European Journal of Sustainable Development (2024), **13**, 4, 117-130 ISSN: 2239-5938
Doi: 10.14207/ejsd.2024.v13n4p117

Beyond Growth: A Provincial-Level Assessment of the Doughnut Economy's Potential in Indonesia

By Hania Rahma[1] and Akhmad Fauzi[2]

ABSTRACT:
The focus on a growth-oriented development paradigm has led to unsustainable outcomes such as environmental degradation, resource depletion, increased inequality, and compromised social well-being. An alternative approach known as the Doughnut Economy has emerged, offering a new economic development model that aims to guide humanity towards staying within planetary boundaries. The Doughnut model visualizes sustainable development with an ecological ceiling as the outer limit and a social foundation as the inner boundary. This study attempts to create a Doughnut Economy Index for 34 provinces in Indonesia, categorizing them into four groups to assess how well they meet societal needs while remaining within planetary limits. The index, derived from a simple formula, yields two indices: social performance and ecological damage. The research reveals that only three out of the 34 provinces in Indonesia fall within the safe zone of the Doughnut model. Shortfall issues are prevalent in Eastern Indonesian provinces like Papua, Maluku, and Nusa Tenggara Islands, while overshoot concerns are more prominent in provinces in Kalimantan and Java & Bali Islands.

Keywords: Growth-oriented paradigm, Doughnut Economy, sustainable development, regional development, Doughnut Economy Index

1. Introduction

For decades, the prevailing development model has promoted continuous growth as the pathway to success. This approach, centered on escalating consumption and production, has undeniably brought about advancements. Economic growth has contributed to rising living standard, reducing poverty and spurred innovation that benefit to human well-being (OECD, 2020). However, as we enter the 21st century, the shortcomings of this model are becoming more evident. The relentless pursuit of growth has exacerbated social and environmental inequalities (Milanovic, 2018), with the exploitation of natural resources and environmental degradation continuing unchecked. Similarly, developed countries might overcome financial crisis such as that in 2008, however the effects of global environmental crisis arising from conventional growth based economic model remain uncertain (Harangozo et al, 2018). Climate change now poses a greater threat than ever to vulnerable populations and ecosystems, while the planet's capacity to sustain these pressures is on the verge of being exceeded (Prescot, 2018).

The government could implement policy measures to address the trade-offs between economic growth and social-environmental disparities through different frameworks. These may involve enhancing governance and institutional aspects of

| [1] Lecturer at Faculty of Economic and Management, IPB University, Indonesia. Email: haniarahma@apps.a
[2] Professor at Department of Resource and Environmental Economics, Faculty of Economic and Management, IPB University, Indonesia.

development, fostering green industries, and enacting policies for social inclusivity and environmental regulation enforcement. However, the effectiveness of these measures may be limited without a paradigm shift that serves as the overarching policy framework for all policies.

Recognizing the shortcomings of growth-centric development, various alternative development paradigms have been proposed. These alternatives encompass green and inclusive growth, degrowth, and beyond growth or post-growth (Likaj et al, 2022; Kallis et al, 2012). Green and inclusive growth involves adjusting growth-centered policies to be more sustainable and inclusive. Degrowth, on the other hand, challenges the notion that growth itself is the root of the issue, advocating for deeper structural reforms such as halting fossil fuel extraction and emphasizing community practices and universal basic income (Kallis, 2011). The third alternative, known as beyond growth or post-growth, aims to steer development towards a multidimensional model (Jackson, 2019).

In addition to the three existing development paradigms, a new alternative development paradigm called Doughnut Economics, developed by Kate Raworth (Raworth, 2017a; Raworth, 2017b), has been proposed. Doughnut Economics offers policies that enable policymakers to achieve two objectives. The first is to map areas within cities or regions that exceed planetary boundaries, while the second is to pinpoint regions or sectors that fall short of meeting minimum standards (Savini, 2024). Hence, the essence of the Doughnut Economy is to ensure that social foundation as the inner circle boundary does not experience a shortfall, while also ensuring that ecological ceiling as the outer circle is not exceeded, as this would lead to overshoot (Figure 1). The economic challenge in the Doughnut Economy lies in finding a way to meet the needs of the present without surpassing the environmental boundaries, thus operating within a safe range. Consequently, by utilizing the Doughnut Economics framework, policymakers have been able to identify sectors that exceed limits and those that fail to meet essential human requirements.

While the Doughnut concept originated on a global scale, recent studies have adapted it to country, regional, and even city levels. Researchers such as Dearing et al (2014), Sayers (2015), and Ferretto et al (2022) have utilized national or regional indicators (Fanning et al., 2022; Rahma et al, 2022) and a spatial dynamics approach (Dearing et al, 2014) to explore this concept further. The adoption of the Doughnut Economics paradigm has become increasingly vital in developing nations like Indonesia. It is crucial for other developing nations encountering comparable challenges but with varying levels of socio-economic and environmental issues to consider the relevance of Doughnut Economics. Therefore, the adoption of this framework in such countries involves identifying the key socio-economic and environmental issues that require immediate attention. As a result, implementing the framework necessitates reevaluating the selection of indicators suitable for these countries, as well as determining the appropriate index for measuring the progress of Doughnut Economics performance.

With challenges such as climate change, inequality, and resource depletion becoming more urgent, traditional economic models have proven insufficient in addressing these intricate issues. The Doughnut Economics framework presents a comprehensive approach that prioritizes the creation of a sustainable and fair economy that caters to the needs of both people and the planet. This study aims to delve into the reasons why embracing this paradigm is crucial for fostering a more resilient and inclusive society, particularly within the context of a developing country like Indonesia. It represents the first application of the Doughnut Economics framework in Indonesia and seeks to assess the sustainability of regional developments using the principles of Doughnut Economics. By offering an alternative framework to the conventional measurements employed by the Indonesian government, such as Gross Domestic Product, Human Development Index, and Environmental Quality Index, Doughnut Economics can identify regions that exceed planetary boundaries and those that fall short in meeting essential human needs.

Figure 1. Doughnut economics framework (Raworth, 2017a)

2. Methods

To assess regional development performance using the Doughnut Economics framework, the study employs the Social Performance Index to ascertain the proximity of provinces to the baseline of essential human needs required to avert any shortfall. Additionally, an Ecological Damage Index was utilized to determine if ecological harm in each province has surpassed the threshold boundaries, known as the overshoot phenomenon. This measurement seeks to enhance the method previously employed by Rahma et al. (2022) by adjusting certain indicators and assigning weights to variables. The assessments were carried out across 34 provinces in Indonesia.

The Social Performance Index was measured based on 12 variables (Raworth, 2017) and 22 indicators that have been utilized by previous researches (Raworth, 2017a; Raworth, 2017b; O'Neill et al., 2018; Cole et al., 2014; Rahma et al., 2022), while the Ecological Damage Index was formulated using 6 variables and 10 indicators (Raworth, 2017a; Raworth, 2017b; Rockstrom et al., 2009; Nykvist et al., 2013; Cole et al., 2017; Dearing et al., 2014). These indices, focusing on social performance and ecological damage, were then employed to compare the various provinces in Indonesia. The study utilized secondary data at the provincial level for the year 2021. Due to some data not being available for 2021, certain data from 2020 were utilized. Most of the data used were sourced from Statistics Indonesia (BPS), with some additional data obtained from the Ministry of Health, Ministry of Manpower, and Ministry of Agriculture.

The delay in data availability is recognized and may impede the overall accuracy and reliability of capturing recent dynamics at the provincial level. Data for 2021-2022 could be skewed due to the impact of Covid-19, with certain provinces experiencing significant socio-economic performance challenges due to lockdown and other pandemic-related policies. Despite these challenges, official data published in developing countries like Indonesia typically lags by two years. Consequently, to analyze the economic, social, and environmental dynamics of 2024, the data will only be accessible in 2026. To mitigate this issue, the study acknowledges that the current doughnut index is contingent on the data used and may not fully reflect post-Covid recovery, where some provinces may perform better than during the pandemic. To address this, future studies employing a similar approach should conduct sensitivity analyses and recommend improved data collection methods for authorities.

Table 1. Social performance variables and indicators of doughnut economy

Variable	Indicators [a]	References	Min	Max	Foundation
Water (Wtr)	Households who able to access of decent drinking water (%)	Positive	46	100	91
Health (Hlth)	Life expectancy (years)	Positive	51	80	70
	Under-five mortality per 1000 live births	Negative	0	25	5
Education (Edu)	Mean years of schooling	Positive	2.1	14.1	9
	Population Aged >15 years graduated from senior high school at minimum (%)	Positive	10.66	88.64	55.45
Energy (Egy)	Households who use public electricity (%)	Positive	7.4	100	95
	Households that use LPG and electricity for cooking (%)	Positive	0	100	68.5
Housing (Hs)	Households with ownership status of dwelling (%)	Positive	18	100	77
	Households that have access to proper sanitation (%)	Positive	0	100	95
Network (Nwk)	Population aged >5 years who use cellular phone (%)	Positive	0	100	75
	Population aged >5 years with access to the internet (%)	Positive	6.1	100	59.6
Income & Work (I&W)	Population living below poverty limit (%)	Negative	0	36.65	27
	Share of worker to the total working age population (%)	Positive	30.75	87	65
Food (Fd)	Population aged <5 years were too short for their ages (%)	Negative	1.2	56.5	13.5
	Prevalence of undernourishment (%)	Negative	0	53.1	9.8
Peace & Justice (P&J)	Households who feeling safe walking alone in their living area (%)	Positive	31	95	72
	Populations as victims of crime (%)	Negative	0	2.19	0.45
Political Voice (PV)	Political right index	Positive	0	100	56.6
	Population aged >10 years who participate in social activities (%)	Positive	0	100	77.42
Gender Equality (GEq)	Representation gap between % women and % men in parliament (%)	Negative	0	100	40
	Gap of % work force between men and women (%)	Negative	0	100	30
Social Equity (SEq)	Proportion of population who live under 50% of national median income (%)	Negative	0	40	12.36

[a] Source: Raworth (2017a), Raworth (2017b), O'Neill et al. (2018), Cole et el. (2014), Rahma et al. (2022)

Table 2. Ecological Damage Variables and Indicators of Doughnut Economy

Variables	Indicators [a]	Reference	Min	Max	Ceiling
Water Pollution	Village experiencing water pollution (%)	Positive	0	40	12.70
	Water quality BOD (mg/l)	Positive	0	17	5
Soil Pollution	Village experiencing soil pollution (%)	Positive	0	10	1.78
Air Pollution	Village experiencing air pollution (%)	Positive	0	20	6.71
	NO2 concentrate (μg/Nm³)	Positive	0	30	10
Land Coverage	Forest coverage of total land (%)	Negative	0.5	93.17	60.74
	Households with plants in the home yard (%)	Negative	0	70	44.45
Natural Disaster	Village with landslide disaster (%)	Positive	0	30	7.92
	Village with floods (%)	Positive	0	50	18.27
Waste	Households whose waste transported by officials (%)	Negative	0	100	26.78

[a] Source: Cole et.al (2017), Raworth (2017a), Raworth (2017b), Rockstrom et al. (2009), Nykvist et al. (2013), Dearing et al. (2014), Rahma et al. (2022)

All indicators, except for those already presented as indices, were subsequently standardized using the Min-Max method formulas outlined as follows:

For indicators with positive reference: $X^*_{ij} = (X_{ij} - X_i\min)/(X_i\max - X_i\min) * 100$

For indicators with negative reference: $X^*_{ij} = (X_i\max - X_{ij})/(X_i\max - X_i\min) * 100$

where X^*_{ij} is the value of indicator i for the province j. The maximum and minimum values for each indicator represent the highest and lowest values achieved by countries worldwide, respectively. The normalized values fall within the range of 0-100. The foundation of social performance denotes the minimum threshold of essential human needs that provinces must meet to attain a satisfactory standard of living and remain within the safe zone of the doughnut, thereby avoiding any shortfall phenomena. On the other hand, the ceiling of ecological damage signifies the upper limit that provinces should steer clear of to prevent overshooting and maintain a secure position within the doughnut. The foundation values of social performance indicators and the ceiling values of ecological damage indicators are predominantly based on national and global average performances obtained from CBS Indonesia, UNICEF, UNESCO, World Bank, FAO, and WHO.

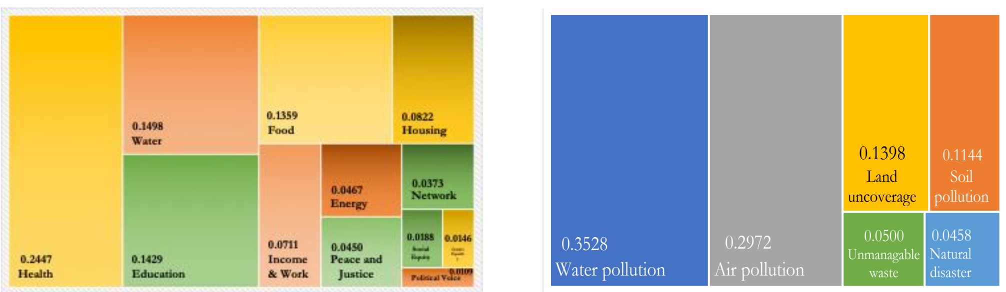


Figure 2. Weight of variables for aggregating social performance index (left) and ecological damage index (right)

The study utilized the subjective direct ranking method (Jahan and Edwards, 2013; Odu, 2019) to determine the weight of each variable based on the subjective experiences and judgments of decision-makers or experts. Eight experts were directly asked with ranking the variables in order of importance. These rankings were then converted into weights for all variables using the Rank Order Centroid (ROC) technique, with the outcomes presented in Figure 2. However, within each variable, all indicators were assigned equal weight, allowing for the aggregation of index values for each variable through a simple arithmetic mean.

The composite index of social performance and ecological damage was calculated by aggregating the two using the following formula:

$$SPI_{DE_j} = \sum_j \sum_{i=1}^{K} w_i \; X_{ij}^{*} \; \dots\dots\dots\dots (1) \qquad EDI_{DE_j} = \sum_j \sum_{i=1}^{K} w_i \; X_{ij}^{*} \; \dots\dots\dots\dots (2)$$

In the equation (1) and (2), SPI_{Dej} represents the Social Performance Index of province j, EDI_{DEj} stands for the Ecological Damage Index of province j, w_i denotes the weight of variable i, and X_{ij}^{*} signifies the normalized value of variable i in province j.

3. Results and Discussion

3.1 Sosial Performance Index

As previously discussed, there are 12 elements of human needs outlined in doughnut economy to attain the profound objectives of social performance. Table 3 displays the 12 indices of social performance based on doughnut economy for every province in Indonesia. These indices are then combined using the formula detailed in equation (1) with the outcome illustrated in Figure 3.

Table 3. Social performance index of doughnut economy of 34 provinces in Indonesia year 2021

Provinces	Wtr	Hlth	Edu	Engy	House	Nwk	I&W	Fd	P&J	PV	GEq	SEq	SPI
Aceh	79.24	62.37	52.28	95.37	76.89	61.81	54.60	82.38	66.26	76.42	45.59	75.05	68.66
North Sumatra	83.13	76.84	55.30	92.61	71.24	71.92	68.62	89.79	51.03	66.53	50.43	85.33	74.47
West Sumatra	69.26	65.71	50.41	88.53	65.04	71.06	70.70	84.39	59.95	73.13	47.96	93.83	68.25
Riau	81.04	76.70	51.08	91.56	75.06	74.22	68.36	85.67	64.99	71.54	54.04	93.70	74.19
Jambi	62.41	75.29	44.69	90.78	80.55	67.14	68.87	88.22	63.99	70.99	47.54	85.23	70.37
South Sumatra	71.67	76.39	42.92	93.40	77.25	68.37	63.30	91.14	68.10	74.65	57.27	66.90	71.69
Bengkulu	39.61	65.95	46.83	95.47	80.34	66.22	62.72	87.52	56.31	67.54	51.87	79.08	64.17
Lampung	63.33	77.26	39.17	92.91	85.48	71.90	65.50	86.55	70.38	75.25	52.23	69.70	70.53
Bangka Belitung	50.74	69.87	41.51	95.62	85.84	71.54	71.91	86.70	67.91	66.72	40.48	97.48	67.93
Riau Islands	83.02	69.98	64.14	92.71	75.58	85.47	69.49	88.04	70.64	64.47	42.89	96.03	75.68
DKI Jakarta	99.74	84.14	71.20	95.89	66.17	88.04	67.24	96.30	48.03	67.88	56.22	99.55	82.38
West Java	87.48	81.55	44.64	94.16	73.41	73.87	63.86	89.22	55.28	74.47	53.93	71.25	74.73
Central Java	88.19	73.39	36.61	92.78	85.49	68.63	65.49	79.25	75.58	78.99	56.15	53.98	71.85
D.I. Yogyakarta	92.02	81.78	57.83	88.33	84.25	77.58	68.79	79.56	74.91	74.39	60.88	67.65	78.06
East Java	90.78	72.70	39.46	91.34	83.66	66.83	66.87	83.80	69.31	69.47	53.33	61.10	72.62
Banten	87.98	72.03	48.64	93.61	80.97	71.76	65.41	90.58	60.76	70.42	50.99	89.50	74.36
Bali	95.48	74.97	51.91	90.98	82.07	74.64	78.08	90.11	85.20	71.85	60.45	85.65	78.76

Provinces	Wtr	Hlth	Edu	Engy	House	Nwk	I&W	Fd	P&J	PV	GEq	SEq	SPI
West Nusa Tenggara	90.00	60.63	37.38	89.51	83.72	67.82	64.64	81.69	55.96	76.21	39.89	59.25	68.00
East Nusa Tenggara	72.96	61.16	36.22	40.51	77.67	59.47	57.90	70.77	62.79	78.50	61.41	27.50	60.40
West Kalimantan	60.67	70.53	35.63	88.89	82.01	63.76	70.64	67.08	72.82	72.25	49.04	83.68	65.21
Central Kalimantan	57.50	64.45	41.86	84.66	72.89	69.72	73.90	80.34	69.42	69.96	66.54	91.50	65.67
South Kalimantan	56.30	63.69	41.79	92.19	78.42	74.93	74.96	88.61	66.68	79.35	55.59	91.90	67.32
East Kalimantan	73.70	67.53	57.83	92.73	77.06	82.11	68.35	76.33	61.11	68.30	53.80	97.18	70.90
North Kalimantan	75.56	66.86	49.30	77.73	71.36	78.66	69.53	77.69	62.55	60.34	44.78	99.23	68.65
North Sulawesi	84.54	76.35	53.84	90.21	78.63	70.26	63.97	91.78	59.63	80.41	62.42	68.93	75.13
Central Sulawesi	78.72	67.73	44.53	81.12	78.55	62.96	64.85	78.33	53.00	66.20	60.97	71.53	67.93
South Sulawesi	83.67	72.18	44.70	94.14	86.49	72.12	65.27	85.48	66.83	70.37	60.08	52.38	72.68
Southeast Sulawesi	85.07	71.59	48.41	80.50	84.47	70.64	66.51	78.54	69.12	60.12	56.10	45.68	71.37
Gorontalo	89.94	56.91	37.72	93.78	77.80	69.83	58.49	78.61	55.69	81.15	61.08	47.90	66.20
West Sulawesi	59.91	55.39	38.84	86.48	83.79	63.52	67.00	68.30	76.83	68.19	45.25	35.65	60.96
Maluku	87.43	63.92	57.75	46.47	73.22	62.75	54.82	64.33	58.70	75.52	61.29	80.68	66.04
North Maluku	79.00	55.21	48.00	44.45	78.43	56.75	68.76	61.97	66.37	71.96	59.85	84.15	62.39
West Papua	66.07	64.38	47.87	42.37	74.33	64.98	51.77	59.30	54.74	59.63	53.42	72.90	60.02
Papua	35.04	62.68	31.59	20.68	60.16	33.42	52.59	52.88	67.37	66.37	55.90	66.63	49.01
Social Foundation	83.33	72.76	57.47	81.55	83.48	65.96	43.61	79.65	71.68	67.01	60.00	69.10	73.63

Based on the data presented in Table 3 and Figure 3, it is observed that out of 34 provinces, only 8 have a social performance index (SPI) surpassing the foundation of 73.63, with variations across different social performances variables. The variables of energy, network, and gender equality show the highest number of provinces with performance indices exceeding the baseline. Conversely, several provinces faced deficiencies in variables such as education, income & work, peace and justice, housing, health, and water.

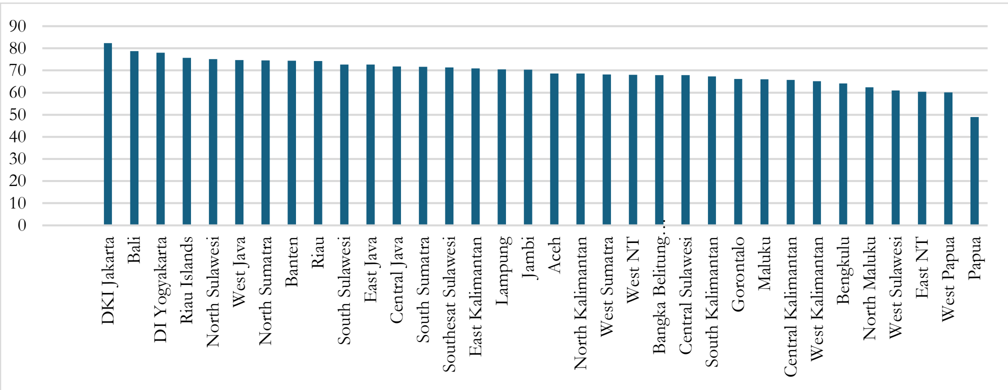


Figure 3. Provincial social performance index of doughnut economy in Indonesia year 2021

DKI Jakarta Province has the highest social performance index at 82.38, followed closely by Bali and Yogyakarta. It means that those provinces are excelling in terms of the fulfillment of what people need to meet, much higher than the foundation (73.63). In the bottom, there are Papua, West Papua, and East Nusa Tenggara. DKI Jakarta Province exhibits subpar performance only in the housing and peace & justice variables. On the other hand, Papua province struggles in nearly all variables except income & work.

3.2 Ecological Damage Index

Table 4 displays the six variable indices representing ecological damage in the context of doughnut economics for 34 provinces in Indonesia. These variables are combined using the formula outlined in equation (2) and the resulting aggregate is depicted in Figure 5. DKI Jakarta province exhibits the highest ecological damage index at 73.43, while West Papua Province has the lowest at 13.40. The upper limit or ceiling for the ecological damage index is 32.89 indicating that any values surpassing this threshold indicate an overshoot phenomenon.

Table 4. Ecological damage index of doughnut economy of 34 provinces in Indonesia year 2021

Provinces	Water Pollution	Soil Pollution	Air Pollution	Land Uncover	Natural Disaster	Unmana-geable Waste	Ecological Damage Index
Aceh	14.80	3.53	29.18	33.83	27.10	84.97	24.52
North Sumatra	37.50	11.74	27.70	54.88	25.07	79.66	35.61
West Sumatra	27.16	16.32	22.79	41.55	55.32	83.60	30.74
Riau	39.49	4.80	31.82	43.73	26.12	85.77	35.54
Jambi	39.18	10.24	19.76	48.18	36.56	90.22	33.79
South Sumatra	21.50	22.17	33.84	57.34	16.76	85.22	33.22
Bengkulu	18.84	5.28	22.24	39.31	20.21	86.27	24.60
Lampung	22.04	8.67	35.68	46.70	16.75	90.66	31.20
Bangka Belitung	39.01	66.16	33.68	52.18	15.44	79.85	43.33
Riau Islands	38.32	9.35	22.98	56.13	23.99	46.47	32.69
DKI Jakarta	76.84	37.45	88.66	92.58	45.19	13.40	73.43
West Java	35.83	21.66	44.95	68.25	56.06	66.54	43.92
Central Java	26.15	26.16	45.84	53.06	37.75	79.78	38.98
D.I. Yogyakarta	29.84	18.26	43.22	41.27	33.87	61.71	31.38
East Java	25.30	18.13	43.25	52.76	23.87	74.48	36.05
Banten	38.35	25.77	64.52	68.56	37.31	60.07	49.95
Bali	22.80	6.98	21.29	52.59	29.89	55.25	26.62
West Nusa Tenggara	21.74	15.64	32.48	14.47	22.62	76.05	25.97
East Nusa Tenggara	11.16	10.14	25.84	33.34	45.99	96.51	24.37
West Kalimantan	54.61	56.33	29.46	41.85	45.34	94.50	47.12
Central Kalimantan	55.00	79.31	22.90	39.96	49.18	88.81	47.56
South Kalimantan	57.93	19.43	32.29	50.56	52.43	73.69	45.41
East Kalimantan	69.97	24.86	35.34	39.29	44.58	80.66	49.60
North Kalimantan	32.53	64.32	34.08	22.46	56.02	68.74	38.10
North Sulawesi	17.47	14.67	20.75	44.32	35.40	63.14	24.98
Central Sulawesi	16.62	12.38	17.91	33.41	39.04	87.98	23.46
South Sulawesi	19.53	12.78	30.85	47.07	34.03	69.84	29.15
Southeast Sulawesi	15.14	9.96	26.12	32.54	13.71	90.31	23.94
Gorontalo	16.44	9.54	16.53	38.71	50.05	81.91	23.60
West Sulawesi	32.34	15.38	27.03	30.10	56.15	87.41	32.25
Maluku	12.16	4.01	14.29	39.12	20.01	93.53	20.06
North Maluku	13.26	12.47	20.81	41.32	33.53	83.49	23.78

Provinces	Water Pollution	Soil Pollution	Air Pollution	Land Uncover	Natural Disaster	Unmana-geable Waste	Ecological Damage Index
West Papua	8.57	6.55	7.58	16.22	12.99	90.14	13.40
Papua	10.84	17.10	11.12	23.79	8.05	92.06	17.38
Ceiling	31.76	17.82	33.45	35.91	31.48	73.22	32.89

Based on the data presented in Table 4 and Figure 4, it is observed that 15 out of 34 provinces surpassed the ceiling of 32.89 in their ecological damage index (EDI), indicating they were experiencing overshoot phenomena. Approximately 60-70% of all provinces scored significantly on the variables related to land uncover, unmanageable waste, and natural disasters, while less than 40% scored high on water, soil, and air pollution variables.

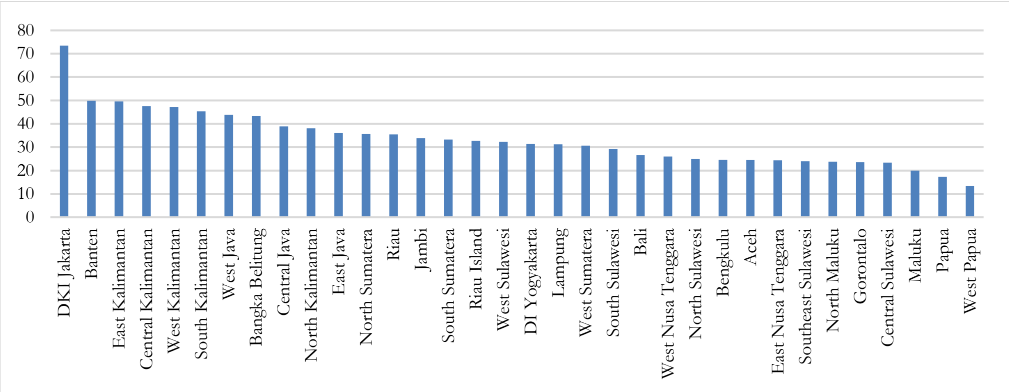
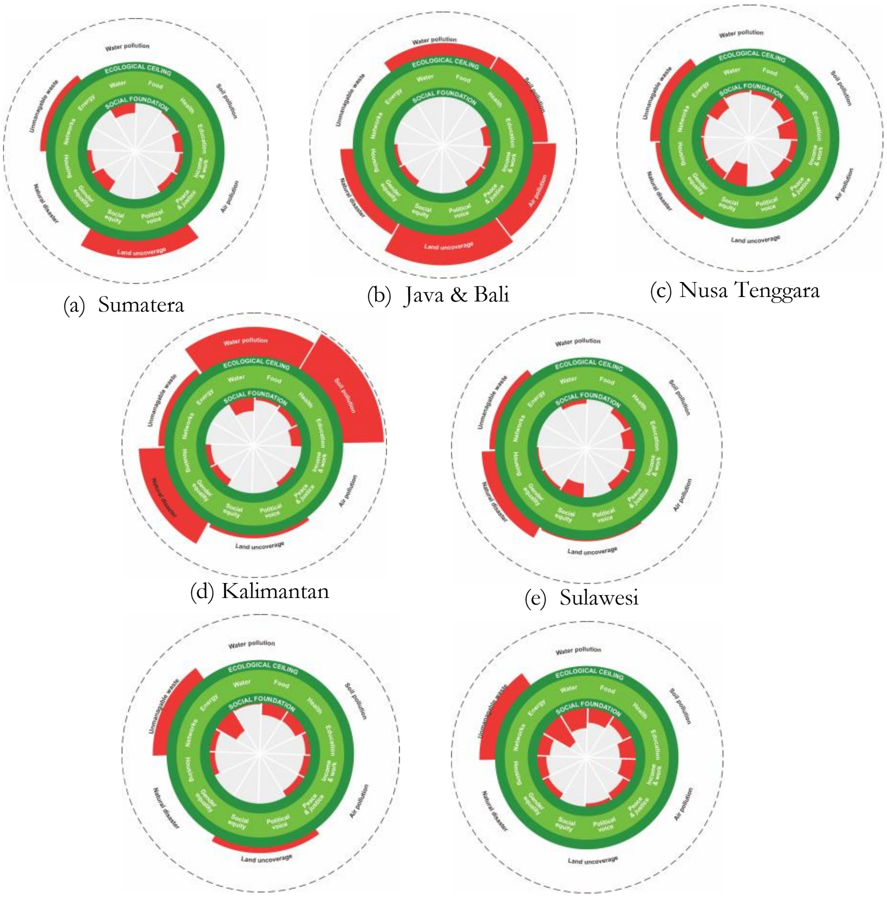


Figure 4. Provincial ecological damage index of doughnut economy in Indonesia year 2021

DKI Jakarta holds the highest ecological damage index at 73.43 followed by Banten (49.95) and East Kalimantan (49.60), while West Papua province having the lowest at 13.40. This indicates that the ecological damage in those three provinces surpassed the planetary boundary or ecological ceiling. Notably, Jakarta shows a low value only for the unmanageable waste variable, while the situation is reversed in West Papua province. The determination of the ceiling value is based on the average ecological damage in Indonesia, as there are limited references available to establish the maximum threshold for each variable used in measuring ecological damage.

3.3. Shortfall and Overshoot Phenomena

Figures 4a to 4g depict the shortfall in social performance and the overshoot in ecological damage across various island clusters in Indonesia. The 34 provinces are categorized into seven island clusters: Sumatra, Java & Bali, Nusa Tenggara, Kalimantan, Sulawesi, Maluku, and Papua. The red area within the doughnut symbolizes the shortfall, indicating that basic human social needs are not being satisfied. As the red area shifts closer to the inner circle or moves away from the social foundation, the severity of unmet human basic needs deepens. Conversely, the red area outside the doughnut represents the overshoot phenomenon, signifying that the upper limit of ecological damage has been surpassed (Raworth, 2017b). Any point that extends beyond this threshold is considered an overshoot. The greater the distance of the red area from the highest planetary boundary, or ecological ceiling, the more severe the ecological damage becomes.



(a) Sumatera (b) Java & Bali (c) Nusa Tenggara

(d) Kalimantan (e) Sulawesi

(f) Maluku (g) Papua

Figure 5. Shortfall and overshoot visualization of doughnut economy in Indonesia by island year 2021

As shown in Figure 5, the islands experiencing the most significant shortfalls are Papua, Nusa Tenggara, and Maluku. These islands demonstrate deficiencies in nearly all social performance variables, particularly in energy, education, health, income & work, and social networks. The variables for education, housing, and peace & justice indicate shortfalls across all the islands, while issues related to water and health are observed in every island except Java & Bali. Papua is the most challenged island, with 11 out of 12 social performance variables falling below the foundation line, and 7 of these variables ranked the lowest among all islands. The most severe shortfalls in Papua occur in energy, water, and food. In contrast, Java & Bali face shortfalls in only five variables, with education being the most affected.

Kalimantan Island has experienced the most extreme overshoot, with ecological damage exceeding the outer boundary, or ecological ceiling. Levels of soil and water pollution in Kalimantan surpass this ecological threshold. Additionally, provinces within

Kalimantan are grappling with disaster-related challenges, particularly due to frequent flooding. Java and Bali have also encountered overshoot phenomena, especially in terms of land conversion and air pollution. Meanwhile, ecological damage in Papua, Maluku, Nusa Tenggara, and Sulawesi remains relatively low overall, keeping these islands within the safe zone of the doughnut framework. However, both Papua and Maluku are dealing with significant issues related to unmanageable waste.

The findings of this study indicate that certain socio-economic development indicators, such as income inequality and environmental degradation, which are not captured by conventional metrics like GDP, can be assessed for progress using the Doughnut Economics framework. This highlights the potential value of Doughnut Economy as a supplementary tool to traditional economic progress metrics. By incorporating this framework into national planning policies, the government can utilize Doughnut Economics as a "satellite account" or supplementary metric. In the case of Indonesia, this integration has already been implemented, with the government utilizing the Green Economics index as complementary indicators for monitoring economic development at the provincial level. A similar approach could be applied to the Doughnut Economics index, as demonstrated in this study.

3.4 Quadrant Mapping of the Social Performance and Ecological Damage

Figure 6 clearly shows that nearly half of the provinces in Indonesia are in the lower left quadrant, indicating a low level of social performance with relatively minor ecological impacts. Only 3 out of the 34 provinces are situated in the safe zone of the doughnut model, represented by the green dot in the upper left section of the diagram. These provinces demonstrate superior social performance relative to the social foundation while maintaining lower ecological damage compared to their ecological ceiling.

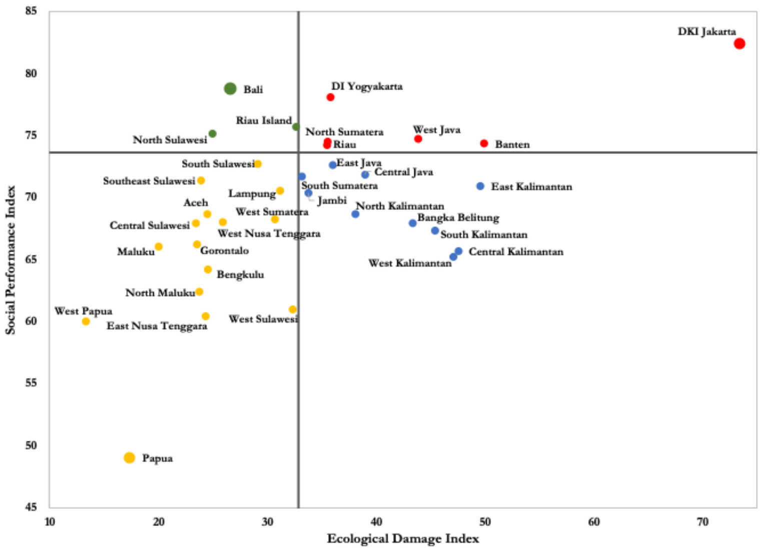


Figure 6. Quadrant mapping of the social performance and ecological damage index of provinces in Indonesia

Notably, DKI Jakarta has the highest social performance but also registers the highest level of ecological damage. Along with DKI Jakarta, five additional provinces fall into this category. The remaining ten provinces are found in the lower right quadrant, reflecting both low social performance and significant ecological damage. Interestingly, 7 out of the 10 provinces in this category are major mining areas, particularly for coal and tin.

3.5 Making a new pathway toward the safe zone in the doughnut

Figure 7 illustrates the ideal pathway to the safe zone within the doughnut framework, reflecting the relationship between the social performance index and the ecological damage index. The dashed line represents the trend line, indicating the "normal" or undesirable trajectory where an increase in the social performance index corresponds with an increase in the ecological damage index. This trade-off is often encountered by regions that prioritize social indicators without adequately considering their environmental impact.

Doughnut economics provides a framework to address this challenge by advocating for regions to stay within the safe zone, where both social needs are met, and ecological limits are not exceeded. The ideal pathway, depicted by the solid concave curve in Figure 6, represents a more sustainable approach. This curve illustrates how regions can aim for both higher social performance and lower ecological damage in tandem. As one moves along this pathway from left to right on the horizontal axis, this downward trajectory reflects an increase in the social performance index coupled with a decrease in ecological damage.

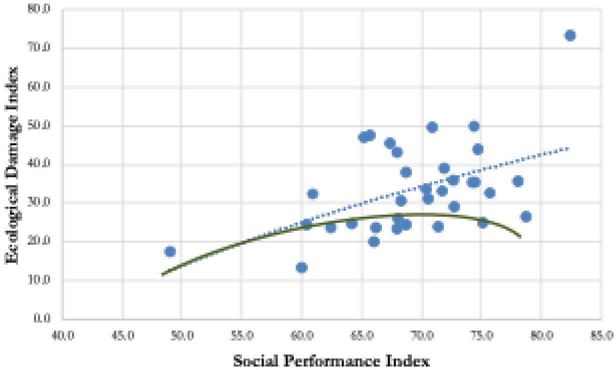


Figure 6. Making a new pathway toward the safe zone in the doughnut

This balanced approach suggests that it is possible to enhance social outcomes while simultaneously mitigating environmental impacts, leading to a more holistic model of development. The concave nature of the ideal pathway emphasizes the importance of strategic interventions that align social progress with ecological sustainability, advocating for solutions that do not compromise the environment in the pursuit of social advancement. Ultimately, Figure 6 encapsulates the core idea of doughnut economics: achieving a state where human needs are met without overshooting the planet's ecological boundaries, thereby promoting a sustainable and equitable future.

4. Concluding Remarks

Evaluating regional development performance solely based on traditional macro indicators like GDP and the Human Development Index may yield incomplete results and potentially lead to inaccurate conclusions. This is because these indicators overlook crucial factors such as planetary boundaries and basic human needs. Doughnut Economics presents a new and more comprehensive framework for assessing regional sustainable development. Research indicates that regions with higher economic performance (measured by regional GDP) and better social indicators, like Jakarta, often experience greater ecological damage. Conversely, regions with lower social performance indicators, such as Papua, tend to have lower ecological impact. Therefore, utilizing Doughnut Economics for evaluating regional performance offers a more balanced assessment that considers both social and ecological aspects.

To implement the in-sight gain from this study, the government has ability to develop strategies aimed at achieving a harmonious balance between economic prosperity and ecological sustainability to promote long-term resilience and inclusivity. These strategies may involve prioritizing social well-being and environmental preservation in regional development efforts, as well as decoupling economic growth from its environmental consequences. This can be achieved through the implementation of circular economy practices and the promotion of green economy initiatives utilizing local resources, while simultaneously enhancing governance and institutional structures. Such actions not only support long-term sustainability but also bolster resilience at the local level.

This study has derived valuable insights for policymakers aiming to formulate policies that promote regional sustainable development. Despite the challenges associated with collecting and analyzing data, particularly in developing countries like Indonesia, this research offers guidance for policymakers to strike a balance in their policies, focusing not only on economic growth but also on social well-being. While Gross Domestic Product is a widely used indicator of economic prosperity, Doughnut Economics argues that it is inadequate. It emphasizes the importance of incorporating a wider array of metrics to evaluate progress, encompassing social welfare and environmental sustainability.

The study's results suggest several promising directions for future research. One potential avenue is to enhance the model by including additional dimensions of well-being. Investigating the integration of cultural, psychological, and potentially spiritual aspects into the Doughnut framework could offer a more comprehensive insight into human well-being. This could entail creating new indicators or modifying existing ones to encompass these elements. Subsequently, further research could concentrate on improving and verifying the indicators utilized within the Doughnut framework to guarantee their precision and significance. This may entail exploring alternative data sources or methodologies beyond traditional index measures, such as employing machine learning, probabilistic modeling, and other modeling techniques

References

Cole, M. J., Bailey, R. M., & New, M. G. (2014). Tracking sustainable development with a national barometer for South Africa using a downscaled "safe and just space" framework. In *Proceedings of the National Academy of Sciences of the United States of America* (Vol. 111, Issue 42, pp. E4399–E4408). https://doi.org/10.1073/pnas.1400985111.

Cole, M. J., Bailey, R. M., & New, M. G. (2017). Spatial variability in sustainable development trajectories in South Africa: provincial level safe and just operating spaces. *Sustainability Science*, *12*(5), 829–848. https://doi.org/10.1007/s11625-016-0418-9.

Dearing, J. A., Wang, R., Zhang, K., Dyke, J. G., Haberl, H., Hossain, M. S., Langdon, P. G., Lenton, T. M., Raworth, K., Brown, S., Carstensen, J., Cole, M. J., Cornell, S. E., Dawson, T. P., Doncaster, C. P., Eigenbrod, F., Flörke, M., Jeffers, E., Mackay, A. W., … Poppy, G. M. (2014). Safe and just operating spaces for regional social-ecological systems. *Global Environmental Change*, *28*(1), 227–238. https://doi.org/10.1016/j.gloenvcha.2014.06.012.

Fanning, A. L., O'Neill, D. W., Hickel, J., & Roux, N. (2022). The social shortfall and ecological overshoot of nations. *Nature Sustainability*, *5*(1), 26–36. https://doi.org/10.1038/s41893-021-00799-z

Ferretto, A., Matthews, R., Brooker, R., & Smith, P. (2022). Planetary boundaries and the doughnut frameworks: A review of their local operability. In *Anthropocene* (Vol. 39). Elsevier Ltd. https://doi.org/10.1016/j.ancene.2022.100347.

Harangozo, G., Csutora, M., & Kocsis, T. (2018). How big isb ig enough? Toward a sustainable future by examining alternatives to the conventional economic growth paradigm.*Sustainable Development*, 172-181.

Jackson, T. (2019). The post-growth challenge: secular stagnation, inequality, and the limits to growth. *Ecological Economics*, 156, 236-246.

Jahan, A. & Edwards, K. L. (2013). *Multi-criteria Decision Analysis for Supporting the Selection of Engineering Materials in Product Design*. Butterworth-Heinemann. https://doi.org/10.1016/C2012-0-02834-7.

Kallis, G. (2011). In defence of degrowth. *Ecological Economics*, 70(5), 873-880.

Kallis, G., Kerschner, C., & Martinez-Alier, J. (2012). The economics of degrowth. *Ecological Economics*, 84, 172–180. https://doi.org/10.1016/j.ecolecon.2012.08.017.

Likaj, X., M. Jacobs., and T. Fricke. (2022). Growth, de-growth and post growth? Towards a synthetic understanding of the growth debate. Forum for New Economy Basic Paper 02/2022.

Milanovic, B. (2018). *Global inequality: A new Approach for the age of globalization*. Harvard University Press.

Nykvist, B., Persson, Å., Moberg, F., Persson, L., Cornell, S., & Rockström, J. (2013). *National Environmental Performance on Planetary Boundaries.* Swedish Environmental Protection Agency.

Odu, G. O. (2019). Weighting Methods for Multi Criteria Decision Making Technique. *Applied Science Environmental Management, 23(8), 1449-1457. https://www.ajol.info/index.php/jasem/*

OECD (2020). *Beyond growth: Towards a new economic approach*. New Approaches to Economic Challenges, OECD Publishing, Paris. https://doi.org/10.1787/33a25ba3-en.

O'Neill, D. W., Fanning, A. L., Lamb, W. F., & Steinberger, J. K. (2018). A good life for all within planetary boundaries. *Nature Sustainability*, 1(2), 88–95. https://doi.org/10.1038/s41893-018-0021-4

Prescott, J. (2018). Current economic development is unsustainable. How can we reverse this trend? *Global Economic Review*. https://www.researchgate.net/publication/351181193_Current_Economic_

Rahma, H., Rahmaditio, M.R., and Fauzi, A. (2022). Doughnut economy index of Indonesia for development's sustainability. Research AN/BIPrestasi PS02/02/DKEM/2022. Jakarta, Bank Indonesia.

Raworth, K. (2017a). A Doughnut for the Anthropocene: humanity's compass in the 21st century. The Lancet Planetary Health, 1(2), e48–e49. doi:10.1016/s2542-5196(17)30028-1

Raworth, K. (2017b). *Doughnut economics: Seven ways to think like a 21st-century economist*. London: Random House.

Rockström, J., Steffen, W., & Noone, K. (2009). A safe operating space for humanity. *Nature,* 461, 472-475. https://doi.org/10.1038/461472a.

Savini, F. (2024). Post-growth, degrowth, the doughnut, and circular economy: A short guide for policymakers. *Journal of City Climate Policy and Economy*, 13-123

Sayers, M. and Trebeck, K. (2015). *The UK Doughnut: A framework for environmental sustainability and social justice. Oxfam Research Report.* www.oxfam.org.