Greenhouse Gas Emission Reduction Guidelines to Promote Green University of Rajabhat Universities in Southern Thailand

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Abstract

This research aims to develop a guideline to reduce greenhouse gas emissions from the organization's operations to promote the green university status of the 5 Rajabhat Universities, namely, Surat Thani Rajabhat University, Phuket Rajabhat University, Nakhon Si Thammarat Rajabhat University, Songkhla Rajabhat University, and Yala Rajabhat University. Data were collected from an in-depth interviews with open-ended questions. The sample selected by purposive sampling consisted of experts from 5 Southern Rajabhat Universities. Experts from Rajabhat University in Southern Thailand were recommended as qualified interviewees (Gatekeeper) in conjunction with snowball sampling to reach the desired study group who can provide information on the subject study in-depth. The results of development of greenhouse gas emission reduction guidelines to promote green university of Rajabhat Universities in Southern Thailand comprised 3 steps. Policy formulation process consists of 1) policy formulation and action plan, and 2) roles, duties, and participation of personnel and students. Policy implementation process consists of 1) establishing the structural system and facilities that infrastructure, information technology, carbon footprint for organization, and carbon offset, and 2) implementation of energy and environmental management, and 3) communicate and environmental management, transportation, water management, and waste management, and 3) communicate and create a network of cooperation both within and outside the organization. Policy evaluation process consists of 1) university assessment, and 2) external assessment.

Keywords: greenhouse gas emission, greenhouse gas emission reduction, green university, Rajabhat University

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1. Introduction

Greenhouse gases are a significant contributor to global warming and climate changes that pose many risks to human beings and all other forms of life on earth, such as higher temperatures, more severe storms, increased drought, loss of species, and more health risks [1]. Thailand is under the Nationally Determined Contribution (NDC) with GHG emissions reduction target of achieving net-zero GHG emissions by 2065 and carbon neutrality by 2050. This matter was included in the 20-year national strategy [2], which is the core strategy for national development, and was conveyed to practice at the provincial and local levels. The strategies includes developing GHG reduction capabilities and setting GHG reduction goals from all sectors, namely government, private sector, including education sector. Education can contributes to GHG emissions, at the same time it is a source of knowledge, cultivate awareness of natural resources and environmental conservation in students, which will be a significant force in transmitting the concept

of reducing GHG emissions to society in the future. Additionally, students can be a resource for knowledgeable personnel in designing various forms and innovations to reduce GHG emissions within the university and be a role model for other agencies. Rajabhat Universities in Southern Thailand, as educational institutions, has also responded to the country's net-zero emissions policy and assigned the issue in "developing the university to be a green university or actions to promote the university to be a green university" in the master plan of each university [3]. However, there is no concrete plan to find ways to reduce GHGs. In addition, considering Section 7 of the Rajabhat University Act B.E. 2547 that "the University is a higher education institution for local development" [4], and the strong network of Rajabhat Universities, it is necessary to set guideline to promote green university in Southern Rajabhat Universities to be a role model for the locality in developing organizations in energy and environmental management, creating a low-carbon society according to national plans and policies, and leading society and local communities.

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2. Materials and Methods

The tool used to collect data through an in-dept interviews was "open-ended questions" for the draft GHG reduction guideline designed by the researcher based on the data obtained from the carbon footprint assessment and study on guidelines for reducing GHG emissions from the past activities to promote green universities of Rajabhat Universities in Southern Thailand [3]. The resulting guidelines were verified by 12 experts, selected by purposive sampling in conjunction with Snowball Sampling. Experts from Rajabhat University in Southern Thailand were recommended as qualified interviewees (Gatekeeper) by selecting interviewees who can provide information on the subject study. They consisted of 12 people as follows: 1) executives in charge of the green university Promotion Project, 2) experts in environmental management and sustainable development, 3) experts in greenhouse gas management, 4) executives or people with experience in the development of higher education institutions to recommend recommendations, and 5) those who have the knowledge and assigned by the university to take any action in GHG emission reduction. In-depth interviews were conducted on individual subjects one by one to obtain complete and in-depth information and facilitate systematic data collection until all issues completely answered the research objectives.

The data obtained from the interviews were opinions and suggestions for the draft guideline to reduce GHG emissions. The researchers used the analytic induction technique by analyzing data obtained from transcripts from interviews and interpreting data with common characteristics to create common conclusions. After that the researchers made adjustments according to the opinions of experts, and took the "messages" obtained from the interviews as references to obtain a complete GHG reduction guideline that is suitable for the 5 Southern Rajabhat Universities and report the study results in the form of descriptive analysis [5].

3. Result and Discussion

Greenhouse gas emission reduction guidelines to promote green universities of Rajabhat University in Southern Thailand consisted of 3 steps: policy formulation, implementation, and evaluation as follows:

3.1 Policy Formulation

3.1.1 Policy Formulation and Action Plan

The GHG reduction policy to promote green university is divided into 4 aspects. 1) Curriculum and educational management were divided into 2 levels: subject level and curriculum level. 2) Research consisted of 4 issues that must be continuously implemented: internal research funding, research issues, academic services, individual indicators for conducting research, and provision of external research funding related to GHG reduction, energy and environmental conservation, and other management that promotes green university. 3) For energy, a long-term energy management plan in the university must be formulated specifically taking into account the energy potential in the university based on the principle and giving importance to the following issues: use of highly efficient and energy-saving tools and equipment, repair and maintenance of equipment and electrical appliances, alternative energy supply, planning and controlling energy usage for maximum efficiency and benefit, and recycle. 4) According to environment, a specific longterm campus environmental management plan must be developed by giving importance to 3 main areas, namely, transportation, water management, and waste management. The policy formulation for environmental management in all 3 areas is based on the principles and gives importance to the following issues. First, traffic management consists of fleet management and travel routes management. Second, water management consists of tools and equipment management, and water administration and management. Third, waste management consists of a waste database, reducing the amount of waste with the 3Rs, and separation of waste. The policy in each area must 1) designate the host or the core person responsible for the operation who will have a management role to be the central point in planning, driving, and coordinating work with stakeholders; 2) set goals and desired results that are measurable and concrete; 3) determine methods for enforcing policies, such as requesting and applying technology to change behavior and enforcement by regulations or laws; 4) set guidelines for operations; and 5) set guidelines for supervising various activities within the university to be clear and cover all activities within the university.

In formulation of policies and action plans, existing policies should be synthesized to develop new ones or improve existing ones by adhering to the following principles and actions. They are 1) specifying details that show the connection between that activity and environmental management to reduce GHG emissions and the linkage of the policy to the goals of the national development plan provincial development plan and the development plan of Rajabhat Universities; 2) pushing for the policy to reduce GHG emissions at a strategic level to receive budget support for the implementation of projects and activities; 3) establishing personnel and departments to implement the GHG reduction policy and action plan for general adherence including to be used as a basis for approval of projects or activities within the university by the priority of the principle that "support projects that are more compliant with university policies and are more sustainable". The review and improvement period should not exceed 10 years due to the rapid and ever-changing climate, the effects may vary, planning to deal with

such impacts, therefore, needs to be reviewed regularly and promptly; 4) encouraging participation and support from relevant individuals and organizations from the beginning of the formulation of the policy and action plan to reduce GHG emissions mirror as well as analysis of stakeholders, find funding sources, and cooperate with external organizations to get support in terms of budget, tools, equipment and people with expertise. It also publicizes the university's operations to create awareness among external agencies; and 5) assessing the carbon footprint of the organization and analyze the university's GHG data and forecast the future from the base case to assess the status of GHG emissions present and future trends to serve as a database for policy formulation and action plans to reduce GHG emissions to promote a green university in the future.

3.1.2 Specification of Roles and Responsibilities and Participation of Personnel and Students

It was divided into 2 parts: 1) establishing a specific agency with primary responsibility for driving such policies; and 2) determining the roles, duties, and participation of personnel and students. Since the development of the university is everyone's business, this is to create cooperation in implementing the university's GHG reduction measures together in an integrated manner according to roles, duties, expertise, and the ability of each population group.

3.2 Policy Implementation

3.2.1 Organization of Structures and Facilities Infrastructure, consisting of:

1) Physical structure (infrastructure) includes buildings, roads, electrical and water systems, and wastewater treatment system. Infrastructure should operate in a multi-function manner to increase the efficiency of resource utilization. It should be built, improved, or maintained to ensure a perfect, ready-to-use and complete manner, as well as increasing green areas by planting trees. 2) The master plan for building and construction management, including general control measures, should be used as a guideline for the development, utilization, conservation, and long-term maintenance of buildings and facilities in the university area in line with the conditions of being a green university. 3) For responsible agency, a core unit and person responsible should be established for driving policies and implementing activities that will help the university achieve its goal of reducing GHG emissions, and delegate authority and decision-making in management to ensure unity and flexibility in administration. 4) For legislation, rules, regulations, or announcements related to GHG reduction, energy, and environmental management should be made to specify details related to the duties of the agency or operator's scope of work and penalties to support management following the university's policy.

Information Technology

A central database system that contains complete information to support the university's GHG reduction operations should be established for effective access, operation tracking, and control. An information system should be developed using innovation and technology to manage the existing infrastructure and services in various areas of the university in a way that is easily accessible, fast and comprehensive. The system should cover all kinds of activities and services within the university that reduce the use of paper, reduce travel, reduce pollution and environmental impact. Moreover, new digital platforms should be created to support specific actions related to reducing GHG emissions, including the development of various management systems that can support carbon offsets. Because access to detailed and high-quality data is key to the integrity of carbon footprint assessment results.

Carbon Footprint of the Organization

The organization's carbon footprint should be assessed to know the amount of GHG emissions from all activities within the university and the data should be publicized to individuals or external organizations about the university's intention to contribute to GHG emission reduction and responds to the policy of the country. The assessment should adhere to 3 principles: 1) assess annually, 2) assess every activity of the university, and 3) assess accurate and quality data in order to be used as information for finding Guidelines for effective and precise management of GHG reduction in universities.

Carbon Offsetting

Participation and approaches can be divided into 2 levels: individual and department level. Universities can 1) determine individual indicators by having students and staff record their daily activities to calculate the amount of individual GHG emissions: and 2) carry out activities that contribute to offsetting all the carbon emitted by the university, e.g., the beautiful garden project to increase green space, mangrove planting, and restoration of watershed forests and wetlands to increase the absorption and storage potential of GHG within the university area. The purchase of carbon credits that have been registered by the GHG Management Organization (Public Organization) is another measure that universities can driving Thailand's carbon market and supporting the reduction of GHG emissions in the country.

3.2.2 Implementation of Energy and Environmental Management Standards

The results of the organizational carbon footprint assessment of the Southern Rajabhat Universities found that activities type 2 electricity consumption have high levels of GHG emissions, compared to other activities. This led to the determination of management 2 measures: energy management and environmental management, as follows: Universities must consider the cost of operating versus the potential benefits, taking into account the energy potential on of university. This includes measures for energy management, meanwhile maintaining efficiency in teaching and learning and conducting various activities within the university, and emphasizing on the use of technology to help save energy. The guidelines for energy management should be established using principles of energy conservation. There are 5 methods, namely, use of highly efficient and energy-saving tools and equipment, repair and maintenance of equipment and electrical appliances, alternative energy supply, reusing, and planning and controlling energy usage with maximum efficiency and benefit.

Environmental Management

It was divided into 3 aspects. 1) Transportation management determine how to manage the traffic environment according to the characteristics of the area, buildings, way of life, and vehicle use into vehicle management and management of travel routes. 2) For water management, Southern Rajabhat Universities has used both tap water and use water from natural sources. Some places are not equipped with meters for measuring water consumption. Some places do not have a wastewater treatment system on campus. Water management is considered based on the information obtained from the study along with legal requirements, as well as conservation concepts that focus on the costeffective use of resources and the principle of maximizing water use and reducing wastewater as much as possible. Therefore, the method of water management is determined as management of tools and equipment and water administration and management. 3) Waste management gives importance to waste reduction with good integrated waste management. It starts at the source and try to manage the least amount of waste by applying the 3Rs (reduce, reuse, recycle) principle. Along the way, it is important to sorting waste according to the correct type. Moreover, the place where the waste has been disposed should be suitable for the type of waste and maximize benefits. The waste management guidelines were divided into waste database creation, waste reduction through 3Rs, and waste segregation.

3.2.3 Communication and Networking for Cooperation both Inside and Outside the Organization

Communication goals should be set to raise awareness to people broadly and deeply because it has the most sustainable influence in controlling GHG reduction behavior. Coupled with collaboration with individuals and agencies both inside and outside the university including raising awareness about the policies and activities, the universities should be implemented through the strategies of 1) communication and 2) networking cooperation with the quality of the media and communication for delivering messages. Focusing on communication issues is divided into 2 parts: 1) communicating to educate and raise awareness of the importance of GHG reduction and environmental conservation, and 2) communicating about the policies and activities that have been implemented to become a green university.

3.3 Policy Evaluation

3.3.1 University Assessment

It is a follow-up and evaluation by the university in order to acknowledge the information and apply it for the benefit of reviewing, improving and developing the university. It consists of 1) assessment methods should base on real-time evaluation from efficient systems and information, reducing time and paper with emphasis on the participation of all people both inside and outside the university at any time. The form of evaluation focuses on transforming existing data into information for decision making of executives or decisionmakers to review, improve and further develop such information for public relations and corporate communication. 2) Assessment criteria should adhere to the principle of reducing the use of resources but not the quality of life. In other words, it should improve the quality of life without reducing or compromising the quality of work or services. The standard of the work must be as good as before or even better. 3) Evaluation form consists of an assessment of the process, results obtained from the operation, and the impact of operations.

3.3.2 External Assessment

Many agencies have developed measures, projects, and mechanisms to reduce greenhouse gases in the country. For example, the Department of Environmental Quality Promotion (DEQP), which implemented through the Green Office measure, Thailand Greenhouse Gas Management Organization (Public Organization), developed a method to reduce GHG based on the principles of the Clean Development Mechanism through Thailand Voluntary Emission Reduction (T-VER) and the development of a system for reducing GHG emissions, Measure Reporting and Verification (MRV). For abroad, agencies that have standardized and international ranking internationally recognized, and have conditions or indicators to take any action to reduce GHGs include UI Green Metric World University and Times Higher Education Impact (SDGs). Universities can work with external agencies that specialize in reducing GHG emissions or energy and environmental management to obtain an assessment. In addition, haring knowledge to increase efficiency in GHG emissions reduction from experts can also guarantee performance through standard certificates that demonstrates the university's potential and contribution to driving Thailand towards its goal of becoming carbon neutral by 2050 and achieving net zero GHG emissions by 2065.

Setting the policy-making process as an important starting point for success in reducing GHG emissions corresponds to the research results of K. H. Hussein, et al. (2022) [6], which shows that the University of Babylon participated in UI rankings in 2017 to 2020 and the result is a continuous improvement. This success is due to the University's strategic plans, policies, and operating procedures related to the provision of a clean and green environment in line with the United Nations Sustainable Development Goals and environmental friendliness. However, the country has had economic and domestic security problems, including the spread of Covid-2019. In addition, the research results of Abdul-Azeez, I. A., and Ho, C. S. (2015) [7], which studied Realizing Low Carbon Emission in the University Campus towards energy sustainability, suggested that sustainable environmental and energy planning should be a continuous process in the form of a policy, passed goal acceptance, research analysis, planning, and determining policy outcomes. It is instrumental in directing the achievement of a lowcarbon and sustainable university. Moreover, the roles and responsibilities and participation of personnel and students should be determined, consistent with the findings of L. G. Perdamaian, et al. (2021) [8], who studied implementation and impacts of education for sustainable development. As a result, the Education for Sustainable Development (ESD) program to raise awareness of sustainable development and encourage everyone participating in the program to respond and participate in activities has been held annually since 2016. Tthere has been an immediate and noticeable change in cognition and behavior toward a sustainable lifestyle. Sustainable development is a long-term vision and requires participation from everyone. Similarly, Tohmoh, S., et al. (2020) [9] studied the perception and participation of personnel and students of Yala Rajabhat University towards environmental management to become green university. Implementing an environmental management policy toward the development of a green university is essential to create understanding, awareness, and cooperation from personnel in the organization.

For policy implementation process, action steps in terms of structures and facilities, including physical structure (infrastructure) and information technology systems, the implementation of the specified measures is possible smoothly as well as preparing supporting information for assessment, analysis, finding trends and guidelines for reducing GHG emissions, namely, carbon footprint assessment and carbon offset. This is consistent with the research results of S. M. Abtahi (2021) [10], Towards a Green Campus Energy, Climate and Sustainable Development Initiatives at Isfahan University of Technology (IUT). It was found that the university has followed the basic steps in the implementation green management in infrastructures such as providing green buildings, building an energy efficiency management system, designing and constructing wastewater treatment and improvement of irrigation systems, using vehicle management software to organize fuel consumption, etc. The implementation of such measures resulted in reduced consumption of water, energy, and pollution from switching to clean energy as well as cost savings and the university's budget. Similarly, the research results of D. Chalil, and R. Barus (2021) [11], studied opportunities from the COVID-19 pandemic: being greener through online and e-learning methods. It was found that the university recognizes the importance of reducing the amount of paper through the use of online and e-learning methods. As a result, efforts are now being made to improve internet facilities and elearning accessibility. The process that requires an assessment of the carbon footprint of the organization is consistent with several studies. It shows the number of GHGs emitted from the organization's operations, which is an important tool in determining management guidelines to effectively reduce GHG emissions both at the agency, organization, and national level. As a result, Mangkang, R. (2015) [12] studied the carbon footprint and carbon offset of Kasetsart University to manage GHGs and promote green university and found that it support plans and policies formulation for energy and environmental management as well as management for the goal of GHG emission reduction at Kasetsart University. As a result of the carbon footprint assessment, managing both energy and environmental management, e.g., water, waste, and transportation important role in reducing GHG emissions, is consistent with Janangkakan, B., et al. (2012) [13], who studied the carbon footprint of educational organizations. A case study from the Department of Environmental Engineering, Chulalongkorn University, shows that a good and sustainable measure to reduce GHG emissions is the use of energy conservation principles in buildings, not only being able to reduce electricity costs but also reducing GHG emissions effectively. Furthermore, M. A. Budihardjo, et al. (2022) [14] studied the improvement of water conservation at Diponegoro University, Indonesia. The study found that the university has a water management approach based on water conservation principles by reusing treated water. Wastewater Treatment Plans (WWTPs) are in place and water efficiency is prioritized. The research results of Pandiyarajan, V., et al. (2022) [15], who studied the concept of 3Rs in waste management for a sustainable environment, found that the use of the 3Rs concept in waste management is the most appropriate solution for managing environmental problems within the university. In terms of communication and networking for cooperation both inside and outside the organization, the goal in communicating to raise awareness to people in a wide and deep sense has

the most sustainable influence in controlling greenhouse gas reduction behavior. It includes collaboration with individuals and agencies both inside and outside the university as well as raising awareness about the policies and activities that the university is working on with the quality of the media as an intermediary in delivering that message. This is consistent with the findings of C. B. Milanes, et al. (2022) [16], who studied innovations in education and research management at the Universidad de la Costa, Colombia in the epidemic era. The study noted that Universidad De La Costa increased international cooperation during the coronavirus pandemic in research, academic publications, and academic and scientific cooperation networks, including participation in the UI Green Metrics project. At the same time, it shows the strength of networks and good inter-agency collaboration within the university which facilitate data collection, present results, and disseminate knowledge related to the university's sustainable development.

Finally, the evaluation is the process of reviewing and analyzing the results of the implementation of the GHG reduction policy from the beginning, which is the policy formulation and the resulting end point from performing the procedure. Assessment forms were used to evaluate the whole process, the results obtained from the operation, and the impact of operations. The evaluation results corresponds to the research results of Sitthipitak, M., et al. (2021) [17], studying the success factors of a sustainable green university. It was found that one of the success factors of the operation to become a sustainable green university is to determine indicators, goals, monitoring, and evaluation of projects and activities using quality processes (PDCA) for continuous improvement.

4. Conclusions

Based on the study, the Greenhouse Gas Emission Reduction Guidelines to Promote Green Universities of Southern Rajabhat Universities were defined according to a systematic work process based on management principles throughout the organization. It consisted of 3 steps: policy formulation, implementation, and evaluation. Setting a policy at the first step in the implementation likes a compass for the operation. All activities of all departments must be consistent with university's policy along with personnel participation and acceptance in terms of policy formulation, goals, plans, outcomes, and joint actions according to their duties. The next step is the implementation process, an active process that focuses on setting up necessary infrastructures and enabling individuals to comply with standards to reduce GHG emissions. The last step is the evaluation process by the university and external agencies with specific expertise to improve, develop, and be accepted by the evaluation results from standardized external agencies. This systematic approach to reducing GHG emissions will cause management throughout the organization covering all positions, individuals, and agencies, making operations to reduce GHG sustainable towards becoming a green university.

References

- United Nations Thailand, Causes and Effects of Climate Change, https://www.un.org/en/climatechange/science/causeseffects-climate-change, 12 March 2022 (accessed 7 March 2023).
- [2] United Nations Development Programme, Climate Promise, Thailand, https://climatepromise.undp.org/what-we-do/wherewe-work/thailand, November 2022 (accessed 7 March 2023).
- [3] Nihafeezar Hayiwangoh, et al., Carbon Footprint Assessment and Actions to Promote Green Universities of Rajabhat Universities in Southern Thailand, Interdisciplinary Research Review (IRR), 18(4) (2023), pp 1-6, https://ph02.tcithaijo.org/index.php/jtir/article/view/248346. (accessed 1 August 2023).
- [4] Rajabhat University Act B.E. 2547, section 7, 10 June 2004.
- [5] Supang Chantavanich, Data analysis in qualitative research, Chulalongkorn University Press, Bangkok, 2011.
- [6] K. H. Hussein, A. F. Hassoon, A. Abdulhassan, B. M. Al-Muttairi, and W. A. Tameemi, University of Babylon Performance in Setting and Infrastructure Indicator through UI Green Metric 2017-2020, Journal of Sustainability Perspectives, 2(Special Issue 2 August 2022), pp 187-193, DOI: https://doi.org/10.14710/jsp.2022.15510, (accessed 8 December 2022).
- [7] Abdul-Azeez, I. A., and Ho, C. S., Realizing Low Carbon Emission in the University Campus towards Energy Sustainability, Journal of Energy Efficiency, 4(2) (June 2015), pp 15-27, DOI: http://dx.doi.org/10.4236/ojee.2015.42002, (accessed 8 December 2022).
- [8] L. G. Perdamaian, S. S. Utami, B. Prayitno, and P. J. Guntoro, Implementation and Impacts of Education for Sustainable Development: Experience of Universitas Gadjah Mada, Journal of Sustainability Perspectives, 1(August 2021), pp 406-415, DOI: https://doi.org/10.14710/jsp.2021.12033. (accessed 12 December 2022).
- [9] Tohmoh, S., Ayakaji, P., Manae, N., Bahagiri, M., Pluemjai, D., Naphommanee Y., Vikabampeng T., Perception and Participation of Personnel and Students of Yala Rajabhat University towards Environmental Management to become to Green University, https://wb.yru.ac.th/handle/yru/5530, 2020 (accessed 10 December 2022).
- [10] S. M. Abtahi, Isfahan University of Technology (IUT): Towards a Green Campus Energy, Climate and Sustainable Development Initiatives at IUT, Journal of Sustainability Perspectives, 1(August 2021), pp 424-430, DOI: https://doi.org/ 10.14710/jsp.2021.12035. (accessed 7 December 2022).
- [11] D. Chalil, and R. Barus, Opportunities from the COVID-19 Pandemic: Being Greener through Online and E-Learning Methods, Journal of Sustainability Perspectives, 1(August 2021), pp 416-423, DOI: https://doi.org/10.14710/jsp.2021.12034. (accessed 8 December 2022).
- [12] Mangkang, R., Carbon Footprint and Carbon Offset of Kasetsart University for Greenhouse Gas Management and Promotion of Green University, Faculty of Environment Department of Technology and Environmental Management, Kasetsart University, https://tnrr.nriis.go.th//services/researchreport/detail/293512, 2013 (accessed 30 June 2022).
- [13] Janangkakan, B., Chavalparit, O., and Kanchanapiya, P., Carbon Footprint of an Academic Organization: A Case Study of the Department of Environmental of Environmental Engineering, Chulalongkorn University, Journal of Environmental Research, 34(1), pp 23-35.
- [14] M. A. Budihardjo, I. S. Arumdani, A. S. Puspita, and A. Ambariyanto, Improving Water Conservation at

Universitas Diponegoro, Indonesia, Journal of Sustainability Perspectives, 2(August 2022), pp 277-284, DOI: https://doi.org/10.14710/jsp.2022.15523. (accessed 11 November 2022).

- [15] Pandiyarajan, V., Neelakantan, T., Sridharan, S. A., and Ramrao, N., Three "R" Concept in Waste Management for Sustainable Environment, Journal of Sustainability Perspectives, 2(August 2022), pp 255-262, DOI: https://doi.org/10.14710/jsp.2022.15520 (accessed 9 November 2022).
- [16] C. B. Milanes, C. P. Salgado, and J. F. Camargo, Innovation for Education and Research Management at Universidad de la Costa in the pandemic era, Journal of Sustainability Perspectives, 2(August 2022), pp 409-416, DOI: https://doi.org/10.14710/ jsp.2022.15542 (accessed 9 December 2022).
- [17] Sitthipitaks, M., Tachaphahapong, S., S., and Polsaram, p., Key Success Factors of Sustainable Green University, Journal of Education Studies, 49(2) (April-June 2021) Article 6, DOI: 10.14456/educu.2021.27. (accessed 29 November 2022).