in the amount of Rp. 19,910.36. The lowest depletion value is for the processing industry, which is Rp 50.96 (million).

4.3. Semi Green GDP

The depletion value is obtained by multiplying the volume of extraction of each type of natural resource with the unit rent or unit price. With this approach, the results of the 2019 Kendari City semi-green GDP calculation results are obtained as presented in Table 5.

Kendari City's conventional GDP in 2019 is Rp. 14,826,049.9 (million). The total depletion value of the business sectors that use water resources is Rp. 525,225.69 (millions), so the depletion value of water use absorbs around 3.54% of the total value of Kendari City's conventional GDP in 2019. Thus, the Semi-Green GDP value for Kendari City in 2019 is estimated at Rp. 14,300,824.21.

4.4. Natural Resource Degradation Value

Calculation of the value of environmental degradation in Kendari City uses a degradation approach to land resources. As a preliminary step in quantifying the value of land degradation, the data used is the area of critical land in Kendari City multiplied by the NPK fertilizer price of Rp. 11,000/kg. The critical land area in Kendari City is presented in Table 6.

In general, the criticality of the land is distributed in a critical order, followed by critical, and there is a potential for critical. So that critical and potential critical may shift to critical if no handling intervention is carried out. Conversely, if there is an intervention it can also reduce the area of critical land. It is important that there is a need to set a strategic agenda next in relation to economic development activities by considering things that can minimize land degradation.

The focus of attention is that the widest distribution of critical land is in Mandong District, then the area of critical land is in Baruga District and Puuwatu District. Critical potentials that are of concern to policy are in Kadia District, Mandonga District, and Kendari District.

After knowing the total data of the semi-critical and critical land area, then the value of land degradation is calculated by calculating the economic value of the lost soil nutrients from the critical land area. The results of the analysis obtained that the total value of land degradation in Kendari City is Rp. 2,212,389,105,000. The details of these calculations are presented in Table 7.

The calculation of environmental degradation in this study is still in the preliminary calculation stage. Calculation of degradation still requires a survey of environmental restoration costs allocated by each business unit in all economic sectors, as well as the budget provided by the Kendari City government to improve the environment to be calculated into Green GDP. In addition, the calculation of environmental damage caused by air pollution has not been taken into account in the measurement of Green GRDP in Kendari City considering that the transportation sector is one of the basic sectors in Kendari City.

4.5. Green GDP

The land degradation value is then used in the Green GDP calculation by subtracting the degradation value from the Semi-green GDP value. The estimated Green GRDP for Kendari City in 2019 is Rp. 12,088,435.10 (million). The following is the result of the calculation of Kendari City's Green GRDP,

Table 4: Depletion value per business sector in Kendari city in 2019

Sector/field of business	Water usage volume (liters)	BWP (Rp/liter)	Water depletion (Million Rp)
Agriculture, forestry and fisheries	32.349.214.662	12,72	410.204,2
Mining and excavation	-	-	-
Processing industry	1.368.922	37,23	50,96
Electricity and gas	2.740.530.000		23.087,67
Contruction	-	-	-
Wholesale and retail trade, repair of cars and motorcycles	1.014.156.916	27,47	27.856,86
Transportation and warehousing	54.345.600	27,47	1.492,76
Real estate	23.542.500	27,47	646,66
Services other	3.374.289.000	74,74	84.974,19
Total water depletion value			548.313,3

Source: Analysis Results (2023)

Table 5: 2019 Semi-green GDP (in Million Rupiah)

Sector/field of business	PDB	Water depletion (Million Rp)	Semi-green GDP (Million Rp)
Agriculture, forestry and fisheries	1.498.786,7	410.204,26	1.088.582,44
Mining and excavation	336.270,9	-	336.270,90
Processing industry	1.540.913,5	50,96	1.540.862,54
Electricity and gas	63.963,7	23.087,67	23.087,67
Contruction	2.637.809,0	-	2.637.809,00
Wholesale and retail trade, repair of cars and motorcycles	2.460.649,4	27.856,86	2.432.792,54
Transportation and warehousing	2.766.865,6	1.492,76	2.765.372,84
Real estate	3.249.620,1	646,66	3.248.973,44
Services other	271.177,2	84.974,19	186.203,01
Total	14.826.049,9	525.225,69	14.300.824,21

Source: Analysis results (2023)

Table 6: Critical land area in Kendari city

Subdistrict	Land critical class (ha)		
	Critical potential	Somewhat critical	Critical
Mandonga	1.064,57	571,71	559,64
Baruga	238,77	3.600,92	886,34
Puuwatu	6,33	3.896,17	413,54
Kadia	1.616,80	132,74	544,22
Wua-Wua	913,08	665,16	399,23
Poasia	2,78	1.660,77	996,01
Abeli	14,23	2.584,47	408,39
Kambu	88,88	1.216,04	942,40
Kendari	1.064	700,54	688,95
West Kendari	238,77	223,68	1.699,46
Total			26.735,82

Source: Analysis results (2023)

Table 7: Land degradation values in Kendari city

Fertilizer type	Fertilizer needs (Kg/ha)	Soil nutrients (%)	Fertilizer price (Rp/Kg)	Product price (Rp/Ha)
Fertilizer N	250	70%	7.700	1.925.000
Fertilizer P	250	20%	2.200	550.000
Fertilizer K	250	10%	1.100	275.000
Fertilizer requirement/ha (Rp/ha/season)				2.750.000
Fertilizer requirement/ha (Rp/ha/year)				8.250.000
Total area of critical land (ha)				26.735,82
Economic value of lost soil nutrients (Rp)				2.212.389.105.000

Source: Analysis Results (2023)

	(Million Rp)
Conventional GDP	Rp. 14.826.049,90
Depletion	Rp. 525.225,69 (-)
Semi-Green GDP	Rp. 14.300.824,21
Degradation	Rp. 2.212.389,11 (-)
Green GDP	Rp. 12.088.435,10

Kendari City's green GRDP value is Rp. 12,088,435.10 (millions), this value is around 3.54% lower than the conventional GRDP value of Rp. 14,826,049.90 (millions), or the percentage figure for the reduction in GRDP is still lower when compared to the percentage reduction for conventional GRDP.

The findings of this study are in line with Suparmoko (2013); and Mulya et al., (2012) that Green GDP is lower than Conventional GDP. The depletion value obtained is relatively smaller, this fact also agrees with the results reported by Setyarko (2013).

When referring to the results of a survey conducted by the World Bank (2008), the total economic loss from limited access to clean water and sanitation is estimated at 2% of GDP annually in Indonesia. This estimated figure is greater than the estimate for water use in the business sector of Kendari City, which reaches 3.54% of the conventional GDP. This means that the use of water as an input in the regional economy in Kendari City exceeds the national average, thus there needs to be an emphasis on the use of water resources so that it does not have negative consequences in the future.

5. CONCLUSION

There are 9 of the 17 identified sectors whose activities are supported by the extraction of natural resources, namely water, and land. Of the nine sectors, there are 7 sectors that are basic in the economic structure of Kendari City, namely the processing industry; electricity and gas; Construction; Wholesale and retail trade, repair of cars and motorcycles; Transportation and warehousing; Real estate; and other Services.

The depletion value of natural resources (water) in the Kendari City regional economy is IDR 548,313.3 (million). The highest depletion value occurred in the agricultural business sector/field and the lowest was in the processing industry. The theoretical consequence is that the base sector does not always have a unidirectional relationship with a high contribution to the value of depletion so every sector that is supported by natural resource extraction continues to generate depletion.

The total value of land degradation in Kendari City's GRDP is IDR 2,212,389,105,000. This value is quite large and in line with the critical area of the land. Theoretically, it means that the extraction of natural resources in supporting (input) the economy goes hand in hand with the criticality of land.

The green GDP value as a measure of economic sustainability is lower than the semi-green GDP. Every development activity for the economy in GDP results in land degradation and criticality of around 3.54%, this figure is higher than the national average of around 2%.

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