

# The Influence of Green Technology, Environmental Disclosure and Green Intellectual Capital on Stock Returns

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## Abstract:

**Purpose** –Company performance can be measured in terms of financial and non-financial. Shareholders are motivated to invest their capital in the hope of getting a return in accordance with the capital invested. Indonesia is currently in a dilemma with a knowledge-based, fast-changing and technology-based economy. Most companies use technology to improve the efficiency of company activities and reduce costs incurred. Issues related to the environment and the adoption of green technology have received much attention over the past few years. The purpose of this study is to determine the relationship between Green technology, environmental disclosure and green intellectual capital on stock returns

**Design/methodology/approach** –The type of data in this study is secondary data. The samples used in the study were Basic Materials and Transportation & Logistic companies with a sample size of 267.

**Findings** –The results show no effect of green technology on stock returns. There is a significant negative relationship between Green Intellectual Capital and stock returns. While environmental disclosure has a significant positive effect on stock returns.

**Research limitations/implications** –In developing countries, no statistically relevant relationship was found between fair valuation and earnings quality, which may be due to the adoption of IFRS and the lack of experience in fair valuation, or more generally, the very low influence of IFRS regulations on local accounting practices.

**Originality/value** –In this paper, researchers use clear technology to measure green technology that has not been used by previous researchers.

**Keywords:** Green Technology, Environmental Disclosure, Green Intellectual Capital, Stock Returns

## I. Introduction

Companies in Indonesia are currently in a dilemma with a knowledge-based, fast-changing and technology-based economy. Most companies use technology to improve the efficiency of company activities and reduce costs. Issues related to the environment and the adoption of green technology have received much attention in recent years. According to a McKinsey Quarterly November 2019 global survey, 41% of senior executives in the US and 53% in Europe believe that environmental issues will have a major impact on shareholder value over the next 5 years. In this situation, managers need to decide whether their companies should adopt environmentally friendly technologies that will reduce emissions but may require large initial investments and/or increased production costs.

In recent years, there has been a steady increase in the volume of sustainability disclosures by companies. (Huang, et al. 2014). Investors need information to assess a company's capabilities and performance before making investment decisions. (Sugiyanto et al, 2020) As a consequence, business entities as members of society are expected to be able to solve or overcome problems. social and environmental in such a way that aims to add value to society (Luning, et al. 2012). Thus, corporate sustainability disclosure aims to improve financial performance, attract the best employees and inspire leaders. (Guarnieri, et al. 2008).

Contemporary businesses are regularly changing due to new risks and challenges related to ethical, social and environmental issues. (Grubor et al. 2020). Stakeholder awareness interest in corporate social responsibility has increased. Companies, governments,

Regulatory authorities, investors and consumers around the world are paying more attention to environmental sustainability issues. (Gregory-Smith et al. 2017). Society around the world is very concerned in recognizing that companies are truly committed to environmental protection from issues such as emissions, climate change, contamination, and other environmental impacts arising from corporate operations. Therefore, companies are increasingly interested in legitimizing themselves by disclosing their environmental activities and practices. (Llena et al. 2007). By disclosing environmental activities and their impacts to stakeholders, companies will build a positive image. (Bhattacharyya and Cummings 2015).

Company performance can be measured in terms of financial and non-financial aspects. Shareholders are motivated to invest their capital in the hope of getting a return according to the capital invested. (According to Beylin 2016) efforts to maximize stock returns are the main goal of a company. This is because high returns in a company reflect the company's ability to generate profits.

The purpose of this study is to determine the relationship between Green technology, environmental disclosure and green intellectual capital on stock returns using firm size and company value as control variables. Previous studies related to green technology, Lingli et al (2022) in his research stated that green technology has a long-term positive influence on company performance. consistent with the findings Lu et al. (2018). so also with the findings Xie et al. (2015). They argue that absorptive capacity has a positive moderating effect on the relationship between clean technology in green process innovation and financial performance. This is different from the research results from Amores-Salvado et al. (2014), who argue that environmental product innovation does not have a statistically significant positive effect on firm performance.

The results of previous research that directly tested the influence of CSR on stock value. The research conducted Ashrafi et al. (2020) which aims to examine the benefits of CSR in business organizations. This study implies that companies that effectively demonstrate that companies that implement CSR in business processes are successful in developing positive relationships with stakeholders such as customers, suppliers, investors, and employees. This result is also in line with previous research from Deer and Zarestky (2017), which shows that CSR is a policy and practice designed and implemented to achieve business objectives, taking into account the environmental requirements of government regulatory authorities, customers, and the general public. Previous research from Farooq et al. (2020) also agree with this result. This study examines the role of CSR in achieving a highly sustainable business. The study highlights that CSR policies continue to oversee business decisions and operations so that business activities do not leave negative impacts on the atmosphere, natural resources, and health of living things.

In contrast to the results studied by Abdulazizi, et al, 2021, in his research stated that Environmental Sustainability disclosure is significantly and negatively related to stock returns, indicating that higher levels of corporate environmental disclosure reduce stock returns of Saudi listed companies. Furthermore, Barnea and Rubin (2010) argue that the level of ESG performance can be a cause of agency costs because company management is more likely to support investments in ESG at the expense of shareholder interests with the company. the goal of increasing their reputational benefits. In line with that, Kochhar (1996) states that when CSR control is low, agency conflict will increase, which can have an impact on stock price fluctuations as a result of conflicts between company management and shareholders. Healy et al. (1999) states that voluntary disclosure can improve stock performance. Healy et al. (1999) found that expanding disclosure would help investors in valuing company shares, increase share liquidity, and help stakeholders in analyzing shares. Fitri et al. (2020) found that Green Intellectual capital has a significant influence on future stock returns.

Liu and Jiang (2020) It has also been proven that IC has a positive impact on business progress, such as increasing brand equity and social networks. In addition, IC provides various positive benefits for companies such as employee satisfaction and job retention. (Longo and Mura, 2011), increasing business innovation (Ornek and Ayas, 2015; Adesina, 2019), increasing the relevance of accounting information (Hayati et al., 2015) and cost efficiency (Martinez et al., 2020).

Due to the gap between phenomena and research gaps, the purpose of this study is to determine the role of green strategy, environmental disclosure, green intellectual capital and their impact on stock returns of public companies.

## **II. Literature review**

This study is anchored on stakeholder theory, a fundamental and essential recommendation of stakeholder theory which states that the group needs to expand the company consists of non-traditional stakeholders, such as regulatory businesses hostile to changing social needs. (Trotman, 1999) followed p in (Bassey et al., 2013).

Legitimacy Theory explains This theory emerged from the social science paradigm and emphasizes this assumption that companies must order their social functions by meeting social needs and contributing to society having a higher image. Companies are increasingly trying and showing their positive operations for extraordinary social activities, to achieve legitimacy, and show a good image of their company. In addition, social pressure on companies, must allow legitimacy activities in front of society and additionally they use instruments such as social and environmental information speech acts by Ali Khani et al., 2014.

### **Empirical review and hypothesis development**

This paper aims to determine the influence of green technology, environmental disclosure and green intellectual capital on stock returns.

#### **Green Technology on Returns Share**

Green technology innovation in companies is not always conducive to improving the company's short-term financial performance, but it is conducive to improving its long-term performance. (Lingli et al, 2022). In other words, although implementing green technology innovation is slightly detrimental to a company's financial performance in the short term, it will benefit performance in the long term. This offers a new perspective on the old debate on the relationship between green technology innovation is slightly detrimental to a company's financial

performance in the short term, it will benefit performance in the long term. This offers a new perspective on the old debate on the relationship between green technology innovation and a company's financial performance.

This is in accordance with the findings Xie et al. (2015). They argue that absorptive capacity has a positive moderating effect on the relationship between green technology in green process innovation and financial performance. Thus, for firms that proactively implement green process innovation, their stronger absorptive capacity can generate good profits in both the short and long term. On the other hand, absorptive capacity negatively moderates the relationship between proactive green product innovation and short-term corporate financial performance. However, surprisingly, it positively moderates the relationship between a firm's proactive green product innovation and its long-term corporate financial performance.

This may be due to the absorptive capacity making it difficult to advance green technology innovation in the short term. Green technology innovation requires companies to have high knowledge and technology transfer capabilities. Usually, however, this usually involves a continuous and long-term process before companies can effectively and successfully change technology and research and development activities.

**Based on the explanation above, a hypothesis can be formulated.**

Study namely:

**H1: Yes The Positive Influence of Green Technology on Stock Earnings**

#### **Environmental Disclosure of Stock Returns**

Many studies have shown that environmental disclosure affects corporate financial performance using meta-analysis. Studies, Endriakt et al, 2014, suggesting that the association is particularly strong when the strategic approach underlying a firm's environmental performance is proactive rather than passive. They also reveal a methodological construct fairness effect, which can provide an explanation for previous research findings. Similarly, Dixon-Bunga et al., 2013. found that small firms appear to benefit from environmental practices than large firms. This is because small firms can compensate for the lack of free resources by being flexible. The disclosure of environmental activities is also explained by signaling theory. This theory proposes that for firms to differentiate themselves, they send signals about their positive outcomes. Thus, firms use CSR disclosure as a signal to their investors that they are engaged in CSR initiatives. This will support the positive image of the firm in the market. (Sun et al. 2010) and their stock value will increase due to the demand for these stocks and the valuation will be adjusted following CSR disclosure. In fact, the image and reputation risks associated with ESG can impact the company's stock price in the market. (Sahut and Pasquini-Descomps 2015). Therefore, ESG risk reduction should not be ignored. The signal strength conveyed by CSR is identified by its operative communication to a large number of stakeholders. (Godfrey et al. 2009). If investors anticipate that a company can leverage good environmental performance to create value, they will act positively and increase the company's stock price.

Based on the explanation above, a research hypothesis can be formulated, namely:

**H2: Yes Positive influence of Environmental Disclosure on Earnings Share**

#### **Green Intellectual Capital on Stock Returns**

Green intellectual capital enables companies to comply with strict international environmental regulations and meet increasing environmental awareness by consumers and create value for the company. (Chandra and Augustine, 2019).

The available empirical evidence seems to support the benefits of reporting intellectual capital to external stakeholders. For example, there is an increasing number of companies now reporting intellectual capital and the frameworks for doing so are well developed. (Systematic, 2004). In addition there is evidence to support the proposition that financial analysts are interested in intangibles and that companies that disclose their company's long-term future have been rewarded with better market valuations. (Marr, 2003). There is also evidence to support the argument that corporate managers believe that

Disclosure of intellectual capital increases transparency to the capital markets. Transparency results in lower weighted costs therefore higher market capitalization helps to create trust with stakeholders, supports long-term vision through propagation of long-term perspectives, and is suitable for use as a marketing tool. (vander Meer-Kooistra and Zijlstra, 2001). A recent empirical study of Fortune 500 companies' annual reports also supports the argument that intellectual capital disclosure influences market valuations. (Abdolmohammadi, 2005). So it is likely that communication with external stakeholders will continue to be an important basis for measuring and reporting intellectual capital. It is the method by which companies disclose intellectual capital that is of further interest.

Based on the explanation above, a research hypothesis can be formulated, namely: H3: There is a positive influence of Green Intellectual Capital on Stock Earnings.

### III. Methodology

#### Research design

The analysis method used is by using a multiple linear regression analysis model. The analysis of this research data uses statistical calculations with the application of Eviews version 9.

#### Population and sample

The population in this study were Basic Material and Transportation & Logistics sector companies listed on the Indonesia Stock Exchange with a total of 90 Transportation & Logistics and Basic Material sector companies from 2019 to 2021 listed on the IDX. The initial population was 123 companies, 33 companies were excluded from the population because they did not have complete financial reports. The number of samples used in the study was 267.

#### Operationalization and measurement of variables

##### Stock Return

Return is the total return of an investment over a certain period of time, consisting of capital gain (loss) and yield. Capital gain (loss) is the difference between the current investment price relative to the previous period's price. Calculate stock returns using total return. This study calculates total return by adding up capital gain (loss) and dividend stock yield from the formula (Sugiyanto, 2021).

$$RS = \frac{P(t) - P(t-1) + D(t)}{P(t-1)}$$

##### Green Technology

Green Technology is the development and application of products, equipment and systems used to preserve the environment and natural resources, which minimize and reduce the negative impacts in human activities (KETTHA, 2011). In this study, the measurement of Green Technology was measured using the green technology index (GTI), where each disclosure will be given a score of 1, and those not disclosed will be given a score of 0. The indicator for green technology researchers took sources from Stenly (2001), Wang (2019) And Iyyanki V (2017), as follows:

Table 1: Green Technology Index

Clean Technology Renewable Energy		Water-Related Adaptation Technology	
1.	The materials used reduce the creation of pollution	1.	The company uses renewable energy development
2.	The materials used reduce waste creation	2.	The company has plans to use renewable energy
3.	Reusable materials designed to recover raw materials, energy, water and by-products during final processing.	3.	The company has sufficient investment to meet its renewable energy targets.
4.	Products manufactured with low waste or non-waste (LNWT)	4.	The company's employees have sufficient competence in tracking the progress of renewable energy development.
5.	Initiative to provide products that use efficient energy.	5.	The company has a monitoring, reporting and verification system for greenhouse gas emissions.
6.	Initiative to provide products using the latest style sources.	6.	The company uses solar power for operations
7.	Remediating previously used technology	7.	The company uses solar buildings for operations
8.	Other energy conversion or management systems that reduce emissions	8.	Photovoltaic devices use semiconductor materials such as silicon to convert sunlight into electricity.
9.	Other energy conversion or management systems that reduce wastewater treatment	9.	Companies use Wind power
10.	Other energy conversion or management systems that reduce solid waste management	10.	The company uses geothermal/gas/coal/plant power plants
		11.	The company uses fuel that produces less carbon
		12.	Technology for efficient generation, transmission or distribution of electric power

In this study, the measurement of the Green Technology Index items was carried out using the following calculations:

$$non/ DGCI$$



Where: GTI is the Green Technology Index:  $n$  is the number of items disclosed by the company,  $k$  is the number of items contained in the Green Intellectual Capital Index.

### Environmental Disclosure

Environmental disclosure is the disclosure of information relating to the environment in a company's annual report.

Environmental disclosure measurement can be obtained through CSR disclosure in annual reports or sustainability reports. The assessment uses the GRI index, the GRI index is obtained from ([www.globalreporting.org](http://www.globalreporting.org)) in 2021. In detail, the environmental performance disclosure categories are as follows:

Table 2. GRI Environmental Disclosure Items

Bahan	Energy	Air	Keanekaragaman Hayati	Emisi	Effluen dan Limbah	Produk dan Jasa	Kepatuhan	Transportasi	Lain-lain	Asesmen Pemasok atas Lingkungan	Mekanisme Pengaduan Masalah atas lingkungan
Material yang digunakan dan diklasifikasikan berdasarkan berat dan ukuran .	Pemakaian energi yang berasal dari sumber utama dari luar organisasi	Total pemakaian air dari sumbernya	Lokasi dan luas lahan yang dimiliki, disewakan , di kelola atau yang berdekatan dengan area yang dilindungi dan area dengan nilai keanekaragaman hayati yang tinggi di luar area yang dilindungi.	Lokasi dan luas lahan yang dimiliki, Total emisi gas rumah kaca secara langsung dan tidak langsung yang diukur berdasarkan berat.	Total air yang dibuang berdasarkan kualitas dan tujuan	Inisiatif untuk mengurangi dampak buruk pada lingkungan yang diakibatkan oleh produk dan jasa dan memperluas dampak dari inisiatif ini.	Nilai moneter dari denda dan jumlah biaya sanksi-sanksi akibat adanya pelanggaran terhadap peraturan dan hukum lingkungan hidup.	Dampak signifikan terhadap lingkungan yang diakibatkan adanya transportasi, benda lain dan materi yang digunakan perusahaan dalam operasinya mengirim para pegawainya.	Jumlah biaya untuk perlindungan lingkungan dan investasi berdasarkan jenis kegiatan.	Persentase penapisan pemasok baru menggunakan kriteria lingkungan	Jumlah pengaduan tentang dampak lingkungan yang diajukan, ditangani, dan diselesaikan melalui mekanisme pengaduan resmi
Persentase material bahan daur ulang yang digunakan	Pemakaian energi yang berasal dari sumber energi yang utama baik secara langsung maupun tidak langsung.	Pemakaian air yang memberi dampak cukup signifikan dari sumber mata air.	Deskripsi dampak signifikan yang ditimbulkan oleh aktivitas produk dan jasa pada keanekaragaman hayati yang ada di wilayah yang dilindungi serta area dengan nilai keanekaragaman hayati diluar wilayah yang dilindungi.	Emisi gas rumah kaca secara tidak langsung dan relevan yang diukur berdasarkan berat.	Bobot total limbah berdasarkan jenis dan metode pembuangan	Persentase dari produk yang terjual dan materi kemasan dikembalikan berdasarkan kategori.				Dampak lingkungan negatif signifikan aktual dan potensial dalam rantai pasokan dan tindakan yang diambil	
	Penghematan energi melalui konservasi dan peningkatan efisiensi	Persentase dan total jumlah air yang didaur ulang dan digunakan kembali	Habitat yang dilindungi atau dikembalikan kembali	Emisi gas rumah kaca lainnya	Bobot limbah yang dianggap berbahaya menurut ketentuan konvensi Basel 2 lampiran i, ii, iii, dan viii yang diangkut, diimpor, diekspor, atau diolah, dan persentase limbah yang diangkut untuk pengiriman internasional						
	Inisiatif penyediaan produk dan jasa yang menggunakan energi efisien atau sumber gaya terbaru serta pengurangan penggunaan energi sebagai dampak dari inisiatif ini.		Jumlah spesies yang termasuk dalam data konservasi nasional dan habitat di wilayah yang terkena dampak operasi, berdasarkan resiko kepunahan.	Intensitas emisi gas rumah kaca	Identitas, ukuran, status yang dilindungi dan nilai keanekaragaman hayati yang terkandung di dalam air dan habitat yang ada disekitarnya secara signifikan terkena dampak akibat adanya laporan mengenai kebocoran dan pemborosan air yang dilakukan perusahaan .						
	Inisiatif dalam hal pengurangan pemakaian energi secara tidak langsung dan pengurangan yang berhasil dilakukan.			NO, SO dan emisi udara lain yang signifikan dan diklasifikasikan berdasarkan jenis dan berat.							

In this study, the measurement of Environmental Disclosure items was carried out using the following calculations. (Meng et al: 2015):

$$SEID_i = \sum_{j=1}^n I_{ij}$$

### Green Intellectual Capital

Green intellectual capital is all the knowledge possessed by an organization, that the organization can utilize in environmental management processes to gain a competitive advantage. (López-Gamero et al. (2011).

This variable can be measured based on research conducted by Chen and Hung (2014) where each item disclosed by the company is given a score of 1 and vice versa if it is not disclosed by the company it is given a score of 0. After that, the amount disclosed will be divided by the total of all criteria that must be disclosed.

$$GICI = n/k$$

It is known:

$GICI$  is the Green Intellectual Capital Index;

$n$  is the number of items that

disclosed by the company, Capital Index

$k$  is the number of items in Green Intellectual

Study model and analysis

This study uses a regression equation design in the analysis and hypothesis testing as follows:

$$RS = \alpha + \beta_1 GT + \beta_3 ED + \beta_2 GIC + \varepsilon$$

Where: RS is the stock return;

$\alpha$  is Constanta;

$\beta_1, \beta_2, \beta_3, \beta_4$  is Regression coefficient, GT is green technology, ED is environmental disclosure, green intellectual capital,  $\varepsilon$  is Error.

GIC is

Table 3 Measurements variable Variable Indicator (s) Measurement

Variable Indicator (s) Measurement		
Independent variable		
Stock return	Total Return, (Sugiyanto,2021)	total return by adding up capital gains (losses) and stock yield dividends
Dependent variable		
green technology	Green Technology Index, Stenly (2001), wang (2019) and Iyyanki V (2017)	the amount expressed divided by the total of all criteria
environmental disclosure	GRI	
green intellectual capital	Green Intellectual Capital Index, Chen and Hung (2014)	

#### IV. Results and discussion

##### Regression Analysis

Panel data regression analysis aims to test how influential the independent variables are to the dependent variables with several companies as samples over several time periods. The following table shows the results of the panel data regression analysis of the Random Effect Model (REM) used:

Table 5. Random Effect Model

Table 4. Influence Green Technology, Environmental Disclosure and Green Intellectual Capital on Stock Returns

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.178202	0.257745	0.691389	0.4899
Green Technology	0.670925	0.540219	1.241948	0.2154
Green Intellectual Capital	-0.676584	0.335037	-2.019432	0.0445**
Environmental Disclosure	1.584420	0.934884	1.694777	0.0913***
	Effects Specification		SD	Rho
Random cross section			0.276565	0.0328
Idiosyncratic random			1.502152	0.9672
	Weighted Statistics			
R-squared	0.029340	Mean dependent variable		0.314651
Adjusted R-squared	0.018268	SD dependent var		1.514043
SE of regression	1.500150	Sum squared residual		591.8684
F-statistic	2.649882	Durbin-Watson stat		1.834430
Prob(F-statistic)	0.049289			

Description: \*significant at  $\alpha = 1\%$  \*\*significant at  $\alpha = 5\%$  \*\*\*significant at  $\alpha = 10\%$

### **Green Technology Has No Effect on Stock Returns**

The results presented in Table 4 show that Green technology assessed based on the green technology index with three criteria, namely clean technology, renewable energy and water-related adaptation technology, provides a significance value of  $0.2154 > 0.05$  indicating that green technology does not affect stock returns, so the hypothesis stating that green technology affects stock returns cannot be accepted because the results of the study are shown in table 4.13. The positive coefficient value is 0.670925, which means that even effective green technology is unable to increase stock returns in the company. This is because green technology in Indonesia is still a new thing so that investors do not really care about this factor when they want to buy shares.

In the research results Chuang et al. (2015) also revealed that green technology has no effect on stock returns.

### **Green Intellectual Capital Has a Negative Influence on Stock Returns**

Table 4 shows that Green intellectual capital assessed based on the green intellectual capital index with three criteria, namely Green human capital, Green Structural Capital and Green relational capital, provides a significance value of  $0.0445 < 0.05$  indicating that green intellectual capital has an effect on stock returns, so the hypothesis stating that green intellectual capital has an effect on stock returns can be accepted. The negative coefficient value of -0.676584 means that even ineffective green intellectual capital is able to increase stock returns in the company. This is in accordance with the signaling theory which explains that companies can maintain productivity with the company's competitive advantage by implementing strategies to create added value.

In the research results Bontis (2000), Ulum (2018), Sugiyanto and Dwi (2021) also revealed that green intellectual capital has an effect on stock returns. maintaining productivity with the company's competitive advantage by implementing strategies to create added value. In the research results Bontis (2000), Ulum (2018), Sugiyanto and Dwi (2021) also revealed that green intellectual capital has an effect on stock returns.

### **Environmental Disclosure Has a Positive Influence on Stock Returns**

Table 4 shows that Environmental Disclosure assessed based on the GRI index provides a significance value of  $0.0913 < 0.1$  indicating that Environmental Disclosure has an effect on stock returns, so the hypothesis stating that Environmental Disclosure has an effect on stock returns can be accepted. The positive coefficient value of -1.584420 means that effective Environmental Disclosure can increase stock returns in the company. This is in line with stakeholder theory and Legitimacy Theory. This means that the company can be accepted in society because of the support of the surrounding community. Therefore, the company runs its business in a manner and behavior that is in accordance with the guidelines applied by the community. In the research results Alsahlawi et al. (2021), Mănescu, (2011), Tasnia et al (2020) also revealed that environmental disclosure has an effect on stock returns.

## **V. Conclusion and implications**

This study attempts to analyze the influence of Green Technology, Environmental Disclosure and Green Intellectual Capital on Stock Returns. First, the study observed that Green Technology has no effect on Stock Returns. This means that the high and low levels of Green Technology have no effect on Stock Returns.

Second, Green Intellectual Capital has a negative and significant effect on Stock Return. This means that the more employees who do not understand the environment, the lower the stock return level.

Third, Environmental Disclosure has a significant positive effect on stock returns. This means that the higher the company's environmental disclosure, the higher the stock return.

## **VI. Suggestions for future research**

The sample size in this study is small and the results cannot be considered representative of the current situation in Indonesian companies. Future research can analyze the influence of Green Technology, Environmental Disclosure and Green Intellectual Capital on Stock Returns and focus on comparative analysis across all corporate sectors in Indonesia.

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