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Implementation of Sustainable Development on the Island of Sumatra

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Abstract
This study aims to discuss the implementation of sustainable development on the island of Sumatra within the framework of the concept of sustainable development in terms of economic, social and environmental aspects. Data Analysis Method using Composite index which is a collection of several indicators or sub-indicators that do not have a unit of measurement. This research uses panel data method. Indicators on the economic aspect are Gross Regional Domestic Product (GRDP) Per capita and the Open Unemployment Rate. Indicators on the social aspect are the Human Development Index (IPM), School Participation Rate, Life Expectancy at Birth, and Poverty Levels. While the indicators on environmental aspects are the Environmental Quality Index, Air Quality Index, Water Quality Index, Land Cover Quality Index. The results of the study show that there is a lack of attention to environmental development. The achievement of environmental development has decreased nationally.

Keywords: sustainable resources, Composite index, Sustainable Development, Population Quality (Human Development Index).

Introduction
Development is a process of change towards improvement. Sustainable development is realizing the needs of today's life without compromising the ability of future generations to meet their needs (Muktianto and Diartho, 2018). The measure of achievement of development success is currently more complex, namely economic growth, poverty reduction and job growth, efforts to maintain environmental sustainability are one of the important things in development. The concept of sustainable development is also expected to facilitate environmental problems that occur.

The concept of sustainable development has long been a concern of experts. However, the term "sustainability" emerged several decades ago, attention to sustainability has started since Malthus in 1798 who was concerned about the availability of land in England due to the rapid population explosion. With the existence of this aspect of sustainability, it resurfaced when in 1987 the World Commission on Environment and Development (WCED) or known as the Brundland Commission published a book entitled Our Common Future. This publication then triggered the birth of a new agenda regarding the concept of economic development and its relationship to the environment in the context of sustainable development. The current directed development paradigm focuses on achieving equitable development (Equity), Growth Efficiency and Sustainability in a balanced development (Erlinda, 2016).

Sustainable development is the main agenda of Indonesia's development, both at the national and regional levels. The Government of Indonesia has issued Presidential Regulation Number 59 of 2017 concerning the Implementation of the Sustainable Development Goals. The Presidential Regulation is Indonesia's commitment in implementing sustainable development/SDGs to implement and participate in achieving global development as stated in the SDGs. Development progress is still focused on the economic sector which is in fact uneven. In accordance with the data on the results of the 2014 Indonesian Environmental Status, it is stated that development in Indonesia results in social inequality by increasing the

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Gini coefficient and environmental disasters. Thus, development should not focus on creating higher economic growth, but should consider the realization of a better quality of life, equity, and social justice (Jamaludin, 2016).

In 2013–2018 almost all provinces in Sumatra had GRDP growth at constant prices that continued to increase, with the exception of Riau. This shows that the economic growth on the island of Sumatra is quite good. However, at the same time, provinces with high GRDP growth also experienced an increase in the number of critical lands, namely North Sumatra, West Sumatra, South Sumatra, and Lampung. Critical land is defined as land that has been damaged due to loss of vegetation cover, so that it loses or reduces its function as a water barrier, erosion control, nutrient cycle, microclimate regulator and carbon retention (Ministry of Forestry, 2011). This condition shows that fairly stable economic growth is not always directly proportional to environmental conditions.

In addition to economic growth, you can compare social and environmental aspects in the form of the Human Development Index (IPM) and the Environmental Quality Index (IKLH). The comparison between HDI and IKLH will provide an overview of the synergy between economic and social development and environmental development. Provinces with good HDI ratings have poor IKLH ratings. On the other hand, provinces with good IKLH ratings have not-so-good HDI ratings, such as Aceh province. This province's IKLH ranking in 2018-2020 is in first position, while its HDI value is in 4th place.

Materials and methods
Types of research
The type of research is descriptive quantitative research with secondary data obtained from the Central Statistics Agency (BPS), Statistics Indonesia, the Ministry of Environment and Forestry (KLHK), journals and the results of previous research.

Research Analysis Unit
This research was conducted in Indonesia in 2016-2020. The research location is North Sumatra Island. Sumatra Island consists of 10 provinces in 2016-2020. The selection of Sumatra Island as a research site is because development on Sumatra Island is still unable to answer environmental, equity and justice problems. Development is still very dominant in paying attention to economic and social dimensions, but is weak in development in other fields. In terms of the environment, development creates new critical lands, which means that the quality of the environment is decreasing. Development also creates a widening gap between the rich and the poor.

Data Types and Sources
The type of data in this study is secondary data obtained from various sources and literature related to the research objectives. Secondary data is obtained by collecting data through various literatures, scientific books, journals, previous research and references related to research. The data in this study uses a period of 5 years, namely in 2016-2020. In this study using data sources published by the Central Statistics Agency (BPS), Statistics Indonesia, the Ministry of Environment and Forestry (KLHK). Data Analysis Method using Composite index which is a collection of several indicators or sub-indicators that do not have a unit of measurement. The composite index adopted from the research of Fauzi and Oktavianus, (2014) which can be considered as a model and its preparation follows a series of steps as determined so that the resulting composite index becomes useful and applicable to the public.

The steps in the preparation of the composite index of sustainable development (IPB) follow the composition of the composite index in the OECD (2008) and Kondily (2010), (Fauzi and Oxtavianus, 2014). There are seven steps in the preparation of a composite index that can be carried out sequentially, including:
1) Preparation of Theoretical Framework
2) Identification and Selection of Indicators
3) Imputation of Lost Data
4) Data Normalization
5) Weight Determination
6) Aggregation
7) Presentation and Dissemination of Results

Data Analysis Method
This research uses panel data method. The panel data itself is a combination of cross section data and time series data. In panel data study, the same cross section unit will be measured over a certain period of time, so it can be said that panel data has dimensions of space and time (Melliana & Zain, 2013).

Results & Discussion
Result
The composite index of sustainable development in this study is the Sustainable Development Index or abbreviated as IPB. In accordance with the method previously mentioned, the preparation of IPB was carried out in several stages, namely:

(1) Preparation of a theoretical framework carried out in order to provide a solid basis for carrying out the selection and combination of single indicators into meaningful composite indicators. The theoretical framework in this study uses the theoretical basis of sustainable development that has existed since the 18th century introduced by Thomas Robert Malthus in 1798 which explains the concern for the environment caused by the increasing population explosion, but the limited number of natural resources available. Sustainable development has shifted its focus to the regional or regional level, this is because the role of the region is very important as an intermediary for local and national interests and can be used as a more operational analysis tool.

(2) Identification and selection of indicators is carried out to select indicators based on their level of reliability. To measure sustainable development must have a relationship between indicators with each other. Indicators of sustainable regional development consists of three aspects, namely economic, social, and environmental. Indicators on the economic aspect are Gross Regional Domestic Product (GRDP) Per capita and the Open Unemployment Rate. Indicators on the social aspect are the Human Development Index (IPM), School Participation Rate, Life Expectancy at Birth, and Poverty Levels. While the indicators on environmental aspects are the Environmental Quality Index, Air Quality Index, Water Quality Index, Land Cover Quality Index.

(3) The imputation of missing data is carried out to describe the condition of sustainable regional development in the

field if the available data is incomplete. The preparation of the composite index for sustainable regional development is strongly influenced by the availability of data. Therefore, in this study, no missing data were found. This is because the complete available data is obtained from the publications of the Central Statistics Agency and the Ministry of the Environment.

(4) In this study, the indicators of the economic aspect will be emphasized more, because the normalized indicators will focus on values that are not percentages. Meanwhile, in the social and environmental aspects, the resulting value is in the form of a percentage. This study uses data normalization with the minimum-maximum method. The results of the analysis of the selection of economic indicators in 2016 and 2020 are shown in Table 4.3, the variables used are 3 variables. This study uses data normalization with the Minimum-Maximum method as follows:

Table 1: Normalization of PDRBC.

Province	Normalization of PDRBC				
	2016	2017	2018	2019	2020
ACEH	2.81	3.63	4.65	5.94	6.22
SUMATERA UTARA	18.52	20.55	22.71	24.72	23.66
SUMATERA BARAT	11.14	12.93	14.74	16.24	15.09
RIAU	77.42	77.69	77.68	80.46	87.29
JAMBI	26.09	27.82	29.68	32.47	32.69
SUMATERA SELATAN	18.23	20.35	22.85	25.14	25.45
BENGKULU	0.00	1.11	2.27	3.85	3.23
LAMPUNG	7.08	8.71	10.47	12.28	8.92
KEP, BANGKA.BELITUNG	20.47	21.72	23.01	25.22	23.86
KEP, RIAU	92.63	91.76	94.05	93.94	100.00
PULAU SUMATERA	**27.44**	**28.63**	**30.21**	**32.03**	**32.64**

Source: Processed by Researchers (2022).

Based on the table above shows the calculation of the highest PDRBC data normalization value is in the Riau Islands Province and the province with the lowest normalization value is Bengkulu Province. This study also measures the Normalization of the Open Unemployment Rate (TPT) on the island of Sumatra in 2016 – 2020 as follows:

Table 2: Normalization of Open Unemployment Rate (TPT).

Province	Normalization of Open Unemployment Rate (TPT)				
	2016	2017	2018	2019	2020
ACEH	92.43	93.43	93.66	93.83	93.41
SUMATERA UTARA	94.16	94.40	94.45	94.61	93.09
SUMATERA BARAT	94.91	94.42	94.34	94.62	93.12
RIAU	92.57	93.78	94.02	94.24	93.68
JAMBI	96.00	96.13	96.27	95.94	94.87
SUMATERA SELATAN	95.69	95.61	95.73	95.47	94.49
BENGKULU	96.70	96.26	96.65	96.74	95.93
LAMPUNG	95.38	95.67	95.96	95.97	95.33
KEP, BANGKA BELITUNG	97.40	96.22	96.39	96.42	94.75
KEP, RIAU	92.31	92.84	91.96	92.50	89.66
PULAU SUMATERA	**94.76**	**94.88**	**94.94**	**95.03**	**93.83**

Source: Processed by Researchers (2022).

Based on the table above shows that the highest Open Unemployment Rate Normalization (TPT) calculation is in the Riau Islands Province. The province with the lowest normalization value is the Riau Archipelago Province. This study also measures the Normalization of the Human Development Index on the island of Sumatra in 2016 – 2020 as follows:

Table 3: Normalization of HDI.

Province	Normalization of HDI				
	2016	2017	2018	2019	2020
ACEH	29.60	37.15	44.58	53.53	54.66
SUMATERA UTARA	29.60	36.78	44.46	51.51	51.89
SUMATERA BARAT	38.79	45.21	51.39	59.70	59.57
RIAU	44.71	52.14	60.33	67.38	63.73
JAMBI	24.81	29.47	37.78	45.47	45.84
SUMATERA SELATAN	7.43	15.24	21.91	29.85	29.72
BENGKULU	21.16	28.97	37.66	44.84	47.23
LAMPUNG	0.00	7.56	17.25	24.18	25.69
KEP.BANGKA BELITUNG	23.93	29.47	38.04	45.97	48.11
KEP, RIAU	79.85	85.64	90.55	98.61	100.00
PULAU SUMATERA	**29.99**	**36.76**	**44.40**	**52.10**	**52.64**

Source: Processed by Researchers (2022)

Based on the table above shows the results of the highest HDI Normalization calculation are in the Riau Islands Province and the lowest normalization value is Lampung Province. This study also measures the Normalization of School Enrollment Rates on the island of Sumatra in 2016 – 2020 as follows:

Table 4: Normalization of School Participation Rate.

Province	Normalization of School Participation Rate (APS) Age : 16-18				
	2016	2017	2018	2019	2020
ACEH	84.67	86.48	90.70	92.56	92.61
SUMATERA UTARA	55.17	56.98	60.54	61.96	64.92
SUMATERA BARAT	89.05	90.37	91.57	94.58	94.85
RIAU	51.07	55.67	59.77	59.88	60.59
JAMBI	26.55	28.41	30.60	30.76	32.95
SUMATERA SELATAN	12.70	14.78	18.06	21.57	24.96
BENGKULU	65.79	69.62	71.05	71.37	73.18
LAMPUNG	16.20	20.14	24.52	25.73	27.31
KEP, BANGKA BELITUNG	0.00	3.50	4.16	7.88	7.66
KEP, RIAU	85.88	90.04	95.40	96.83	100.00
PULAU SUMATERA	**48.71**	**51.60**	**54.64**	**56.31**	**57.90**

Source: Processed by Researchers (2022)

This study also measures the Normalization of Life Expectancy at Birth on the island of Sumatra in 2016 – 2020 as follows:

Table 5: Normalization of Life Expectancy at Birth.

Province	Normalization of Life Expectancy at Birth				
	2016	2017	2018	2019	2020
ACEH	62.07	61.76	61.44	57.68	50.47
SUMATERA UTARA	100.00	98.75	97.49	89.97	79.31
SUMATERA BARAT	88.40	86.21	84.64	77.43	68.03
RIAU	17.24	15.99	15.36	9.09	0.00
JAMBI	28.84	24.14	22.57	18.50	13.17
SUMATERA SELATAN	73.35	72.73	72.10	64.89	57.37
BENGKULU	93.42	91.54	90.60	82.76	71.16
LAMPUNG	49.53	48.28	47.96	40.75	30.41
KEP, BANGKA BELITUNG	50.16	48.90	47.96	40.75	30.72
KEP, RIAU	64.89	63.64	62.70	57.68	52.66
PULAU SUMATERA	**62.79**	**61.19**	**60.28**	**53.95**	**45.33**

Source: Processed by Researchers (2022)

And this study also measures the Normalization of the Poverty Level on the island of Sumatra in 2016 - 2020 as follows:

Table 6: Normalization of the Poverty Level.

Province	Normalization of the Poverty Level				
	2016	2017	2018	2019	2020
ACEH	83.57	84.08	84.32	84.68	84.57
SUMATERA UTARA	89.73	90.72	91.06	91.17	90.86
SUMATERA BARAT	92.86	93.25	93.45	93.58	93.44
RIAU	92.33	92.59	92.79	92.92	92.96
JAMBI	91.63	92.10	92.15	92.40	92.03
SUMATERA SELATAN	86.61	86.90	87.18	87.29	87.02
BENGKULU	82.97	84.41	84.59	84.77	84.70
LAMPUNG	86.14	86.96	86.99	87.38	87.24
KEP, BANGKA BELITUNG	94.96	94.70	95.23	95.38	95.11
KEP, RIAU	94.16	93.87	94.17	94.10	93.87
PULAU SUMATERA	**89.50**	**89.96**	**90.19**	**90.37**	**90.18**

Source: Processed by Researchers (2022)

(7) Determination of weights is strongly influenced by the output generated from the composite index. In general, there are three ways to determine equal weights with indicators. In this study, weighting can be done by utilizing the results of confirmatory factor analysis (CFA). The following is the proportion of the absolute value of the loading factor of each dimension in compiling the composite index (IPB):

Table 7: Determination of the Weighting of the Economic Dimension.

Indikator Dimensi Ekonomi	Loading Faktor	Bobot
PDRBC	0.75	0.43
TPT	1.00	0.57
Indikator Dimensi Sosial	**Loading Faktor**	**Bobot**
IPM	0.68	0.33
APS	0.99	0.48
AHPSL	0.34	0.17
TK	0.05	0.02
Indikator Dimensi Lingkungan	**Loading Faktor**	**Bobot**
IKLH	0.99	0.36
IKU	0.52	0.19
IKA	0.65	0.24
IKTL	0.59	0.21
Dimensi Pembangungan Berkelanjutan	**Loading Faktor**	**Bobot**
Ekonomi	0.98	0.56
Sosial	0.69	0.40
Lingkungan	0.07	0.04

Source: Processed by Researchers (2022)

Based on the table above, the Index (GFI) in this study is 0.48 0.09 where the bigger the better, the Root Mean Square Error of Approximation (RMSEA) is 0.36 in accordance with the expected indicator, which is smaller than 0.08. The overall value is not in accordance with the expected criteria, which is greater than 0.90, which means that the greater the value, the better. Based on the explanation of the table, it can be concluded that the test does not meet the criteria of the Godness of Fit Index.
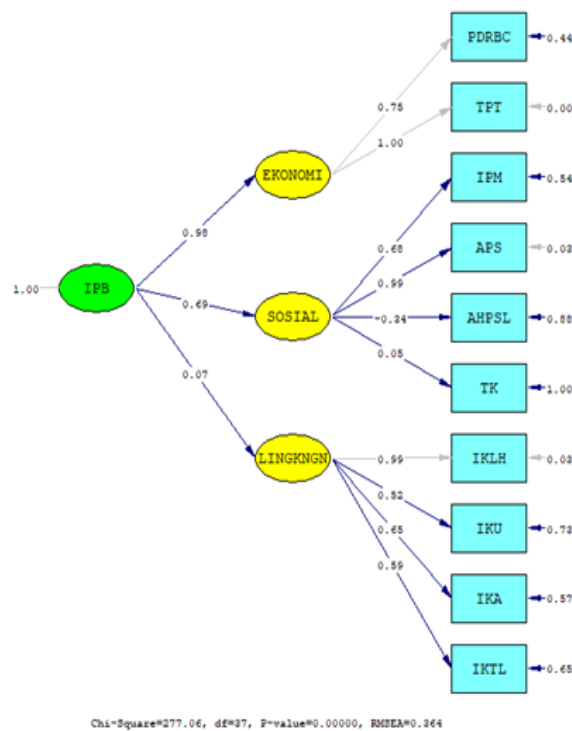
Fig. 1: Path Diagram of Loading Factor Value

Source: Processed by Researchers (2022).

(7) Linear aggregation is a combination of indicators that is carried out by adding up each indicator with a predetermined weight to form a composite index of sustainable regional development.

(8) The presentation and dissemination of the calculation results is the final step in the preparation of the composite index. The assessment of sustainable development is the first step for the formulation of policies that are the key to achieving sustainable development. Analysis of the resulting composite index is one way to explore development problems.

Table 8: Sustainable Development Index for Sumatra Island.

Provinsi	Indeks Pembangunan Berkelanjutan				
	2016	2017	2018	2019	2020
ACEH	58.36	60.05	62.61	64.42	63.68
SUMATERA UTARA	59.08	60.49	63.05	63.68	62.61
SUMATERA BARAT	63.34	64.65	66.94	69.71	67.36
RIAU	66.41	69.11	72.41	73.66	73.51
JAMBI	49.68	51.06	53.07	55.07	54.54
SUMATERA SELATAN	46.51	48.20	50.55	52.13	51.28
BENGKULU	56.70	57.94	59.51	60.83	59.21
LAMPUNG	41.15	42.99	45.57	46.68	45.21
KEP, BANGKA BELITUNG	46.14	46.83	48.57	50.34	48.74
KEP, RIAU	86.91	87.98	89.97	90.66	91.71
PULAU SUMATERA	**57.43**	**58.93**	**61.22**	**62.72**	**61.78**

The increase in the Riau province's sustainable development index is strongly influenced by an increase in all its dimensions, especially the economic and environmental dimensions, which if seen are indeed higher than other provinces on the island of Sumatra. Meanwhile, the smallest increase occurred in Bengkulu province, which was 2.51.
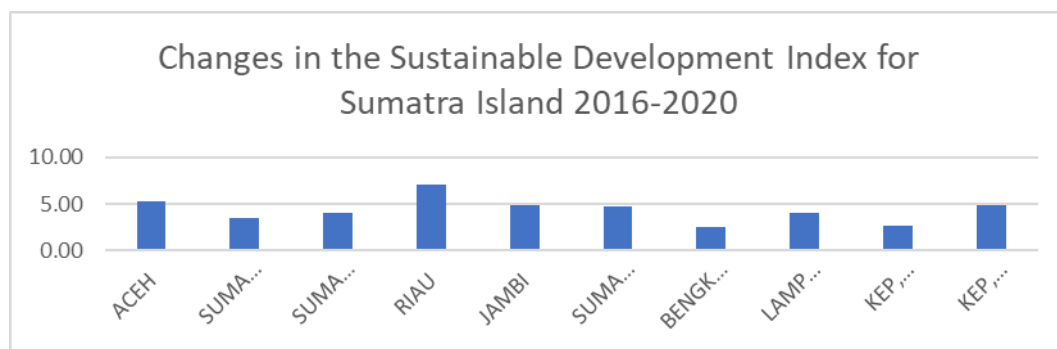
Fig. 2: Changes in the Sustainable Development Index for Sumatra Island 2016-2020
Source: Processed by Researchers (2022).

When viewed from the value of the sustainable development index, Riau Islands province is the province that has the highest IPB value of 91.71 in 2020. While the lowest IPB value occurs in Lampung province with an IPB value of 45.21 in 2020.

Conclusions

Based on the results of research and data analysis, it is concluded:

Several sections in this study indicate a lack of attention to environmental development. The achievement of environmental development has decreased nationally. The government must be more serious in encouraging development on the environmental dimension. Prevention of environmental damage, restoration of the damaged environment and the provision of quality environmental data are forms of policies that can be carried out on the environmental dimension. Identification of local wisdom that has a positive impact on environmental development must continue to be carried out. Once identified, the effort that can be done is to maintain the local wisdom, for example by incorporating the local wisdom into formal rules in the community concerned. This formal regulation does not mean that it must be included as a government regulation, because sometimes it is counter-productive. The formal rules referred to are more directed to agreements made jointly by community members. The making of these formal rules can be supported by scientific facts that elevate the positive values of the local wisdom.

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