International Journal of
Economics Development Research, Volume 4(4), 2023
pp. 2011-2030

The Effect Of Information And Communication Technology (ICT) On Inclusive Green Growth (IGG) In Indonesia

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Abstract:

The concept of sustainable development has evolved to include the notion of inclusive green growth, which emphasizes balanced attention to economic expansion, social inclusion, and environmental sustainability. The objective of this study is to assess the progress of inclusive green growth within Indonesia's provinces from 2013 to 2021, particularly focusing on the role of information and communication technology (ICT). Utilizing the composite index method for this assessment, the study also incorporates panel data regression analysis to determine the influence of ICT on inclusive green growth. Findings reveal that Indonesia is achieving moderate success in terms of inclusive green growth. A regional analysis indicates that provinces in Eastern Indonesia lag behind in social dimensions, whereas those in Western Indonesia are under-performing in environmental aspects. The study further identifies that the adoption of mobile phones and the internet has positively influenced inclusive green growth, contrasting with the negative impact of computers and fixed telephone ownership. To foster equitable ICT development, the study advocates for continuous investments in ICT infrastructure, especially in Eastern Indonesia and rural locales.
Keywords: *Sustainable Development, Inclusive Green Growth, ICT Impact, Regional Disparities, Investment In ICT Infrastructure*

1. Introduction

Inclusive Green Growth (IGG) represents an emergent paradigm within sustainable development discourse, one that marries the imperatives of economic growth with the principles of environmental stewardship and social inclusiveness. Defined fundamentally, IGG seeks to promote an economic upturn that is not only robust and broad-based but also environmentally conscious and equitable in its spread of benefits. It is an approach that integrates the quest for economic prosperity with the need for ecological balance and social equity, ensuring that the fruits of growth are shared across all strata of society without compromising the health of our planet.

Sustainable development, as an overarching goal, seeks to foster prosperity both in the present and for future generations (Kostoska & Kocarev, 2019). However, the correlation between high economic growth and widespread prosperity is not always direct (Ariyati et al., 2018), highlighting the necessity for a development model that is inclusive, allowing all societal groups to participate and benefit equitably from economic advancements. This underscores the imperative of inclusive growth, which ensures that the dividends of development are shared broadly across society.

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Concurrently, environmental degradation remains a significant concern, intersecting with economic and social aspects of development. The Environmental Kuznets Curve (EKC) hypothesis, which posits an initial increase and subsequent decrease in environmental degradation as income per capita grows, has been met with mixed empirical support (Gill et al., 2017). This raises questions about the viability of relying solely on economic progress to drive environmental quality improvements, with some arguing that the cost of environmental degradation cannot be justified by economic gains alone (World Bank, 2012).

The evolving development paradigm now integrates economic considerations with social welfare and environmental sustainability. This shift has led to the conceptualization and operationalization of Inclusive Green Growth (IGG) by global organizations such as the World Bank and the United Nations Environment Programme (UNEP). According to the World Bank (2012) IGG is posited as a primary strategy for sustainable development, encapsulating economic growth that concurrently promotes well-being, social justice, and reduces environmental degradation. However, the lack of consensus on standardized concepts and measurements has hampered the establishment of universally applicable indicators, thus challenging the harmonization of IGG strategies and practices globally (GGKP, 2016).

The recognition of Inclusive Green Growth (IGG) as a pivotal developmental goal has galvanized various nations, including Indonesia, to commit to its principles (Bappenas, 2014). Indonesia's economy has seen substantial growth, averaging 5.4 percent from 2010 to 2019, but this progress is juxtaposed against persistent social and environmental challenges (GGGI, 2015). Notably, poverty rates stood at 11.3 percent, and income inequality measured by the Gini coefficient was 0.39, signaling a disparity in wealth distribution (BPS, 2020b). Furthermore, Indonesia's energy demands have led to a reliance on fossil fuels, which has contributed to a significant rise in greenhouse gas emissions, with a 33 percent increase reported between 2011 and 2019 (BPPT, 2021).

The surge in interest regarding IGG has catalyzed research into various determinants of this growth, particularly the role of Information and Communication Technology (ICT). Numerous studies have assessed the impact of ICT on inclusive growth and environmental sustainability, often with mixed results. Research by Vu (2013), Lee & Brahmasrena (2014), Ejemeyovwi & Osabuohien (2020), and Ofori & Asongu (2021) highlight this fact, pointing out the complexity of ICT's impact on socio- economic development. However, there remains a scarcity of research focused on the intersection of ICT and IGG, especially within the context of Indonesia, indicating a gap that requires further scholarly attention.

Information and Communication Technology (ICT) harbors the potential to significantly boost Inclusive Green Growth (IGG) in Indonesia, where the digital economy has already shown promise with a 5.5 percent contribution to the Gross Domestic Product (GDP) in 2018 (INDEF, 2019). A substantial user base, with internet usage at 53.73 percent, mobile phone ownership at 62.8 percent, and computer ownership at 18.83 percent as of 2020, underpins this potential (BPS, 2020a). Despite these encouraging figures, the ICT sector's overall role in fostering sustainable development remains suboptimal, hindered by infrastructural challenges, underutilization, and a lag in human resource development (Bappenas 2020). ITU data (2017) indicates that Indonesia's ICT Development Index (IDI) in 2017 was still in the moderate category, ranked 111th out of 176 countries, and the persistent digital divide across provinces and between urban and rural areas, exemplifies these challenges (BPS, 2020a).

Recognizing the critical need to quantify IGG and understand ICT's impact therein, this study sets out to investigate these dynamics within Indonesia's provinces from 2013 to 2021. Utilizing a composite index to measure IGG, and deploying panel data regression analysis, this research aims to shed light on how ICT contributes to Indonesia's sustainable development goals. Through this multifaceted approach, the study endeavors to provide insights into the effectiveness of ICT in advancing IGG and to identify areas where policy interventions could be most impactful.

The rationale behind centering Information and Communication Technology (ICT) within this context stems from its transformative potential as a lever of economic and social development, as well as its capacity to facilitate environmental sustainability. ICT serves as a cornerstone for innovation and efficiency gains across various sectors, potentially catalyzing green practices in industry, enhancing resource management, and enabling the inclusion of wider populations in the growth narrative through improved connectivity and access to information.

This study ventures into a relatively underexplored territory by scrutinizing the specific role of ICT in driving IGG within the Indonesian archipelago from 2013 to 2021. One of the research gaps addressed herein lies in the nuanced understanding of how different ICT components differentially impact the various dimensions of IGG. Prior investigations have not fully dissected the composite effects of ICT, often treating it as a monolithic entity. This research delineates the positive influences of contemporary ICT facets such as mobile telephony and internet access, against the backdrop of the adverse effects of more traditional ICT elements like computer and fixed telephone ownership.

The novelty of this research is encapsulated in its methodical quantification of IGG through a composite index, applied to the unique socio-economic and geographical landscape of Indonesia’s provinces. It also pioneers in highlighting the regional disparities within the country, thereby underscoring the critical need for targeted ICT development strategies that address the inequities between the more affluent Western provinces and their less developed Eastern counterparts. Through this study, readers are invited to engage with a critical analysis that not only illuminates the current state of IGG in Indonesia but also advocates for strategic pathways towards a more inclusive and sustainable future.

2. Theoretical Background

Measurement of IGG

Several global organizations actively engage in crafting measurement frameworks for Inclusive Green Growth (IGG). The Organization for Economic Cooperation and Development (OECD) (2011) and the Green Growth Knowledge Platform (GGKP) (2016) focus on developing indicators with the OECD emphasizing environmental aspects, and the World Economic Forum (WEF) (2017) with the Inclusive Development Index emphasizing on social aspects. The framework that stands out for its comprehensiveness is from Jha et al. (2018), published by the Asian Development Bank (ADB), introducing the Balanced Inclusive Green Growth Index (BIGGI), which integrates economic, social, and environmental dimensions, covering an extensive range of indicators for sustainable development.

In various countries, researchers adopt different methods to evaluate IGG (Li et al., 2021; Sun et al., 2020; Zhou, 2022). Within Indonesia, Anna et al. (2018) developed the Indonesian Cities Green Development Index (ICGDI) for nine regencies/cities in West Java and Bali from 2014 to 2016, based on the OECD's approach. However, the ICGDI's breadth, particularly in its economic and social aspects, is somewhat limited. In a similar vein, Liderson & Pasaribu (2020) utilized the conceptual framework from Jha, et al. (2018) to create the Provincial Balanced Inclusive Green Growth Index (BIGGI) for Indonesia in 2017, employing unequal weights in their analysis. Aminata et al. (2022) also applied the methodology from Jha, et al. (2018) to assess BIGGI for Indonesia, contrasting the outcomes in 2015 and 2019. This method's choice hinges on its thoroughness in depicting objectives aligned with sustainable development goals. The employed indicators offer a wide-ranging view of sustainability, showcasing the adaptability and methodological rigor of composite index construction.

Information and Communication Technology (ICT) and IGG

The significance of technology in the economy has been recognized since the classical era and remains a cornerstone of modern economic theory. Technology's role in capital accumulation and sustained long-term growth was notably articulated by Paul Romer in 1990 through his theory of endogenous technological change, positing that growth is spurred by technological advancement which stems from the accumulation of knowledge. Unlike physical capital, knowledge offers non-diminishing returns and its proliferation benefits the economy through spillover effects that extend beyond the original innovator.

Information and Communication Technology (ICT), as characterized by the endogenous growth theory, is a prime example of General Purpose Technology (GPT). The concept of GPT, as delineated by Bresnahan & Trajtenberg (1995) underscores the pervasive and dynamic nature of ICT, enabling widespread use and fostering externalities through complementary innovations. The deployment of ICT has been shown to boost productivity both within the ICT sector and across various industries that adopt its applications.

Empirical research has consistently demonstrated the positive impact of ICT on economic growth and productivity enhancement (Pradhan et al., 2018; Solomon & Klyton, 2020; Vu, 2013). This is achieved by bridging gaps between producers and consumers, enabling new business models, and facilitating market expansion (Øverby & Audestad, 2021). The advent of digital transformation, underpinned by ICT, has been instrumental in fostering social inclusion by democratizing access to services (Heeks, 2016). Furthermore, ICT contributes to environmental sustainability by optimizing resource use and enhancing knowledge sharing, which can also lead to more environmentally conscious behavior (GCEC, 2014).

Empirical research into the role of Information and Communication Technology (ICT) in promoting inclusive and green growth has yielded mixed outcomes. Studies such as those by Ejemeyovwi & Osabuohien (2020) have delved into this relationship with varying methodologies but haven't always established a clear link, possibly due to disparities in ICT penetration. In contrast, findings from Ofori & Asongu (2021), Nchake & Shuaibu (2022), and Hazmi (2023), utilizing fixed telephone and broadband subscriptions as ICT indicators, affirm the positive influence of ICT on inclusive growth.

Conversely, the interplay between ICT development and its ecological implications has been more consistently documented. While some research points to an increase in CO2 emissions correlating with ICT expansion, due to heightened energy demand and industrial activities, as noted by Lee dan Brahmasrene (2014) and Park et al. (2018), other studies like those by Raheem et al. (2020) suggest a different narrative. The development of the financial sector supported by ICT usage increases energy demand and industrial activities, leading to a rise in CO2 emissions (Danish et al., 2018). Arshad et al. (2020), argue that many ICT-related investments have not been energy efficient. Nonetheless, Asongu (2018) presents evidence of a beneficial relationship between ICT and the green economy, suggesting that ICT can contribute positively to sustainable economic practices. Regarding the potential role of ICT on inclusive and sustainable practices of economic growth, this research hypothesizes that ICT positively impacts inclusive green growth.

Gross Fixed Capital Formation (GFCF) and Foreign Direct Investment (FDI)

In addition to Information and Communication Technology (ICT), investment is also recognized as a pivotal factor influencing inclusive and green growth (IGG). Increased investment can boost aggregate output and labor demand, consequently enhancing overall economic growth and supporting improved well-being through enhanced access to goods and services, as noted by Kusumaningrum & Yuhan (2019). Foreign Direct Investment (FDI) is particularly noted for its potential to stimulate economic growth in host countries by enhancing output and productivity through technology transfer and skill development, as highlighted by Harianto & Sari (2020). Nevertheless, FDI may also exacerbate inequalities and contribute to environmental challenges in countries grappling with inclusivity and sustainability, according to Wang (2020). While FDI is associated with immediate impacts on IGG, its long-term convergence effects are less clear.

Research by Zhu & Ye (2018) and Ofori & Asongu (2021) posits that GFCF and FDI are conducive to inclusive growth. Specifically, in Indonesia, the positive impacts of trade openness, GFCF, and Gross Regional Domestic Product (GRDP) on inclusive growth have been affirmed. Conversely, studies like those by Nchake & Shuaibu (2022) suggest that FDI may harm inclusive growth in Africa. This discrepancy underscores the complexity of FDI's role, hinting at its potential to favor capital-intensive over labor-intensive sectors. According to this theoretical and empirical background, this research hypothesizes that GFCF and FDI positively impact inclusive green growth in Indonesia.

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3. Methodology

This research focuses on two primary objectives: firstly, it measures the achievement of Inclusive Green Growth (IGG) at the provincial level across Indonesia, and secondly, it assesses the impact of Information and Communication Technology (ICT) on IGG within the nation. The investigation draws upon secondary data published by Indonesia's Central Statistics Agency (BPS) and the Ministry of Environment and Forestry (KLHK), covering annual data from 34 provinces spanning from 2013 to 2021.

The methodology and theoretical approach of this study are adapted from the framework proposed by Jha et al. (2018), with several modifications tailored to this specific research. The initial phase includes the selection of indicators for the calculation of the BIGGI. For this purpose, the study employs 4 indicators for the economic dimension, 11 indicators for the social dimension, and 4 indicators for the environmental dimension.

Table 1. BIGGI Calculation Indicators

No	Indicator	Definition	Source
(1)	(2)	(3)	(4)
Economic Dimension			
1.	Gross Regional Domestic Product (GRDP) per capita growth	Changes in GRDP per capita over time	BPS
2.	Trade openness	Percentage of total exports and imports to GRDP	BPS
3.	Dependency ratio	The ratio of the nonproductive age population (0-14 and 65+ years) to the productive age population (15-64 years)	BPS

No	Indicator	Definition	Source
(1)	(2)	(3)	(4)
4.	Inverse coefficient variation of per capita GRDP growth	The ratio of the average growth of per capita GRDP to its standard deviation	BPS
		Social Dimension	
5.	The ratio of workers to the working-age population	The percentage of the working population to the total working-age population	BPS
6.	Life Expectancy at Birth (LEB)	The average number of years a person can expect to live from birth	BPS
7.	Primary Gross Enrollment Ratio (GER)	The proportion of the population enrolled in elementary school compared to the total population aged 7-12 years	BPS
8.	Labor Force Participation Rate (LFPR)	The percentage of the total labor force compared to the total working-age population	BPS
9.	Access to adequate sanitation	Percentage of households with access to adequate sanitation	BPS
10.	Access to safe drinking water	Percentage of households with access to safe drinking water	BPS
11.	Access to electricity	Percentage of households with access to electricity	BPS
12.	Gini ratio	The value of the gini ratio coefficient	BPS
13.	Percentage of the population living in poverty	Percentage of the population living below the poverty line relative to the total population	BPS
14.	Expected Years of Schooling (EYS)	The expected duration of formal education for the population	BPS
15.	Gender Empowerment Index (GII)	Index measuring women's participation in the economy and politics	BPS
		Environment Dimension	
16.	Water Quality Index (WQI)	Index depicting water quality	KLHK
17.	Air Quality Index (AQI)	Index depicting air quality	KLHK
18.	Land Cover Quality Index (LCQI)	Index depicting land cover quality	KLHK
19.	Share of the GRDP primary sector	Percentage of GRDP from the primary sector relative to the total GRDP	BPS

Sumber: Author (2023)

The process of calculating BIGGI unfolds through multiple stages, starting with the normalization of data across all indicators to ensure uniform measurement units prior to aggregation. The min-max method, as outlined by OECD (2008), serves as the normalization technique. Prior to normalization, it is crucial to determine the functional relationship direction between each indicator and the forthcoming BIGGI. Denote x_{ij} as the i-th observation value for the j-th indicator before normalization, and z_{ij} the observation value post-normalization. Following normalization, scores for each indicator will span from 0 to 10. The normalization for indicators that correlate positively with BIGGI follows formula (1), while formula (2) applies to those with a negative relationship direction.

$$z_{ij} = 10 \times \frac{x_{ij} - min_j(x_{ij})}{max_j(x_{ij}) - min_j(x_{ij})}$$

$$z_{ij} = 10 \times \frac{max_j(x_{ij}) - x_{ij}}{max_j(x_{ij}) - min_j(x_{ij})}$$

The second stage involves assigning weights to each indicator within its respective dimension. This study adopts the unequal weighting method conceived by Iyengar & Sudarshan (1982), which mitigates the risk of any single indicator disproportionately influencing the overall index. The calculation of weights proceeds as follows:

$$w_j = \frac{c}{\sqrt{var\ (x_{ij})}}\ ; j = 1 \ldots K$$

with w_j the weight for the j-th indicator satisfies $0 < w_j < 1$ and $\sum_{j=1}^{K} w_j = 1$, where:

$$c = \left[\sum_{j=1}^{K} \frac{1}{\sqrt{var(x_{ij})}}\right]^{-1}.$$

The third stage is calculating the score for each dimension by summing the weighted scores of the indicators. The fourth stage calculates the score for BIGGI as follows:

$$IGGI_i = \frac{1}{3}(DE_i) + \frac{1}{3}(DS_i) + \frac{1}{3}(DL_i)$$

$IGGI_i$ is the value of the IGGI index for the i-th region, DE_i, DS_i, and DS_i respectively represent the scores for the economic dimension (DE), social dimension (DS), and environmental dimension (DL).

The fifth stage is calculating BIGGI score to capture the balance across dimensions. For this purpose, the absolute gap across dimensions is first calculated using:

$$Gap_i = |DE_i - DS_i| + |DS_i - DL_i| + |DL_i - DE_i|$$

A smaller Gap_i value indicates that the performance across dimensions is more balanced. Then, the Gap_i scores are normalized again using a method at the first stage to generate the Cross Pillar Balance (CPB) scores, which are treated as the fourth dimension in the calculation of BIGGI. The final stage is to calculate BIGGI with:

$$BIGGI_i = \frac{3}{4}IGGI_i + \frac{1}{4}CPB_i$$

The Balanced Inclusive Green Growth Index (BIGGI) created in this research not only reflects green economic growth inclusively but also equilibrates by acknowledging the disparity in achievements across different dimensions. The index spans from 0 to 10, with higher values indicating superior performance, and categorizes the index into three tiers: low (0-3.333), moderate (3.334-6.667), and high (6.668-10).

Additionally, this study investigates the impact of Information and Communication

data regression. Panel data amalgamate time series and cross-sectional data, covering various entities over a particular period, which allows for a more robust informational framework and control of individual heterogeneity. Panel data are also beneficial for examining adjustment dynamics over time, thus providing insights into individual behaviors and the advantage of increasing the number of observations (Baltagi, 2005). This research is grounded in models similar to those used in studies by Asongu (2018), Zhu & Ye (2018), and Ofori & Asongu (2021). However, slightly different from past research, this study uses BIGGI as the dependent variable to comprehensively measure IGG in Indonesia. The analytical model applied in this research is delineated as follows:

$$BIGGI_{it} = \alpha_{\mathrm{Z}} + \beta_i TIK_{\mathrm{j}it} + \theta_1 PMTB_{it} + \theta_2 RASIOPMA_{it} + u_{it}$$

This research hypothesizes that all independent variables have a positive effect on BIGGI.

Table 2. Variable Description

Variable	Symbol	Measurement	Sources
Dependent			
Inclusive Green Growth	BIGGI	Index, measurement of IGG	Calculated by author
Independent			
Utilization of ICT by the population	TIK	Measured by 4 indicators: 1). Percentage of the population aged 5 and above who have accessed the internet. 2). Percentage of the population aged 5 and above who own/use a mobile phone. 3). Percentage of households that own/use a computer. 4). Percentage of households that own/use a fixed telephone.	BPS
Gross Fixed Capital Formation	PMTB	Value of Gross Fixed Capital Formation (PMTB), in natural logarithm	BPS
Foreign Direct Investment	RASIOPMA	Ratio of FDI to GDRP	BPS

Sumber: Author (2023)

Gujarati (2004) describes three main approaches for estimating panel data regression models: the Common Effect Model (CEM), the Fixed Effect Model (FEM), and the Random Effect Model (REM). The CEM approach merges cross-sectional and time-series data, applying the ordinary least squares (OLS) method to estimate the model, presuming uniform behavior across all observational units for each time period. In contrast, the FEM assumes constant slope coefficients across individuals and time, allowing intercepts to differ due to the "fixed effect" of varying intercepts among individuals, while intercept values remain consistent over time. The REM, conversely, posits that intercept variations across each cross-sectional unit might be due to stochastic or random influences.

The process for selecting the optimal model involves the Chow test, the Hausman test, and the Lagrange Multiplier (LM) test. The Chow test determines the more suitable method between CEM and FEM, while the Hausman test differentiates between REM and FEM to identify the more fitting model. Should the REM model emerge as more appropriate from the Hausman test, the LM test is subsequently employed to confirm the best model between CEM and REM (Baltagi, 2005).

4. Empirical Findings/Result

Results of BIGGI Calculation

Table 3 presents the descriptive statistics for the Inclusive Green Growth Index (BIGGI) in Indonesia, spanning from 2013 to 2021. The BIGGI achievement in Indonesia shows variability over time, generally settling within the medium category range. In 2019, the BIGGI values peaked at 7.93 and dipped to their lowest at 3.16. During this interval, Bali emerged as the province with the highest average index achievement, scoring 7.19, while Papua recorded the lowest average index at 3.87 points.

Table 3. Summary of BIGGI Calculation Results

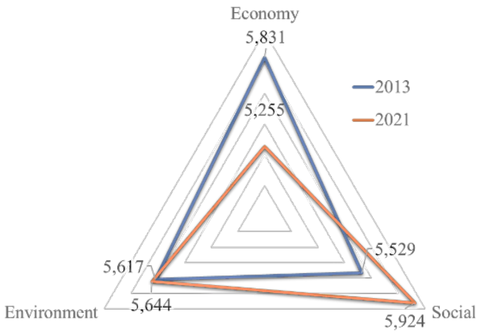
Variable	Stats	2013	2014	2015	2016	2017	2018	2019	2020	2021
BIGGI	Max	6,98	7,30	7,47	7,49	7,60	7,00	7,93	7,21	7,04
	Min	3,74	3,68	3,46	3,98	4,30	3,68	3,16	3,39	3,93
	Ave	5,76	5,83	5,52	5,93	6,25	5,59	6,17	6,20	5,87
Number of Prov. by BIGGI Category	High	2	7	2	6	10	3	9	8	6
	Moderate	32	27	32	28	24	31	24	26	28
	Low	0	0	0	0	0	0	1	0	0

Source: Data Processing Results (2023)

In 2013, the Balanced Inclusive Green Growth Index (BIGGI) scores showed that all 32 provinces in Indonesia were in the medium category, except for Bali and Bangka Belitung, which ranked in the high category. By 2021, the number of provinces in the high category rose to six, including West Sumatra, Bangka Belitung, Central Kalimantan, North Kalimantan, North Sulawesi, and South Sulawesi.

Bali maintained the highest BIGGI score from 2013 to 2019, reflecting strong performance in economic, social, and environmental dimensions. However, in 2020, Bali's BIGGI score slightly dropped to 7.212 points and then significantly declined to 5.747 points in 2021, moving it to the medium category. This sharp decline was largely due to the economic impacts of the COVID-19 pandemic, which affected economic activities, resulting in reduced economic growth and disruptions in export and import activities - key components of Bali's Gross Regional Domestic Product (GRDP).

Conversely, Riau recorded the lowest BIGGI score from 2013 to 2015, mainly due to poor environmental performance. However, in the following years, Papua had the lowest BIGGI score, averaging 3.87 points, primarily due to weak social dimension performance, as indicated by low school enrollment rates, basic education quality, high birth rates, and a low percentage of households with adequate sanitation and safe drinking water, which collectively perpetuate high poverty and income inequality. Despite these challenges, it is noteworthy that Papua's environmental dimension score is rated highly.



Source: Data Processing Results (2023)

Figure 1. Average BIGGI Score by Dimension at The National Level

At the national level, Indonesia has seen an improvement in two of the three dimensions considered in the Balanced Inclusive Green Growth Index (BIGGI) from 2013 to 2021. The social dimension score has risen noticeably, from 5.529 to 5.924 points. The environmental dimension has also seen a slight increase, from 5.617 to 5.644 points. However, the economic dimension experienced a decline, falling from 5.831 points in 2013 to 5.255 points in 2021.

Results of Panel Data Regression Analysis

This study investigates the influence of Information and Communication Technology (ICT) on the achievement of BIGGI in Indonesia by utilizing four models, each incorporating different ICT indicators as independent variables. The dependent variable across these models is the BIGGI score calculated at an earlier stage.

Table 4. Results of Model Selection Test

Model	ICT Indicator	Chow	Haussman	LM	Best Model
1	Internet	16,955*** (0,000)	3,216 (0,360)	470,549*** (0,000)	REM
2	Mobile phone	16,743*** (0,000)	6,288* (0,098)	461,034*** (0,000)	REM
3	Computer	16,894*** (0,000)	13,652*** (0,003)	443,066*** (0,000)	FEM
4	Fixed Telephone	16,105*** (0,000)	5,813 (0,121)	444,256*** (0,000)	REM

Note: Parentheses indicate the p-value. * significant at 10% level, ** significant at 5% level, *** significant at 1% level.
Source: Data Processing Results (2023)

Table 4 presents the model selection results for each model incorporating various ICT indicators. The Chow test for all models yields probability values below 0.01, leading to the conclusion that the FEM outperforms the CEM. Subsequent Hausman tests for models 1, 2, and 4 support this, with probability values exceeding 0.005, suggesting that the REM offers greater efficiency than the FEM. However, the Hausman test for model 3, with a probability value under 0.005, indicates a more efficient estimation with FEM compared to REM.

The subsequent phase involves estimating models based on the most suitable model selected from the previous results. The estimation outcomes, detailed in Table 5, stem from the model feasibility test, showing that collectively, all independent variables significantly impact the dependent variable at varying levels of significance, as indicated by the F-test's probability values. Specifically, the F-test in model 1 registers a probability value below 0.05, signifying significance at the 5 percent level. Models 2 and 4, with F-test probability values under 0.1, achieve significance at the 10 percent level. Model 3, distinct with an F-test probability value below 0.01, reaches significance at the 1 percent level.

Table 5. Estimation Results of Panel Data Regression

Variable	Model 1	Model 2	Model 3	Model 4
Internet	0,0068***			
	(0,0025)			
Mobile phone		0,0122**		
		(0,0404)		
Computer			-0,0437**	
			(0,0412)	
Fixed Telephone				-0,0428**
				(0,0183)
PMTB	-0,0815	-0,0524	0,8712***	0,0236
	(0,4581)	(0,6454)	(0,0007)	(0,8128)
RasioPMA	0,0072	0,0069	-0,0018	0,0064
	(0,2195)	(0,2410)	(0,7873)	(0,2766)
Constant	5,9590***	5,3586***	3,4624***	5,9015***
	(0,0000)	(0,0000)	(0,0001)	(0,0000)
R-square	**0,0355**	**0,0193**	**0,6848**	**0,0235**
Prob F	**(0,0121)**	**(0,0963)**	**(0,0000)**	**(0,0657)**

Note: Parentheses indicate the p-value. * significant at 10% level, ** significant at 5% level, *** significant at 1% level.
Source: Data Processing Results (2023)

Estimation results indicate that ICT components like the internet and mobile phones positively influence the Balanced Inclusive Green Growth Index (BIGGI). The internet's p-value, being less than 0.0025, signifies a robust effect at the 1 percent level

of significance. Similarly, mobile phones, with a p-value of 0.0404, significantly affect BIGGI scores below the 5 percent threshold. Notably, a 1 percent increase in internet and mobile phone usage enhances the BIGGI score by 0.0068 and 0.0122 points, respectively.
Conversely, other ICT indicators such as computers and fixed telephones significantly negatively impact BIGGI at the 5 percent level. Evidenced by the computer's p-value of 0.0412 and the fixed telephone's p-value of 0.0183, the BIGGI score decreases by 0.0437 and 0.0428 points respectively, as household ownership and usage of these technologies rise by 1 percent.

The independent variable Gross Fixed capital Formation (PMTB) shows significance exclusively in the third model, with a p-value of 0.0007, indicating that a 1 percent increase in PMTB corresponds to a 0.8712 point rise in the BIGGI score. However, PMTB does not maintain significance across all models, specifically in models 1, 2, and 4. Additionally, the variable rasio PMA, denoting the ratio of Foreign Direct Investment, does not demonstrate significance in any model.

5. Discussion

The research identifies that internet and mobile phone usage can enhance the Balanced Inclusive Green Growth Index (BIGGI) score. This aligns with the findings from Asongu (2017), Aslam (2021), and Hazmi (2023), which affirm the positive role of the internet and mobile phones in bolstering inclusive growth. ICT serves as a tool to diminish barriers to economic access and increase empowerment, especially for vulnerable groups, as evidenced by Nchake & Shuaibu (2022). The widespread availability and utilization of ICT not only facilitate access to economic resources but also open up myriad opportunities for productivity, as demonstrated by Ejemeyowvi & Osabuhien (2020). Additionally, research by Asongu (2017) and Asongu (2018), corroborates that increased mobile phone penetration may mitigate the environmental impact of CO_2 emissions.

The influence of mobile phone usage on the BIGGI score surpasses that of internet use, a phenomenon also observed by Nchake & Shuaibu (2022), who contend that mobile phones have a more significant impact on inclusive growth compared to the internet, particularly in Africa. BPS data from 2021 reflect this trend in Indonesia, where mobile phone users reached 65.87 percent, outpacing internet usage at 59.14 percent (BPS, 2022). Despite this, disparities in internet access persist between Indonesia's Western and Eastern regions and between urban and rural areas. In 2021, urban internet usage stood at 71.81 percent, markedly higher than rural usage at 49.30 percent (BPS, 2021). Such imbalances underscore the necessity to make internet benefits more equitable across different regions and demographics.

This research uncovers that not every form of ICT positively influences the Balanced Inclusive Green Growth Index (BIGGI) in Indonesia. Increases in household ownership of computers and fixed telephones correlate with a decrease in BIGGI scores. Studies suggest several factors behind this trend, one being the shift away from

traditional fixed telephones, which are becoming less prevalent in Indonesia. In 2021, the penetration of fixed telephones was low, with BPS data showing national ownership at just 1.36 percent. Mobile phones, offering a plethora of capabilities, have largely supplanted the need for fixed-line connections. This transition reflects a broader shift in ICT usage, where mobile phones enable a wide array of functions previously exclusive to computers.
Another aspect influencing this shift is the economic productivity associated with various technologies. High costs and low investments in the ICT sector can make technology acquisition economically burdensome. This is particularly true when the technology becomes obsolete or is not used productively, as noted by Ejemeyowvi & Osabuhien (2020) and Faldrix et al. (2021).

Furthermore, the environmental impact of ICT, particularly concerning computer and fixed telephone ownership, can be significant. Lee & Brahmasrene (2014), Park et al. (2018), and Raheem et al. (2020) highlight that ICT can lead to increased CO2 emissions due to energy-intensive activities associated with these technologies.. This is particularly concerning when the investments in ICT are not energy-efficient, as discussed by Arshad et al. (2020), pointing to the need for greener ICT practices.
Additionally, the research identifies Gross Fixed Capital Formation (PMTB) as a significant driver of BIGGI, supporting findings by Kusumaningrum & Yuhan (2019) and Nchake & Shuaibu (2022). These base stations have a pronounced positive effect on inclusive growth and sustainable development, with increased investment in PMTB likely to support not only enhanced telecommunications infrastructure but also broader socio-economic welfare.

6. Conclusions

The Balanced Inclusive Green Growth Index (BIGGI) calculations reveal that most provinces in Indonesia score moderately, with considerable variations across regions. Provinces in the Western Indonesia region, while scoring lower in environmental dimensions, contrast with provinces in the Eastern Indonesia region, which exhibit lower social dimension scores. Regression analysis indicates that increases in internet and mobile phone usage statistically enhance BIGGI scores, whereas rising computer and fixed telephone ownership correlates with a decline in BIGGI.

The government, in its commitment to sustainable development targets, recognizes the need to bolster BIGGI's achievements. Economic performance across all provinces necessitates continuous improvement, with environmental sustainability becoming a focal point, especially in the Western Indonesia region where environmental scores are notably lower. Conversely, the Eastern Indonesia region requires targeted efforts to improve social dimension scores through the enhancement of basic infrastructure, including electricity, sanitation, education, and health.

With the acknowledged benefits of ICT, it becomes imperative to expand its reach, particularly mobile phones and the internet, which have shown to positively influence BIGGI. Addressing the uneven distribution of ICT infrastructure, particularly acute in

Eastern Indonesia and rural areas, necessitates policy interventions to attract investment in telecommunications infrastructure and its supporting utilities, such as electricity. Such policies aim to bridge the digital divide and ensure equitable access to ICT across diverse demographics.

This research is intended to guide future studies in similar domains, suggesting that further analysis could include BIGGI calculations at the district level for more detailed analysis and incorporation of other determinants that may impact BIGGI, such as financial inclusion and environmental policies.

References:

Aminata, J., Nusantara, D. I. K., & Susilowati, I. (2022). The Analysis of Inclusive Green Growth In Indonesia. *Jurnal Ekonomi & Studi Pembangunan*, *23*(1), Layouting. https://doi.org/10.18196/jesp.v23i1.13811

Anna, Z., Hindayani, P., & Putri, I. A. P. (2018). Indonesian Cities Green Development Index: A Prototype Measurement. *International Journal of Sciences: Basic and Applied Research (IJSBAR)*, *37 (3)*, 290–308.

Ariyati, N., Rahayu, F., Amalia, N. R., Nurhaliza, S., Ghufran, T. M., Adi, A. R., & Jalaluddin, J. (2018). Pertumbuhan Ekonomi, Belanja Modal dan Indeks Pembangunan Manusia: Panel Data Evidence Empat Kabupaten di Aceh. *Jurnal Samudra Ekonomi Dan Bisnis*, *9*(1), 92–103. https://doi.org/10.33059/jseb.v9i1.465

Arshad, Z., Robaina, M., & Botelho, A. (2020). The role of ICT in energy consumption and environment: an empirical investigation of Asian economies with cluster analysis. *Environmental Science and Pollution Research*, *27*(26), 32913–32932. https://doi.org/10.1007/s11356-020-09229-7

Aslam, A., Naveed, A., & Shabbir, G. (2021). Is it an institution, digital or social inclusion that matters for inclusive growth? A panel data analysis. *Quality & Quantity*, *55*(1), 333–355. https://doi.org/10.1007/s11135-020-01008-3

Asongu, S. A. (2018). ICT, openness and CO2 emissions in Africa. *Environmental Science and Pollution Research*, *25*(10), 9351–9359. https://doi.org/10.1007/s11356-018-1239-4

Asongu, S. A., Le Roux, S., & Biekpe, N. (2017). Environmental degradation, ICT and inclusive development in Sub-Saharan Africa. *Energy Policy*, *111*, 353–361. https://doi.org/10.1016/j.enpol.2017.09.049

Badan Pengkajian dan Penerapan Teknologi. (2021). *Outlook Energi Indonesia 2021*. BPPT.

Badan Perencanaan Pembangunan Nasional. (2014). *Rencana pembangunan jangka menengah nasional (RPJMN) 2015-2019* (Vol. 2). Bappenas.

Badan Perencanaan Pembangunan Nasional. (2020). *Rencana pembangunan jangka menengah nasional 2020-2024*. Jakarta: Bappenas.

Badan Pusat Statistik. (2020a). *Indeks Pembangunan Teknologi Informasi dan Komunikasi 2019*. BPS.

Badan Pusat Statistik. (2020b). *Statistik Indonesia 2020*. BPS.

Badan Pusat Statistik. (2021). *Indeks Pembangunan Teknologi Informasi dan Komunikasi 2021*. BPS.

Badan Pusat Statistik. (2022). *Indikator Kesejahteraan Rakyat 2022*. BPS.

Baltagi, B. H. (2005). *Econometric analysis of panel data* (Vol. 4). Springer.

Bresnahan, T. F., & Trajtenberg, M. (1995). General purpose technologies 'Engines of growth'? *Journal of Econometrics*, *65*(1), 83–108. https://doi.org/10.1016/0304-4076(94)01598-T

Danish, Khan, N., Baloch, M. A., Saud, S., & Fatima, T. (2018). The effect of ICT on CO2 emissions in emerging economies: does the level of income matters? *Environmental Science and Pollution Research*, *25*(23), 22850–22860. https://doi.org/10.1007/s11356-018-2379-2

Ejemeyovwi, J. O., & Osabuohien, E. S. (2020). Investigating the relevance of mobile technology adoption on inclusive growth in West Africa. *Contemporary Social Science*, *15*(1), 48–61. https://doi.org/10.1080/21582041.2018.1503320

Faldrix, Y., Andrianus, F., & Kamarni, N. (2021). Analisis Dampak Perkembangan Teknologi Informasi dan Komunikasi Dalam Perkonomian Sumatera Barat. *Jurnal Ekonomi Dan Bisnis Dharma Andalas*, *23*(2), 385–396.

Gill, A. R., Viswanathan, K. K., & Hassan, S. (2017). Is Environmental Kuznets Curve Still Relevant? *International Journal of Energy Economics*, *7*(1), 156– 165.

Global Commission on the Economy and Climate. (2014). *Better Growth, Better Climate: The New Climate Economy Report*. GCEC.

Global Green Growth Institute. (2015). *Delivering Green Growth for a Prosperous Indonesia*. GGGI.

Green Growth Knowledge Platform. (2016). Measuring Inclusive Green Growth at The Country Level. *GGKP Working Paper*, *02*.

Grossman, G., & Krueger, A. (1991). *Environmental Impacts of a North American Free Trade Agreement*. National Bureau of economic research Cambridge, Mass., USA. https://doi.org/10.3386/w3914

Gujarati, D. N. (2004). *Basic econometrics*. The Mc-Graw Hill.

Harianto, S. K., & Sari, D. W. (2020). Dampak Spillover Penanaman Modal Asing terhadap Produktivitas Industri Manufaktur Medium-High Technology di Indonesia. *Jurnal Samudra Ekonomi Dan Bisnis*, *12*(1), 1–17. https://doi.org/10.33059/jseb.v12i1.2138

Hazmi, D. M., Karimi, S., & Muharja, F. (2023). Measuring and Determinants of Inclusive Growth: Evidence from Indonesia. *Optimum: Jurnal Ekonomi Dan Pembangunan*, *12*(2), 135–154. https://doi.org/10.12928/optimum.v12i2.5984

Heeks, R. (2016). Examining "Digital Development": The Shape of Things to Come? *SSRN Electronic Journal*, *64*. https://doi.org/10.2139/ssrn.3431739

Institute for Development of Economics and Finance. (2019). *Ekonomi Digital yang Inklusif di Indonesia: Perspektif Gender, Regional, dan Sektoral*. INDEF.

International Telecommunication Union. (2017). *Measuring the Information Society Report 2017*. ITU.

Iyengar, N. S., & Sudarshan. (1982). A Method of Classifying Regions from Multivariate Data. *Economic Political Weekly*, 2047–2052.

Jha, S., Sandhu, S. C., & Wachirapunyanont, R. (2018). *Inclusive Green Growth Index: A New Benchmark for Quality of Growth*. Asian Development Bank [ADB].

Kementerian Lingkungan Hidup dan Kehutanan. (2018). *Statistik Lingkungan Hidup dan Kehutanan Tahun 2017*. KLHK.

Kostoska, O., & Kocarev, L. (2019). A Novel ICT Framework for Sustainable Development Goals. *Sustainability*, *11*(7), 1961. https://doi.org/10.3390/su11071961

Kusumaningrum, S., & Yuhan, R. J. (2019). Pertumbuhan Ekonomi Provinsi di Indonesia Berdasarkan Indeks Komposit Pertumbuhan Inklusif dan Faktor yang Memengaruhinya. *Jurnal Ekonomi Dan Kebijakan Publik*, *10*(1), 1–17. https://doi.org/10.22212/jekp.v10i1.1150

Lee, J. W., & Brahmasrene, T. (2014). ICT, CO 2 Emissions and Economic Growth: Evidence from a Panel of ASEAN. *Global Economic Review*, *43*(2), 93–109. https://doi.org/10.1080/1226508X.2014.917803

Li, M., Zhang, Y., Fan, Z., & Chen, H. (2021). Evaluation and Research on the Level of Inclusive Green Growth in Asia-Pacific Region. *Sustainability*, *13*(13), 7482. https://doi.org/10.3390/su13137482

Liderson, D. M., & Pasaribu, E. (2020). PEMBENTUKAN BIGGI DALAM MENGUKUR PERTUMBUHAN INKLUSIF HIJAU. *Seminar Nasional Official Statistics*, *2019*(1), 266–274. https://doi.org/10.34123/semnasoffstat.v2019i1.84

Nchake, M. A., & Shuaibu, M. (2022). Investment in ICT infrastructure and inclusive growth in Africa. *Scientific African*, *17*, e01293. https://doi.org/10.1016/j.sciaf 2022.e01293

Ofori, I. K., & Asongu, S. A. (2021). ICT Diffusion, Foreign Direct Investment and Inclusive Growth in Sub-Saharan Africa. *Telematics and Informatics*, *65*, 101718. https://doi.org/10.1016/j.tele.2021.101718

Organisation for Economic Cooperation and Development. (2008). *Handbook on Constructing Composite Indicators: Methodology and User Guide*. OECD Publishing.

Organisation for Economic Cooperation and Development. (2011). *Towards Green Growth: Monitoring Progress*. OECD.

Øverby, H., & Audestad, J. A. (2021). *Introduction to Digital Economics*. Springer International Publishing. https://doi.org/10.1007/978-3-030-78237-5

Park, Y., Meng, F., & Baloch, M. A. (2018). The effect of ICT, financial development, growth, and trade openness on CO2 emissions: an empirical analysis. *Environmental Science and Pollution Research*, *25*(30), 30708–30719. https://doi.org/10.1007/s11356-018-3108-6

Pradhan, R. P., Mallik, G., & Bagchi, T. P. (2018). Information communication technology (ICT) infrastructure and economic growth: A causality evinced by cross-country panel data. *IIMB Management Review*, *30*(1), 91–103. https://doi.org/10.1016/j.iimb.2018.01.001

Raharti, R., Laras, T., & Oktavianti, O. (2021). Model Ketimpangan Pembangunan Ekonomi di Indonesia. *Jurnal Samudra Ekonomi Dan Bisnis*, *12*(2), 257–270. https://doi.org/10.33059/jseb.v12i2.2422

Raheem, I. D., Tiwari, A. K., & Balsalobre-Lorente, D. (2020). The role of ICT and financial development in CO2 emissions and economic growth. *Environmental Science and Pollution Research*, *27*(2), 1912–1922. https://doi.org/10.1007/s11356-019-06590-0

Solomon, E. M., & Klyton, A. van. (2020). The impact of digital technology usage on economic growth in Africa. *Utilities Policy*, *67*, 101104.

https://doi.org/10.1016/j.jup.2020.101104
Sun, Y., Ding, W., Yang, Z., Yang, G., & Du, J. (2020). Measuring China's regional inclusive green growth. *Science of The Total Environment*, *713*, 136367. https://doi.org/10.1016/j.scitotenv.2019.136367
Vu, K. M. (2013). Information and Communication Technology (ICT) and Singapore's economic growth. *Information Economics and Policy*, *25*(4), 284–300. https://doi.org/10.1016/j.infoecopol.2013.08.002
Wang, N. (2020). Does Foreign Direct Investment Improve Inclusive Green Growth? Empirical Evidence from China. *International Journal of Business Management and Finance Research*, *3*(1), 12–19. https://doi.org/10.53935/2641-5313.v3i1.39
World Bank. (2012). *Inclusive green growth: The pathway to sustainable development*. The World Bank.
World Economic Forum. (2017). *The Inclusive Growth and Development Report 2017*. WEF.
Zhou, R. (2022). Measurement and Spatial-Temporal Characteristics of Inclusive Green Growth in China. *Land*, *11*(8), 1131. https://doi.org/10.3390/land11081131
Zhu, S., & Ye, A. (2018). Does Foreign Direct Investment Improve Inclusive Green Growth? Empirical Evidence from China. *Economies*, *6*(3), 44. https://doi.org/10.3390/economies6030044