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TRANSFORMING CHALLENGES INTO OPPORTUNITIES: THE JOURNEY OF THE UNIVERSITY TOWARDS ENVIRONMENTAL-BASED BUDGETING

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ABSTRACT

Purpose: This research scrutinizes the impact of the COVID-19 pandemic on the progress towards achieving a sustainable campus, with a specific focus on carbon emissions in higher education institutions. It aims to provide an in-depth understanding of the challenges and adaptations faced by universities during the pandemic, using the University of Jember in Indonesia as a case study.

Methodology/approach: The study employs a case study methodology, centering on the University of Jember as the subject of analysis. Carbon emissions are quantitatively assessed through an economic valuation of the university's budget, which is then converted using specific parameters. The research meticulously examines the alterations in campus operations induced by the pandemic, encompassing changes in work procedures and financial expenditures.

Findings: The findings reveal a paradoxical scenario where there is an increase in carbon emissions from non-medical waste. However, a noteworthy reduction of 13.5% in overall carbon emissions was observed when comparing the averages before and during the COVID-19 pandemic. These results underscore the complex interplay between operational adjustments and environmental impact during the pandemic period. This study contributes to the existing

body of knowledge by offering empirical evidence on the environmental impact of the COVID-19 pandemic on university operations, particularly in the context of carbon emissions.

Practical implications: It provides valuable insights and potential strategies for other universities worldwide, aiming to adapt and align their operations with sustainable development goals amidst unforeseen challenges.

Originality/value: The unique context of the University of Jember adds a novel dimension to the discourse on sustainability in higher education institutions during global crises.

Keywords: Carbon Emission; Economic Valuation; Environmental Budgeting; Sustainable University.

ABSTRAK

Tujuan penelitian: *Penelitian ini meneliti dampak pandemi COVID-19 terhadap kemajuan menuju tercapainya kampus yang berkelanjutan, dengan fokus khusus pada emisi karbon di lembaga pendidikan tinggi. Penelitian ini bertujuan untuk memberikan pemahaman mendalam tentang tantangan dan adaptasi yang dihadapi universitas selama pandemi, dengan menggunakan Universitas Jember di Indonesia sebagai studi kasus*

Metode/pendekatan: *Penelitian ini menggunakan metodologi studi kasus, yang berpusat pada Universitas Jember sebagai subjek analisis. Emisi karbon dinilai secara kuantitatif melalui valuasi ekonomi anggaran universitas, yang kemudian dikonversi menggunakan parameter tertentu. Penelitian ini dengan cermat meneliti perubahan dalam operasi kampus yang disebabkan oleh pandemi, yang mencakup perubahan dalam prosedur kerja dan pengeluaran keuangan.*

Hasil: *Temuan tersebut mengungkap skenario paradoks di mana terjadi peningkatan emisi karbon dari limbah nonmedis. Namun, pengurangan signifikan sebesar 13,5% dalam emisi karbon keseluruhan diamati ketika membandingkan rata-rata sebelum dan selama pandemi COVID-19. Hasil ini menggaris bawahi interaksi kompleks antara penyesuaian operasional dan dampak lingkungan selama periode pandemi. Studi ini berkontribusi pada pengetahuan yang ada dengan menawarkan bukti empiris tentang dampak lingkungan dari pandemi COVID-19 terhadap operasi universitas, khususnya dalam konteks emisi karbon.*

Implikasi praktik: *Studi ini memberikan wawasan berharga dan strategi potensial bagi universitas lain di seluruh dunia, yang bertujuan untuk beradaptasi dan menyelaraskan operasi mereka dengan tujuan pembangunan berkelanjutan di tengah tantangan yang tak terduga.*

Orisinalitas/kebaharuan: *Konteks unik Universitas Jember menambahkan dimensi baru pada wacana tentang keberlanjutan di lembaga pendidikan tinggi selama krisis global.*

Kata kunci: *Emisi karbon; Valuasi Ekonomi; Penganggaran Berbasis Lingkungan; Universitas Berkelanjutan.*

INTRODUCTION

Recently, the world has made sustainable development one of the requirements that must be satisfied by all countries to maintain a global balance of growth. SDGs will continue to face significant challenges to achieve their target by 2030, and collaborative support from all countries can only help during this time. The United Nations' Sustainable Development Goals (SDGs) envision a peaceful world where human life exists in a safe, healthy, and sustainable environment free of inequalities (Nundy et al., 2021). The SDGs emerged as a solution to economic, social and environmental inequalities (Fujianti et al., 2024; Pramesti et al., 2024).

The environment is a significant issue impacting the world today. Global environmental policies and international accords require a shared knowledge of the environmental problems that must be addressed and the achievement of common goals and targets. Addressing global environmental issues can be most effective when academics, the private/business sector, policymakers, civic society, and local constituents collaborate and communicate effectively. Taking into account the variations between languages, worldviews, and cultures is critical for successful interaction and communication in various situations (Coscieme et al., 2020). Environmental pollution is a major socio-economic issue in most of the globe. As a result, addressing this global problem and also protecting the environment, in general, are viewed as critical objectives (Ouadghiri et al., 2019).

One approach to avert the environmental destruction of the world is to reduce carbon emissions. Humans' daily consumption and production decisions also contribute to world emissions, accounting for 72% of total emissions. Numerous projects have been launched to combat climate change, beginning with calculating the carbon footprint of all human activities (Ridhosari & Rahman, 2020).

Carbon emission reduction initiatives that involve all institutions, including universities, will be more successful. According to the Climate Change Act 2008, the UK's net greenhouse gas (GHG) emissions in 2050 must be at least 80% lower than the baseline 1990 level. Additionally, the Act establishes a minimum interim objective of 34% reduction in emissions by 2020 and five-year carbon budgets for 2008-2012, 2013-2017, and 2018-2022. The Higher Education Funding Council for England (HEFCE) promotes similar objectives in its national carbon policy. HEFCE requires universities to set specific goals for 2020 reductions

in direct and indirect emissions associated with the use of fossil fuels and bought energy in their buildings, fixed and mobile emission sources (Ozawa-Meida et al., 2013).

Several programs have been established for a specified period to achieve the goal of a sustainable university. This program has evolved into the university's flagship to garner support from potential stakeholders. There is increasing demand to promote sustainability across all sectors, including higher education campuses. University campuses function similarly to tiny towns, using water, energy, and food resources and creating garbage. Improved management of these resources may prove to be less expensive for an HEI while also having a lower environmental effect. Implementing environmentally friendly processes in the same site as environmental research makes sense since universities are ideal locations for conducting objective research and creating more advanced ways and methods to mitigate ecological effects (Benevides et al., 2021).

However, the epidemic has altered several organizations plans and operations worldwide, including colleges. COVID-19 has shown the critical need for a wide variety of systemic reforms in areas such as mobility, healthcare, housing, energy, and food supply, to name a few. To foster urban transformational processes capable of addressing contemporary social and ecological demands and problems, actors and institutions must acquire transformative skills (Hestad et al., 2021). The pandemic of COVID-19 has impacted several facets of human life, including mobility. Locally, most universities halted all in-person lectures and business travel in March 2020, affecting the community's energy consumption and greenhouse gas (GHG) emissions (Gamba et al., 2021).

In light of the critical challenges posed by global climate change and the depletion of energy resources, the imperative of pursuing low carbon development has become unmistakable in the quest for sustainable economic and social progress (Niu & Zhu, 2021). Despite the ambitious targets set by the Paris Agreement to restrict the global temperature increase to 'well below' 2°C above pre-industrial levels, the ongoing rise in greenhouse gas emissions reveals a substantial climate ambition gap, hindering efforts to stabilize and reduce emissions (Fuss et al., 2021). The battle against climate change is described as unprecedentedly intense, with human activities in the realms of economics, industry, and transportation causing irreparable harm to nature (Krotova, 2021). Since the 1990s, global energy demand has surged due to rapid industrialization, urbanization, and economic growth, notably in developing countries such as India and Indonesia, resulting in a significant release of carbon dioxide (CO2) that poses a substantial environmental risk and exacerbates climate change (Pata & Kumar, 2021). Recognized as one of humanity's greatest challenges, climate change prompts urgent action to mitigate its impacts, particularly as manifested in the vulnerability of small island developing states (SIDS), which have prioritized adaptation efforts acknowledging the inevitability of some climate change (Robinson & Dornan, 2017). Emphasizing the inevitability of climate change and the necessity for adaptation, recent decades have witnessed global discussions underscoring the urgency of fortifying resilience and adaptive capacity to confront climate risks and natural disasters (Kurniawati et al., 2020).

In recent years, the intricate nature of the climate change issue and its status as a global public good have propelled climate change management to the forefront of global attention (Gong et al., 2020). Recognizing anthropogenic greenhouse gas (GHG) emissions as the primary driver of global climate change, various countries and international organizations are urgently working to address this pressing concern (Li et al., 2015). A concerted global effort is underway to curtail GHG emissions across all sectors, reflecting a shared commitment to mitigating the impacts of climate change (Alazazmeh & Asif, 2021).

The sustainability of our planet is currently a key concern for the global community and has been a central theme for several important global projects in recent years. The United Nations and world leaders developed the seventeen objectives in response to an urgent need for tangible benchmarks for sustainable development. The SDGs call on all governments to take action to enhance wealth while safeguarding the Earth and its life-sustaining systems (Nhamo & Mjimba, 2020). Sustainable management is critical for mitigating climate change's effects. It plays a critical role in mitigating the uncertainty and certainty risk associated with climate change (Oktaviani & Pratiwi, 2024). Sustainable management enables organizations to achieve the proposed Sustainable Development Goals. There are several problems that leaders in higher education face in attaining sustainable development. These are either strategic or implementation issues. According to the study's findings (Pintér et al., 2012), four challenges exist: establishing a commitment to sustainable development for the entire academic community, developing and implementing the best sustainability system, implementing a transparent and responsible budget to ensure program sustainability, and involving all university stakeholders in the sustainability plan. All of these difficulties must be addressed strategically in order to accomplish the goals of sustainable development in higher education.

Universities and colleges, recognized as key providers of higher education, are increasingly acknowledged for their pivotal role in advancing the global agenda for sustainable development (Figueiró & Raufflet, 2015). As agents of positive societal transformations, these institutions are seen as enablers of worldwide progress towards sustainable development goals, a significance that is expected to amplify in the future (Ceulemans et al., 2015). With their long planning timeframes, centralized organizations, and dense populations, university campuses emerge as ideal settings for exploring carbon mitigation strategies, presenting opportunities for examining and implementing effective measures (Li et al., 2015). In this context, the reporting of CarbonFootprints, specifically in terms of CO2e, from educational campuses is underscored as an initial and crucial step towards fostering sustainable practices within the realm of higher education (Kulkarni, 2019).

Reducing carbon footprint has become a paramount goal for universities seeking to align with global sustainability objectives. University campuses, with their sizable infrastructure and energy consumption, have the potential to make a substantial impact on carbon reduction efforts. Implementing green building practices, adopting renewable energy sources, and enhancing waste management systems are crucial steps universities can take to minimize their environmental impact. Moreover, integrating sustainability into academic curricula provides students with the knowledge and skills needed to address environmental challenges, empowering them to become advocates for a greener future. As institutions deeply intertwined with societal progress, universities have a unique opportunity to lead the way in mitigating climate change and promoting a more sustainable world. Often criticized for being too politicized or ideological, universities remain attractive models and powerful forces, driving innovation, economic growth, the arts, and social movements. One such movement involves universities collaborating as bridges with communities to support the Sustainable Development Goals (SDGs), addressing global environmental, social, and economic challenges. As rooted local and globally connected entities, higher education institutions play a significant role in realizing the SDGs by working with faculty, staff, students, and the broader stakeholder community. Apart from support coming from internal factors that can support the implementation of sustainable university, The impact of external factors such as the COVID-19 pandemic on university operations is evident in the case of the University of Oldenburg (Germany), which suspended in-person lectures on March 13,

2020. The global decrease in greenhouse gas (GHG) emissions during the COVID-19 pandemic is noteworthy, with a study revealing an 8.8% reduction in CO2 emissions worldwide in the first six months of 2020 compared to the same period in 2019. Additionally, emissions from ground transportation witnessed a substantial 13.0% decrease in July 2020 relative to July 2019, reflecting the pandemic's influence on environmental patterns (Gamba et al., 2021).

The COVID-19 pandemic, which emerged in early 2020, has proven to be an unpredictable force, defying attempts to forecast its cessation and giving rise to a landscape fraught with uncertainty. This lack of predictability has cascading effects, touching every facet of human existence, from economic and social structures to political institutions and interpersonal relationships. As highlighted by Roman & Plopeanu, (2021), the resulting status quo engenders profound confusion, permeating various dimensions of life. Gamba et al. (2021) emphasize the pandemic's impact on mobility, while Puriwat and Tripopsakul (2021) underscore its pervasive influence on work, lifestyle, recreation, and education. Yerel et al., (2021) and Pomponi et al., (2021) collectively assert that no sector has been immune, with global businesses undergoing unprecedented transformations, individuals experiencing restrictions on movement, and daily life altered in fundamental ways. Topalska, (2021) notes the pervasive nature of these changes, permeating all areas of life, while Bernal Bernal Escoto et al., (2021) highlight the significant shifts in work processes undertaken by companies worldwide. Mańkowska et al., (2021) aptly characterize the pandemic as a global crisis, emphasizing its profound impact on the functioning of the global economy and the sustainable development of supply chains. In essence, the unpredictable trajectory of the pandemic has unleashed a domino effect, reshaping the world in ways previously unimagined and necessitating rapid adaptations across the spectrum of human existence.

The seismic impact of the COVID-19 pandemic on higher education has been profound and widespread. Government-mandated lockdowns, as highlighted by Murphy, (2020), compelled universities and colleges worldwide to abruptly halt their operations, ushering in an era of remote learning. Lopes & Vieira, (2021) contribute a unique perspective, indicating that while this shift to online education during the pandemic has minimized certain environmental impacts, it has also triggered significant alterations in educational practices. In Iraq, the pandemic prompted a paradigm shift, as Makki & Bali, (2021) note the formal recommendation by the government to incorporate social media as a formal platform for education. Rodrigues et al., (2021) shed light on the global response of higher education institutions (HEIs) to the lockdown, emphasizing the implementation of various strategies, including virtual platforms, digital content, and lecturer training. Mansor et al., (2021) underscore the transformative nature of the year 2020, recognizing it as a pivotal moment in reshaping the global education landscape. Puriwat & Tripopsakul, (2021) describe the adaptation of educators to a "new normal," marked by the closure of university premises and the widespread adoption of distance learning, particularly in Thailand. Yerel et al. (2021) encapsulate the global impact, noting that higher education institutions worldwide were universally affected by the virus that emerged in late 2019, quickly evolving into a pandemic.

The ramifications of this transition extended beyond the digital realm, impacting the living situations of students, as noted by Pobegaylov, (2021). Many students, compelled to leave university dormitories due to pandemic-related restrictions, found themselves in challenging and remote locations, leading to significant obstacles in accessing online classes through digital communication channels. This situation highlighted the disparate challenges faced by students during the pandemic. Dohaney et al., (2020) emphasize the vulnerability of Higher Education Institutions (HEIs) to pandemics and other disasters, necessitating the

development and implementation of contingency plans to ensure the continuity of learning and teaching over an extended and uncertain period. Leal Filho, (2021) contribute to the discourse by framing the impact of the pandemic as a broad challenge faced by HEIs in their entirety, affecting not only their overall operations but also posing specific challenges to the delivery of sustainable development teaching. In essence, these insights collectively underscore the multifaceted disruptions and adaptive measures undertaken by higher education institutions in response to the unprecedented challenges posed by the COVID-19 pandemic.

METHODS

This research approach is descriptive qualitative research. A specific phenomenon approach which is one of the characteristics of qualitative research (Berg, 2019), is also used in this study. The object of research in this study is the University of Jember, Indonesia. Especially, this research uses the case study method (Yin, 2018). In analyzing, this study uses the green university concept developed describes three essential parts towards a green university, namely Planning (Institutional Framework), Implementing (campus operation, Teaching, Research, community engagement), and reporting (accountability and reporting). In this study, researchers focus on campus operation at the University of Jember, especially the electricity aspect, fuel consumption, plastic waste, paper waste, non-medical waste (specifically represented by mask waste), and vehicle emissions.

the calculation of carbon emission is carried out by the formula:

$$\text{emissions} = \text{activity data} \times \text{emission conversion factor}$$

emission conversion factor uses parameters developed by (Wiedmann & Minx, 2007). Data collection was obtained through 3 methods: depth interview, secondary data, and observation. The key inquiry for the informants are the policy about sustainable campus, strategy to maintain environment, and the policy to achieve value for money in their institution. The key informants in this study are the assets and environment, finance, and reporting sections. Secondary data is obtained from the University of Jember annual financial report for 2017-2020, 2018 sustainability report, 2018 carbon emission footprint report. All the data analyzed using life cycle analysis and economic valuation to extracting from the budget.

RESULTS AND DISCUSSION

Jember University is one of Indonesia's universities committed to implementing sustainability practices in the campus environment. This commitment is carried out through several actions. Mapping and calculating the carbon footprint is carried out throughout the University of Jember. The calculation of the carbon footprint report was carried out for 2018 and resulted in a carbon footprint report published in 2021. In addition, the University of Jember has also produced a 2018 sustainability report published in 2019. In practice, waste management, fuel consumption, use of electricity, and biodiversity are university priorities. However, the University still does not have formal sustainability planning. The implementation of sustainability is still done partially in certain parts.

In its implementation, management allocates funds that are attached to specific programs. When a pandemic occurs, the planned budget focus on sustainability is shifted through a refocusing program for handling COVID-19. However, in handling COVID-19, which impacts the environment, it is still relevant to achieving a green campus through reducing carbon emissions.

The University of Jember budget in 2020 allocated for two main types of expenditure, namely operational expenditure, and capital expenditure. Operational expenditure is grouped into two categories of disbursement, called employee disbursement, which is used to pay salaries, allowances, and all matters related to honorariums that are received directly by employees and have an impact on the amount of taking home pay of employees' salaries. This value has a proportion of 28.88% of the total budget. Meanwhile, operational disbursement is used for payments other than employee disbursement, and which does not have an impact on increasing the University's fixed assets. This value has a proportion of 37.71% of the total budget. On the other hand, capital expenditure is only used for capital disbursement, which means that every university fund expenditure must add to the University's fixed assets which will later be presented in the financial statements (balance sheet). This value has a proportion of 33.41% of the total available budget in 2020.

Table 1. Budget Composition in 2020

Type Expenditure	Type of Disbursement	Proportion	
Operational Expenditure	Employee Disbursement	28.88%	66.59%
	Operational Disbursement	37.71%	
Capital Expenditure	Capital Disbursement	33.41%	33.41%
Total		100%	100%

Since the WHO announced a pandemic due to the virus known as Covid-19, the Indonesian government responded by announcing various adjustments to activities, restrictions on mobility and refocusing the budget. Following up on the announcement, the University of Jember specifically allocated some of its funds to handle COVID-19 in the campus environment. The composition of the COVID-19 special budget allocation can be seen in table 2. The existence of this special allocation makes activities and work programs at universities much adjusted to existing conditions so that the transmission of COVID-19 does not occur. However, the expenditure of funds outside the special allocation can still be carried out at the university or faculty level or work units under the University of Jember.

Table 2. Budget Allocation for Specific Purpose to Handling Covid-19 Pandemic

Type Expenditure	Type of Disbursement	Budget	Disbursement
Operational Expenditure	Operational goods disbursement	28.88%	28.36%
	Non-operational goods disbursement	17.47%	17.43%
	Inventory disbursement	3.99%	3.99%
	Service disbursement	0.80%	0.80%
	Transportation disbursement	20.70%	20.72%
Capital Expenditure	Capital disbursement	28.70%	28.70%
Total		100%	100%

The COVID-19 pandemic has caused changes and adjustments to programs and activities at higher education institutions in Indonesia, including the University of Jember. At the University of Jember, changes in teaching, research, community service and office activities are carried out by minimizing physical contact and implementing strict health protocols. The Chancellor of the University of Jember issued a decree on forming a Covid-19 task force at the university level through Rector's Decree Number 4823/UN25/KP/2020 dated March 18, 2020. Furthermore, the task force issued several recommendations for changes that must be made at the University of Jember, presented in table 3. The recommendations are categorized into three groups: general recommendations, recommendations for staff and lecturers, and recommendations for students.

Recommendation	Implementation
General recommendation	
a. Implement work from home or work from home (WFH) and evaluate according to the update situation b. Temporarily delays attendance with fingerprint to break the transmission chain c. Learning and administrative services are carried out online d. Stay at home and get used to washing hands with soap and running water is the main thing e. Implementing social distancing, physical distancing, hand washing, and disinfection in the work environment and the community as examples of clean and healthy living behaviour. f. Cleaning the environment by disinfecting surfaces that are potential sources of transmission (tables, chairs, door handles) g. Avoid activities that gather large crowds of people	a) Work from Home for staff, online lectures for lecturers and students b) Presence using QR code, not using fingerprint c) Online lectures have been implemented d) WFH for staff, educating hand washing, hand sanitiser available in various public places. e) Cancellation of various events that bring together many people, such as postponing graduation, changing TA exams online, meetings with online applications. f) Room disinfection program and office and lecture hall furniture. g) Canceling / postponing activities such as graduation, renting a building for weddings, seminars, PPL, Internships, so on.
For Lecturer and Staff	
Clerical staff have to working from home. Some exemption:	
a. Officials at the sub-section level and above continue to enter the office to carry out the coordination function b. For officers who are unable to carry out work at home, they can carry out work in the office but carry out strict health protocols c. Each sub-section can be assigned one standby team member alternately d. All security officers (security guards) are given instructions on preventive measures, security, and setting up guard duties	a) Limitation of Working Hours until 14.00 WIB or as much as six working hours. b) Limitation of Working Hours until 14.00 WIB or as much as six working hours. c) Limitation of the number of employees on standby in a room with working hours of 6 hours following the policy. d) Educate security guards in the covid emergency period by carrying out health protocols such as checking the temperature of customers who want to enter the building and providing hand sanitiser to customers.

e. Cleaning service personnel are given instructions for the steps to disinfect the room, equipment, and equipment and the use of PPE. Task arrangements were made to support the prevention of Covid	e) Educate janitors to constantly clean the room with the provisions of the health protocol by spraying disinfectant before and after working hours.
For student	
a. The study period at home is extended while monitoring the following development situation. b. Face-to-face activities are avoided and apply social distancing, physical distancing, and proper handwashing in the campus environment, home or residence, and the community. c. Be an example in society. d. It is better to stay at home, stay at the boarding house	a) Implementation of online lectures, online graduation, and implementation of webinars until the specified time and providing logistics for students who cannot go home or stay at boarding houses. b) Implementation of lectures, graduations, and webinars online by lecturers and students. Moreover, for students or lecturers who cannot do it from home, health protocols are carried out by washing hands or hand sanitiser, checking body temperature, wearing masks, and keeping a distance. c) Keep applying all health protocols all the time. d) Continue to carry out lectures or campus activities online.

Table 3. The Recommendation Changes in Activity and The Implementation

Changes in activities and activities both in teaching, research, and offices at the University of Jember cause changes to the carbon emissions produced. The carbon footprints generated from these activities are relevant to changes according to the task force's recommendations for handling Covid-19, including electricity, fuel consumption, plastic waste, paper waste, medical waste, and vehicle emissions. The following is a discussion of each element that occurs at the University of Jember:

Electricity consumption at the University of Jember tends to decrease as the green campus program is launched. Green campus programs in the field of electricity include: replacing light bulbs with LEDs, using solar panels for outdoor lights and street lighting, and efficiency through the green building for new buildings. In 2017 the amount of consumption was relatively high, namely 7,541,220 KwH per year. In the following year, 2018, there was a decrease in consumption of 31.56% from the previous year. However, in 2019 there was a relatively high increase of 30.28& due to the addition of new buildings located in three places, Jember, Lumajang, Pasuruan campuses. However, consumption in 2019 was still lower than in 2017. Since the pandemic occurred, many building operations that typically consume daily electricity have not been fully operational. This condition causes electricity consumption in 2020 to decrease by 11.79% compared to 2019.

Carbon emissions resulting from electricity consumption are measured using metric tons/Kwh. In a row, the value of carbon emissions from electricity consumption from 2017 to 2019 is 10.89 tonsCO2, 7.45 tonsCO2, 9.71 tonsCO2. Meanwhile, since the pandemic occurred, there has been a decrease in the emissions produced to 8.56 tons CO2 per year.

Period	2017	2018	2019	2020	unit
Total Consumption	7,541,220	5,160,912	6,723,627	5,931,058	kwh
Carbon Emission	3,974.22	2,719.80	3,543.35	3,125.67	mton/kwh
Daily Emission	10.89	7.45	9.71	8.56	mton/kwh
Trend	Baseline	-31.56%	30.28%	-11.79%	

Table 4. Carbon Emission for Electricity Consumption

Consumption of electricity consumption at the University of Jember from year to year is getting more efficient. The efficiency of electricity use can be seen in table 5, where the value of the intensity ratio decreases from year to year. This value shows that each student's electricity consumption is more efficient and supports the creation of a green university through saving electricity consumption.

Period	2017	2018	2019	2020	unit
Total consumption	7,541,220	5,160,912	6,723,627	5,931,058	Kwh
Total Student	33756	34108	35482	36012	person
Intensity of Energy	223.40	151.31	189.49	164.70	Kwh/student
trend	baseline	-32.27%	25.23%	-13.09%	

Table 5. Intensity of Energy

Contrary to electricity consumption at the University of Jember, fuel consumption for vehicles owned by the University of Jember tends to increase from year to year. From 2017 until 2019, there was an increase of 9.74% in 2018 and 124.11% in 2019. A sharp increase occurred in 2019, as happened in electricity consumption, due to the addition of fixed assets, both 4-wheeled vehicles or two wheels. This increase cannot be reduced significantly because the infrastructure available for electric cars in Jember is still not available. However, in 2020 there was a significant decrease of 49.84% from 2019. The mobility restrictions from the government due to the pandemic caused a decrease in business travel activities using campus operational vehicles.

In line with fuel consumption, carbon emissions resulting from fuel use also increased before the COVID-19 pandemic. Daily carbon emission from average fuel consumption is 0.67 tonCo2. Meanwhile, in 2020 it fell to 0.55 tons of CO2 per day.

Period	2017	2018	2019	2020	unit
total fuel usage	81,685	89,644	200,904	100,771	liter
Carbon emission	162.07	177.86	398.61	199.94	ton/ltr
daily emission	0.44	0.49	1.09	0.55	ton/ltr
trend	baseline	9.74%	124.11%	-49.84%	

Table 6. Fuel Consumption in University of Jember period 2017 - 2020

The production of plastic waste at the University of Jember tends to decrease from year to year. Before the pandemic occurred in 2017, the total production of plastic waste was 6,756 bottles. In 2018 it decreased by 41.24% from the previous year. The policy issued by the University on limiting the use of plastic in the University of Jember was quite successful. However, in 2019 there was an increase of 5.04% from 2018 due to the new campus unit at the University of Jember. Plastic waste production is generally generated from daily

consumption and serving drinks at meetings. Since the pandemic occurred, there has been a significant decrease of 57.79% compared to 2019. The transition to virtual meetings has had a significant impact on the production of plastic waste at the University of Jember.

Carbon emissions from plastic waste have also decreased significantly since the pandemic. The decrease is linear with the use of bottles during daily consumption and serving of drinks at meetings. The value of carbon emissions can be seen in table 7.

Table 7. Total Plastic Waste in University of Jember period 2017 - 2020

period	2017	2018	2019	2020	unit
total usage	6,756	3,970	4,170	1,760	bottle
carbon emision	0.0080	0.0047	0.0050	0.0021	kgCo2
Trend	baseline	-41.24%	5.04%	-57.79%	

Changes in learning patterns, office activities, and research led to a decrease in the production of paper waste at the University of Jember. Paper use at the University of Jember is intended for correspondence, documentation and minutes, printing student exam questions, and teaching clerical activities. The use of paper at the University of Jember can be seen in table 8. Since the pandemic occurred, the teaching pattern has been changed from face-to-face, physical meetings to virtual ones. The impact of this change in pattern is that the use of less paper is increasing, virtual offices and virtual exams are increasing in use. This condition has resulted in minimal paper use, which is only around 124,670 sheets or a decrease of 98.02% from 2019. The reduction in carbon emissions from paper waste has also automatically occurred significantly since using virtual tools and applications.

Table 8. Total Paper Waste in University of Jember period 2017 - 2020

period	2017	2018	2019	2020	unit
total usage	5,289,990	5,834,464	6,298,356	124,670	sheets
carbon emision	0.0233	0.0257	0.0278	0.0005	tonCo2
Trend	basaeline	10.29%	7.95%	-98.02%	

Emission reduction does not occur in all elements in the operation of the University of Jember campus. Pandemic demands extra protection and prevention for staff and lecturers at the University of Jember through masks. The University finances masks for staff and lecturers at the University of Jember for a certain period. This condition causes an increase in waste due to masks at the University of Jember, which has never happened before. In 2020, the total use of masks was 10,230 boxes (including 2 and 3 ply) table 9. This amount causes carbon emissions of 8.61 tons of CO2. This value is sufficient to contribute to the decrease in the achievement of the green campus target at the University.

Table 9. Total Non-Medical Waste in University of Jember period 2017 - 2020

Description	value	unit measure
total usage	10,230	box
unit factor	841.5	grCo2
Carbon emission	8.61	tonCo2

Face-to-face restrictions and changes to online lectures have caused campus activities to be quiet. All students are not allowed to do activities on campus for a predetermined period.

Lecturers and staff not included in the exemption category are also not allowed to work on campus. This situation causes privately owned motor vehicles that usually pass and park on campus to become non-existent. This condition causes the average daily carbon emissions for vehicles at the University of Jember of 0.56 tonsCo2 or 204.4 tonsCo2 per year to decrease drastically to 1.53 tonsCo2 per year. Most of the vehicles in operation are campus-owned vehicles already included in fuel consumption for measuring carbon emissions.

Changes in activity at the University of Jember from physical to virtual activities have a significant impact on reducing carbon emissions. Before the pandemic, most of the activities and activities carried out face-to-face caused campus operations to produce carbon emissions that could increase the burden of environmental damage. Since the pandemic, activities that have gone virtual can produce fewer carbon emissions than offline. The value of carbon emissions before the pandemic, the average of the last three years before the pandemic, was higher than the value of emissions after the pandemic at the University of Jember table 10. A decrease of 13.65% can contribute to the acceleration of achieving a green university.

Element	Before	Pandemic
Electricity	3,412.46	3125.668
Fuel	246.18	199.94
Plastic waste	0.0000059	0.000002
Paper waste	0.0256	0.0005
non-medical waste	0	8.61
Vehicle	204.4	1.533
Total Emission	3,863.06	3,335.75
Impact	-13.65%	

Table 10. The Comparison Carbon Emission Before and During Covid-19

In the future, the pattern of activities and activities that allow it to be carried out online should be continued even though the pandemic has ended. The combination with offline meetings with more attention to carbon emission production will produce quality graduates without contributing to the existing environmental damage.

CONCLUSION

The core business of higher education is to produce quality graduates through a systematic and proper process. In carrying out these activities, universities must pay attention to the existing environmental aspects. Campuses must be able to identify which components or elements of activities can contribute to carbon emissions. The next step is to eliminate it through a more environmentally friendly process. Reducing carbon emissions in electricity consumption, fuel, waste products can be reduced through virtual activities or wiser use so that the University can be an excellent example in realizing a sustainable institution.

Research limitations and suggestion.

This study only evaluates based on the annual budget at Jember University by ignoring the money follow program factor which can later become one of the strengthening elements in formulating an environmental-based budgeting model. for further research, it can pay attention to the money follow program factor and performance agreements between institutions and their stakeholders.

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