

# Analysis of Water Scores in Indonesian University to Accelerate the Achievement of SDGs 6

Valentino Omega Gandi<sup>a\*</sup>, Maylia Pramono Sari<sup>b</sup>

<sup>a</sup>*Department of Accounting, State University of Semarang, unnesgandi@students.unnes.ac.id, Indonesia*

<sup>b</sup>*Department of Accounting, State University of Semarang, mayliapramonosari@mail.unnes.ac.id, Indonesia*

**Abstract.** One of the 17 sustainability goals is to have access to sufficient sanitation and clean water. If human health is the main objective, clean water and adequate sanitation are crucial. The enhancement of human life and well-being is influenced by human health, particularly in emerging nations like Indonesia. Thus, the first step in achieving this objective may be education via Indonesian campuses, which is one of the most significant foundations in life. This study attempts to examine the impact of Campus Area as Control Variable (Z) and Water Score or Water Use Score as Variable X on the Total Ratio or contribution of Indonesian campuses to clean water and adequate sanitation. 50 Indonesian campuses that are UI Green Metric members served as samples for this quantitative investigation. The findings of this investigation show that the Total Ratio (Y) is positively impacted by both Campus Area (C) and Water Score (X). It was concluded that the results of data processing have shown that the variable water score assisted by the campus area has a higher positive impact of 12.4%.

**Keywords:** Water Score, Total Ratio, Campus Area, Water and Sanitation, SDGs 6, Sustainable Development Goals

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\* Corresponding author. E-mail: unnesgandi@students.unnes.ac.id

## Introduction

2015 saw the adoption of the Sustainable Development Agenda for 2030 by UN The Sustainable Development Goals, or SDGs for short, are a set of 17 global objectives that are shared by member states. The United Nations (UN) has made it a global mission to fulfill its 17 goals for Sustainable Development (SDGs) (Wang et al., 2022). To achieve sustainable development and a brighter future, seventeen Sustainable Development Goals (SDGs) were identified in the UN 2030 agenda (Sherif et al., 2023). The Sustainable Development Goals (SDGs) are the next in line after the Millennium Development Goals (MDGs). Thus, in addition to water supply and sanitation, the water security goal now includes targets for integrated water management, water use and efficiency, and wastewater and water quality, natural resource management (IWRM), ecosystems as well as the supportive environment (Nkiaka et al., 2021). The foundational elements of sustainable development are the economy, society, and environment are intended to be consistent with one another through this agenda. Since water is essential to ecosystems, both the planet's and human health, as well as a requirement for economic and social progress, At the core of the 2030 Agenda is SDG 6, "Ensure availability and sustainable management of water and sanitation for all." (Delanka-Pedige et al., 2020).

Every kind of life on Earth depends on water supplies, which are also crucial for a nation's economic growth (Sarkar & Bharat, 2021). This study looks at 50 campuses in Indonesia to assess the sixth sustainable goal, which is hygienic water and proper sanitation. It is among the 17 worldwide objectives. Achieving the goal is to ensure that everyone has access to and can sustainably manage water and sanitation of SDG Target 6, "Sanitation and Pure Water." According to (Ritonga & Susilawati, 2022) hygiene is a crucial component of public health. Water quality improvement, appropriate and equitable sanitation and hygiene, and All people should have equal access to safe and affordable drinking water, significant increases in water use efficiency, a significant decrease in the quantity of individuals experiencing water scarcity, This goal addresses the conservation and restoration of ecosystems associated to water, as well as the use of integrated water resources management at all levels (Helling & Bölsche, 2021).

One of the goals of the idea of sustainable growth (Sustainable Development Goals, or SDGs) is

availability of potable water and proper sanitation. Human wellbeing and quality of life can be enhanced by easy availability of potable water and adequate hygiene, particularly in developing nations like Indonesia. Indonesia has a drinking water and sanitation score of 33.4, placing it 128th on the Environmental Performance Index (2024). This score is significantly lower than Singapore's 99.9, Malaysia's 54.0, Vietnam's 54.7, and Thailand's 51.2.

Table 1  
Goals and Metrics for Indonesia's Access to Potable Water and Sanitary Facilities

Target	Indicator
6.1 By 2030, guarantee equitable and universal access to affordable, clean drinking water for all.	Percentage of homes that utilize drinking water systems that are safely maintained.
6.2 By 2030, get rid of open defecation and give everyone equitable availability of suitable hygiene and sanitation, focusing particularly on women's needs and other marginalized groups.	Percentage of homes that use water and soap handwashing stations and other securely managed sanitation services.
6.3 By 2030, cut the percentage of untreated wastewater in half, eradicate dumping and reducing the amount of hazardous materials and chemicals released, greatly increase recycling and safe reuse of recyclables worldwide, and improve water quality.	a) Percentage of industrial liquid waste that is safely processed. b) Surface water quality as raw water c) Groundwater quality as raw water
6.4 By 2030, significantly cut down on the population impacted by lack of water, ensure the sustainable use and supply of freshwater to mitigate it, and make water consumption more efficient across all industries.	a) The ratio of raw water extracted from surface water sources to available water b) The ratio of raw water availability to that extracted from groundwater sources
6.5 By 2030, when appropriate, use transboundary collaboration to carry out All-level integrated management of water resources.	a) The degree of implementation of integrated water resources management (0-100). b) The proportion of the area of the transboundary basin that has agreements for cooperative operations pertaining to water resources.

6.6 By 2030, protect and restore water-related habitats, including groundwater, lakes, rivers, forests, wetlands, and mountains.	Changes in ecosystem-related water resource levels over time.
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Source: Badan Perencanaan Pembangunan Nasional, 2024

National Development Planning Agency (Bappenas), the National Development Planning Agency Numerous health issues in society, including stunting, newborn and maternal mortality, the spread of different viruses, and other diseases, start with an inadequate sanitation and uncontaminated water (Ronika et al., 2022). Human activities like industrial production, agriculture, and urban wastewater discharge have reduced the water's quality (Kirschke et al., 2020). Groundwater is the primary supply of water In much of the nation, for drinking, cooking, cleaning, and other uses, which results in a severe water crisis (Jama & Mourad, 2019). One of the primary causes of water scarcity is also poor water quality (Alcamo, 2019). Water is causing numerous environmental problems for the world community, and migration is a major factor in this discussion (Nagabhatla & Brahmhatt, 2020) Water ensures the production of food through irrigation and electricity through hydropower and power plant cooling (Hägele et al., 2022). To reduce the quantity of needless water usage in order to address the issues of poor sanitation and clean water, however it turns out that wasteful water use still exists in Indonesia. Finding strategies to efficiently preserve, manage, distribute, and use the water that we now have will be a problem as we move forward (Wimala et al., 2019). One of the key determinants of sustainability is water; if water waste persists, the natural equilibrium will be upset. Our capacity to increase and sustain access to water services and accomplish sustainable development is primarily determined by governance and the scarcity of water resources, as evidenced by the current reality of inequality, climate change, and environmental degradation (Sadoff et al., 2020).

John Elkington first proposed the Triple Bottom Line (TBL) idea in 1994. TBL is a methodology that evaluates organizational sustainability based on three primary factors: economic (profit), social (people), and environmental (planet), according to Elkington (1997) in his book. In order for organizations to prioritize community welfare and environmental sustainability in addition to profit, TBL combines financial objectives with social and environmental

responsibility. TBL is pertinent to campus sustainability since a good campus needs to be able to preserve environmental sustainability, manage resources effectively, and have a positive influence on the academic community. For instance, green space management and the Water Score represent environmental factors, but their effects on cost effectiveness and the well-being of the academic community represent social and economic factors. The use of TBL in sustainability management is supported by earlier studies. Long-term sustainability requires striking a balance between these three factors, as Elkington (1997) discusses in his book *Cannibals with Forks*.

Higher education plays a significant role in raising awareness of water and good sanitation (Torres et al., 2020). As a result, institutions of higher learning must actively participate by integrating the values and principles put forward by the SDGs into their objectives, policies, and operations (Ruiz-Garzón et al., 2021). Promoting prudent water use on campus and in the larger community, as well as offering free drinking water to students, employees, and guests, can have an impact on clean water and sanitation (Newton, 2021).

In order to encourage campuses worldwide, particularly those in Indonesia, to take sustainability seriously, the University of Indonesia established the UI Green Metric program, an annual university ranking website. In order to assess the effectiveness of green campuses, the University of Indonesia (UI) initially created the UI Green Metric-World University Ranking in 2010 (Wimala et al., 2019). Making regulations, fostering a culture, and incorporating sustainability knowledge into both academic and extracurricular activities are ways to increase sustainability. The study will examine how Campus Area (Variable C/Control) and Water Score (Variable X) affect the Total Ratio (Variable Y), which can serve as a guide to raise awareness of water and good sanitation.

Water Score (Variable X) in UI Greenmetric is the amount of campus water usage. This indicator aims for universities to reduce water usage, make conservation efforts, and save habitats as a sustainability effort. Total Ratio is an indicator that describes the campus's contribution to water and sanitation sustainability. Campus Area (variable C/Control) in UI Green Metric is an indicator that shows the campus area based on 3 categories, namely large, medium, and small.

## Research Methods

The quantitative technique of this study made use of cross-sectional secondary data from the UI Green Metric website. This study cites books, journals, and the internet. Between July and October of 2024, the author conducted this survey online from their home. As data analysis techniques, the researcher used regression, descriptive statistics, and hypothesis testing.

The type of data used is nominal data, the data covers 10 indicators contained in the 6th sustainable development goals mission, including safe household drinking water services, percentage of households using safely managed sanitation, safely processed liquid waste, surface water quality as raw water, groundwater quality as raw water, proportion of raw water intake from groundwater, proportion of raw water intake from surface water, integrated water resource management, transboundary basin areas, changes in water resource levels. Sampling in this study used the entire population of universities in Indonesia, totaling 144 and included in UI Greenmetric 2024.

The statistical tool used is IBM SPSS Statistics 27, the tool is a version of statistical software developed by IBM and designed to assist quantitative data analysis. The application is used to test classical assumptions and multiple linear regression

## Results and Discussion

### Classical Assumption Test

Water Score (Variable X) in UI Greenmetric is the amount of campus water usage. This indicator aims for universities to reduce water usage, make conservation efforts, and save habitats as a sustainability effort. Total Ratio is an indicator that describes the campus's contribution to water and sanitation sustainability. Campus Area (variable C/Control) in UI Green Metric is an indicator that shows the campus area based on 3 categories, namely large, medium, and small.

Table 2  
One-Sample Kolmogorov-Smirnov Normality Test Results

	Unstandardized Residual
N	145
Asymp. Sig. (2-tailed)	0,360

Source: Processed secondary data (2024)

The significance value of Asymp. Sig. (2-tailed) of 0.200 is known to be greater than 0.05 based on the SPSS output table. Therefore, it may be inferred that the data is normally distributed based on the rationale behind the Kolmogorov-Smirnov normality test mentioned above. As a result, the regression model's normality assumption or criterion has been satisfied.

Table 3  
Multicollinearity Test Results

Model	Tolerance	VIF
(Constant)		
WR Score (X)	0,749	1,335
Campus Area (C)	0,749	1,335

Source: Processed secondary data (2024)

Variable X and variable C have tolerance values of 0.749 and 0.749, respectively, according to the SPSS output table. The two variables' tolerance is more than 0.10. In the meantime, variables X and C have VIF values of 1.335 and 1.335, respectively. The two variables' VIF is less than 10. This indicates that the regression model does not contain multicollinearity.

Table 4  
Heteroscedasticity Test Results (Glejser)

Model	Sig.	Collinearity Tolerance	VIF
(Constant)	0,000		
WR Score (X)	0,968	0,749	1,335
Campus Area (C)	0,637	0,749	1,335

Source: Processed secondary data (2024)

According to the output table, where the dependent variable is the ABS\_RES variable. For variables X and Z, the significance value (Sig.) is 0.388 and 0.567, respectively. The Glejser Heteroscedasticity Test's premise for decision-making claims that since the significance value of the two variables listed above is more than 0.05, there is no trace of heteroscedasticity in the regression model.

Table 5  
Linearity Test Results of Water Score (X) Against Total Ratio (Y)

		Sum of Squares	df	F	Sig.
Between Groups	(Combined)	3,003	30	2,583	.000
	Linearity	1,532	1	39,525	.000
		1,471	29	1,309	.160

	Deviation from Linearity		
Within Groups	4,419	114	
Total	7,422	144	

Source: Processed secondary data (2024)

The significance value (Sig.) indicates that: Based on the aforementioned output, The Linearity Deviation The significance value is 0.160, exceeding the significance level of 0.05. Therefore, it can be said that There is a substantial linear relationship between variables X and Y.

Table 6  
Results of the Linearity Test of Campus Area (C) Against Total Ratio (Y)

		Sum of Squares	df	F	Sig.
Between Groups	(Combined)	2,044	2	26,981	.000
	Linearity	2,044	1	53,958	.000
	Deviation from Linearity	.000	1	.004	.951
Within Groups		5,378	142		
Total		7,422	144		

Source: Badan Perencanaan Pembangunan Nasional, 2024

According to the significance value (Sig.), According to the result above, the Sig. value for Deviation from Linearity, which is greater than 0.05, is 0.951. Therefore, Therefore, it may be said that there is a strong linear correlation between the Campus area (C) variable and the Y variable.

*Multiple Linear Regression Analysis*

This study employs a multivariate linear analysis approach using IBM SPSS Statistics 27 to determine the impact of independent factors influencing dependent variables. The results of the hypothesis test for The following table displays the results of multiple linear regression:

Table 7  
Multiple Linear Regression Test

Model	Unstandardized Coefficients	Standardized Coefficients	t	Sig.
	B	Beta		
	Std. Error			

(Constant)	.410	.077		5.299	.000
WR Score (X)	.000	.000	-.256	3.206	.002
Campus Area (C)	.124	.025	.397	4.976	.000

Source: Processed secondary data (2024)

*The Influence of Water Score on Total Ratio*

Based on the multiple multivariate regression test's findings, a one-unit rise in the Water Score variable (X) will cause a 0.000 or 0.0% increase in the Total Ratio, based on the X variable's coefficient value in relation to Y, with a Water Score significance value of 0.002. The significant value determines whether the hypothesis is accepted or rejected; if it is less than 0.05 (<0.05), Acceptance of the hypothesis and vice versa. A positive content value of 0.000 along with a level of significance of 0.002 <0.05 were obtained for the Water Score variable (X). Because Water Score has a positive impact on the Total Ratio, it may be concluded that H1 is accepted. In other words, the higher the Water Score or water use score, the higher the campus's contribution to the goal of sustainable water and proper sanitation. When water use increases on a campus in Indonesia, the concern for increasing the contribution of water and sanitation also increases.

This is required by the campus for sustainability reports, because this data is used to show the extent to which the campus has managed water sustainably and provide transparent information to stakeholders regarding the campus's contribution to the environment. In sustainability reports, campuses can include water and sanitation criteria as metrics that show achievements and challenges in sustainability efforts, because water and sanitation are the main pillars in the concept of sustainability. A result of 0% shows that the water score is not effective in disclosing sustainability reports, so it will not have much influence on stakeholders.

Water resource management strategies should be oriented towards water conservation and efficient water use. To achieve efficient water use, the equipment used must have a water-saving concept. This has been shown to be a practical and efficient method of achieving objectives without upsetting campus users. The applied water indicators have a very significant correlation with other indicators. Campuses that promote sustainable concepts have part

of the open area. In the open space of the campus, trees are planted as part of a strategy to adapt to drought, while a drip irrigation system is implemented for efficient water use. This is also explained by (Li et al., 2022).

The Water Score measures the efficiency and effectiveness of water management on a campus, including efforts to reduce water consumption, implement water-saving technologies, and improve the quality of water resource management. Because the UI GreenMetric assessment places a certain weight on the water management category, high performance on the Water Score will directly increase the contribution to the Total Ratio. In addition, good water management is often closely linked to other sustainability practices, such as energy efficiency and waste management, creating an overall positive impact on the total sustainability score.

Restoring clean water systems, monitoring each building's water supply, recycling wastewater, enhancing the quality of surface water, and gathering, controlling, and preserving rainfall are some of the ways that the water score affects campus sustainability. Therefore, increasing the efficiency of clean water use and drinking water quality is one of the strategies for implementing a sustainable campus.

The findings of this research align with those of (Sugiarto et al., 2022). According to a different study by (Jati et al., 2023) sustainability reporting benefits from environmental performance as assessed by the PROPER scale. (Pertiwi, 2022) in her research also revealed that in a case study at the University of Bandar Lampung (UBL) it showed that out of a total score of 3,035 points, the lowest score of 310 points came from the WR indicator. This shows that improvements in water management can contribute significantly to increasing the total campus sustainability score. This study has similarities with research from (Santoso et al., 2017) which shows the need to improve other indicators such as adding open spaces and improving the facilities in them, increasing the area of land planted with forest plants and also reducing areas that cannot be infiltrated by water.

The investigation's findings are consistent with sustainability philosophy. The idea of sustainability entails providing for present-day human needs without sacrificing the capacity of upcoming generations to follow suit. Sustainability theory can be applied to the UI Green Metric to examine how educational institutions manage natural resources, such water, to lessen adverse environmental effects. This theory is the Triple Bottom Line (TBL) Theory, which includes three main pillars of sustainability, namely economic,

environmental, and social. In this case, water management is part of the environmental pillar that must be maintained so as not to cause ecological and social damage.

#### *The Influence of Water Score with Campus Area on Total Ratio*

The outcomes of the test for multiple linear regression show that the variable C's coefficient value compared to Y shows that a rise of one unit in the Campus Area (C) will cause the Total Ratio to drop by 0.124, or 12.4%, with a significance value of 0.000 for the Campus Area. The significant value determines whether the hypothesis is accepted or rejected; if it is less than 0.05 (<0.05), it is accepted, and vice versa. With a significance level of 0.000 <0.05, the Campus Area variable (C) produced a positive coefficient value of 0.124. Consequently, it can be said that H1 is approved, because the Campus Area has a positive influence on the Total Ratio. It can be said that the Campus Area has a significant influence, meaning that the size of the campus area will affect the campus's contribution to water and proper sanitation. The addition of the Campus Area variable greatly helps the Water Score variable in giving an impact on the Total Score. This is indicated by a positive increase of 12.4% on the Total Ratio.

The increase of 12.4% makes the water score with the campus area feasible for universities to adopt a strategy that integrates efficient water management by utilizing the campus area, because it can positively improve the quality of sustainable reports.

Campus Area has a positive influence on Total Ratio in sustainability assessments such as UI Green Metric because the area of land owned by a campus often reflects the capacity to develop green open spaces, environmentally friendly infrastructure, and other sustainability programs. The larger the campus area, the greater the potential to improve environmental indicators, such as biodiversity, energy efficiency, and water conservation. Ample green open space also improves staff and student well-being and adds to the overall evaluation of campus sustainability. Research supports this relationship. The proportion of green open space on campus is one of the key factors in assessing sustainability. Research from (Colding & Barthel, 2017) explains that campuses with adequate land area have more opportunities to implement significant environmental programs. In addition, other studies state that the area of the campus directly contributes to the campus's ability to manage natural resources efficiently, which

affects the Total Ratio in the sustainability evaluation system. Thus, effective planning and management of campus areas are essential to support sustainability. Campuses that utilize green space and environmentally friendly infrastructure can be models of sustainable development at both local and global levels.

(Filho et al., 2024) revealed the importance of campus area planning that is aligned with sustainability goals. Universities can be a leading example in environmental management and have a positive impact on society at large. This study backs up research by (Sugiarto et al., 2022) which discovered that green space, trash management, and energy efficiency were important elements of the sustainable campus idea.

## Conclusion

### Conclusion

It is clear from the study's results and discussion that campus contribution to clean water and sanitation, or the Total Ratio, is positively impacted by water use, or Water Score. This is due to the fact that Indonesian universities are more motivated to enhance clean water and sanitation the more water is used. While Campus Area has a negative effect on the Total Ratio, because the wider the campus area, the more difficult it is for the campus to cover clean water and sanitation in each area of the campus. It was concluded that the results of data processing have shown that the variable water score assisted by the campus area has a higher positive impact of 12.4%.

Based on the research results, the contribution of universities to achieving SDGs 6 is to use equipment that has a water-saving concept such as automatic taps, dual flush toilets, and water sensors, then in open campus spaces, trees are planted as part of a strategy to overcome drought. Restoration of clean water systems, monitoring of water supply in each building, recycling of wastewater, improving surface water quality, and collecting, controlling, and preserving rainfall are some of the ways water scores affect the sustainability of water and sanitation on campus. However, the contribution of campuses in Indonesia to water and sanitation still tends to be low compared to other indicators.

The results of the study show that Water Score is not enough to increase the Total Ratio. However, if

combined with the campus area, the impact will be more significant by 12.4%.

In the context of Sustainability reports disclosure, it would be very good if Water Score combined with the campus area was adopted into sustainability reports.

### Suggestion

There are limitations in this study that can affect the findings, including only 2 independent variables studied, namely Water Score as variable X and Campus Area as Control Variable (Z). Therefore, in order to increase the percentage of independent variables to the Total Ratio greater than the variables in this study, it is advised that future research include additional independent variables like Campus Population and moderating variables like BAN-PT Accreditation or others. In order to assist water sustainability, researchers can also include new variables, such as artificial intelligence (AI). AI components, like automating repetitive jobs, analyzing large data, and merging intelligence and learning, have the potential to address a number of sustainable development issues (Mehmood et al., 2020).

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