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International Collaboration of Students in Supporting the Implementation of Low Carbon Cities

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Abstract. The international collaboration between Universiti Teknologi MARA (UiTM), Malaysia, and the University of Riau Islands (UNRIKA) Batam, held in Pasir Gudang, Malaysia, in 2025, is a strategic step in strengthening academic cooperation to support sustainable development. This activity is designed to increase student and community awareness and understanding of the concepts of sustainable development and low-carbon cities. The main focus is directed at transforming Batam City into a pilot city in the sustainable energy transition, in response to the major challenges of rapid industrial growth, increasing energy consumption, and high carbon emissions. Through the participation of students across countries, this collaboration plays a vital role in strengthening local capacity, accelerating the adoption of low-carbon strategies, and encouraging the exchange of knowledge and innovation. In addition to providing theoretical benefits, this activity also directly engages students in the field to understand the contextual application of environmental policies. Thus, this cross-country collaboration not only strengthens academic and social relations between institutions but also contributes significantly to accelerating the energy transition, reducing carbon emissions, and developing sustainable cities in rapidly growing urban areas such as Batam.
Keyword: International Collaboration, Sustainable Development, Low Carbon Cities

Abstrak. Kolaborasi internasional antara Universiti Teknologi MARA (UiTM), Malaysia, dan Universitas Kepulauan Riau (UNRIKA) Batam, yang diadakan di Pasir Gudang, Malaysia, pada tahun 2025, merupakan langkah strategis dalam memperkuat kerja sama akademik untuk mendukung pembangunan berkelanjutan. Kegiatan ini dirancang untuk meningkatkan kesadaran dan pemahaman mahasiswa dan masyarakat tentang konsep pembangunan berkelanjutan dan kota rendah karbon. Fokus utamanya adalah mengubah Kota Batam menjadi kota percontohan dalam transisi energi berkelanjutan, sebagai respons terhadap tantangan utama pertumbuhan industri yang pesat, peningkatan konsumsi energi, dan emisi karbon yang tinggi. Melalui partisipasi mahasiswa lintas negara, kolaborasi ini memainkan peran penting dalam memperkuat kapasitas lokal, mempercepat adopsi strategi rendah karbon, dan mendorong pertukaran pengetahuan dan inovasi. Selain memberikan manfaat teoritis, kegiatan ini juga secara langsung melibatkan mahasiswa di lapangan untuk memahami penerapan kebijakan lingkungan dalam konteksnya. Dengan demikian, kolaborasi lintas negara ini tidak hanya memperkuat hubungan akademik dan sosial antar lembaga, tetapi juga memberikan kontribusi signifikan untuk mempercepat transisi energi, mengurangi emisi karbon, dan mengembangkan kota-kota berkelanjutan di daerah perkotaan yang berkembang pesat seperti Batam.
Kata kunci: Kolaborasi Internasional, Pembangunan Berkelanjutan, Kota Rendah Karbon

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Introduction

Low carbon cities are an opportunity to reduce carbon emissions while offering tremendous economic opportunities. Anew report from the Coalition for Urban Transition shows that by using existing low-carbon technologies and practices, we can cut 90% of emissions globally. This would require an investment of USD 1.8 trillion (approximately 2%

of global GDP) a year but will generate annual returns worth USD 2.8 trillion in 2030 from the energy and material cost savings alone.

The rapid growth of cities causes an increase in energy consumption, air pollution, as well as carbon dioxide emissions. The 2021-2025 Strategic Plan of Majlis Bandaraya Pasir Gudang (MBPG), is designed to maximize the design of Bandar Raya Pasir Gudang over a period of 5 years. This design will be implemented for a short and simple period to achieve the MBPG Vision, namely Pasir Gudang Bandar Raya Sejahtera, Smart and Low Carbon By 2025, which is the support and aspiration for the entire initiative that will be developed.

This Strategic Plan also takes into account the basics of public and government services determined by interested parties as well as improving the quality of the service delivery system to customers according to their needs. A total of seven (7) MBPG Strategic Cores have been developed and implemented with sixty-three (63) strategic initiatives that will be implemented within five (5) years. Providing the MBPG 2021-2025 Strategic Plan document certainly requires consistent monitoring actions, so that MBPG residents can embody the desires and strategic goals of MBPG, especially from the perspective of achieving implementation and assessing the expected impact. Refining this document in the form of a continuous action plan will continue to make this document the main reference principle for designing Key Performance Indicators (KPI) for Positions, Divisions and Units at MBPG.

Carbon emissions in Malaysia mainly relate to urban settings, where the energy sector (including electricity and transportation) makes up 80% of total emissions. This means that there is enormous potential to reduce emissions from the energy sector to obtain both carbon and cost savings. Ajoint studyby UNDP and the Economic Planning Unit (now known as the Ministry of Economic Affairs) estimated that just by improving energy efficiency in the buildings and transport sectors, RM46.9 billion (USD 11.2 billion) in energy spending could be saved between 2016 and 2030. Low carbon city measures such as clean energy, energy efficiency, sustainable transport and integrated waste management can help cities to leapfrog to a sustainable and green development pathway. Investments in low carbon cities also create opportunities for decent work in these new emerging sectors.

Energy is a crucial component of economic and social development. However, the large amount of energy consumed poses serious threats to climate change, environmental pollution, and health impacts. Significantly reducing the carbon footprint has become a major focus of environmental policies worldwide (Bajzelj et al., 2014; Ward et al., 2016). A country's carbon footprint (CF) is one of the best ways to measure carbon emissions from various economic sectors, including daily household activities (Mulrow et al., 2019). As a collective measure, the per capita carbon footprint varies according to the economic development of each country (Muñiz and Dominguez, 2020).

High-income countries such as the United States, Canada, and Australia produce the highest carbon emissions in the world, at around 15–29 tons per capita per year (Zheng, 2009; World Bank, 2014). This group of countries is followed by a second group of countries with moderate emissions, namely Japan, South Korea, and many European Union member states with average emissions of around 10–12 tons per capita per year (Saboori et al., 2017). The third group consists of most of the world's developing countries, with average emissions of less than 4 tons. Malaysia's carbon emissions per capita have increased to around 8 tons per capita

per year (World Bank, 2014; Maji et al., 2017). This country is categorized as above upper-middle-income countries with a figure of 6.6 tons per capita per year.

Methodology

The preparation of activities in this collaboration is carried out with a planned and systematic approach. There are several main stages that need to be passed so that implementation can be carried out effectively and efficiently but still in line with the principles of collaboration that provide benefits for all parties. The first is planning, which requires intensive and ongoing coordination between the relevant parties, namely MARA Technology University, Riau Islands University, and the Pasir Gudang City Government. This process allows the three institutions to outline a detailed agenda and agree on the division of roles and responsibilities, ensuring everyone understands what they need to contribute and who has what strategic role to play in the event.

Coordination involves more than just regular communication, but also a series of scheduled meetings and discussions to align the vision, goals, and outcomes of the joint activity. Furthermore, developing a planning document that encompasses implementation mechanisms, resource management, and an evaluation system for activity results is essential to ensure the implementation process meets agreed-upon standards and provides transparency and accountability for each step. The next stage is implementation or action, where each party carries out their agreed-upon roles according to their capacity and expertise. Universiti Teknologi MARA provided an official opening remarks, reflecting institutional support, and presented a delegation of lecturers who provided relevant academic perspectives and intellectual support throughout the event.

Meanwhile, the University of Riau Islands is responsible for delivering remarks, presenting supervisors as the main companions for students, and organizing active student involvement in various activity sessions, enriching cross-institutional interactions through real student contributions. The Pasir Gudang City Government's primary role is to provide strategic material related to the policies and implementation of the Low Carbon City program. This is the core of the collaboration, as it connects complementary academic and public policy aspects to produce a program that is applicable and has a real impact on the community. The participation of students of the University of Riau Islands in certain groups is also a real manifestation of active participation, which is not only limited to the delivery of academic material but also through the presentation of arts and culture as a form of appreciation and cultural interaction that strengthens the value of partnership in this activity.

Results and Discussion

This community service event began with remarks from the Chancellor of Universiti Teknologi MARA (UiTM) and the Chancellor of the University of Riau Islands (UNRIKA), who emphasized the importance of international solidarity and collaboration as the main foundation in realizing sustainable development. This speech reinforced participants' awareness of the importance of the Low Carbon Port concept and strengthened the relationship between educational institutions and the Pasir Gudang regional government. This aligns with research by Krisnawati et al. (2023), which states that cross-institutional collaboration is key to success in supporting the complex and multidimensional sustainable development agenda.

Art and cultural performances by students as part of cultural appreciation provide an inclusive atmosphere and strengthen local identity within the context of international cooperation. The art and cultural displays serve not only as entertainment but also as a medium for developing cultural soft power, strengthening social networks between the academic community and the community (Sari & Dewi, 2024). The souvenir handover ceremony then serves as a symbol of strengthening ties between the university and the local government. The core of the event was a presentation by the Pasir Gudang City Council on strategies and policies for implementing a Low Carbon City. This presentation provided students with firsthand insights into efforts to reduce greenhouse gas (GHG) emissions at the local level. According to the Pasir Gudang City Council (2023), this low-carbon city program emphasizes the use of renewable energy, efficient waste management, and the development of green spaces centered on the principles of sustainable development.

Support for this event was strong from various parties, including university leaders, academics, and local governments, demonstrating solid synergy in program implementation. However, challenges in cross-border coordination, particularly related to scheduling adjustments, were overcome through the use of online communication technology. This underscores the importance of technological adaptation in facilitating international cooperation, as explained in Smith and Lee's (2022) study on the effectiveness of virtual collaboration for multinational projects. Overall, this activity demonstrates that student participation extends beyond passive participation to agents of change, capable of linking theory to practical application and bringing positive social and ecological impacts to local communities. A similar approach is found in Oswar Mungkasa's (2022) study, which emphasizes students' strategic role in strengthening low-carbon city policies through hands-on experience and developing an information technology-based circular economy.

In conclusion, the implementation of the Low Carbon Port program in Pasir Gudang Airport demonstrates a strong commitment from the local government and related institutions to promote the sustainable development aspect of carbon emission reduction. Majlis Bandaraya Pasir Gudang's 2021-2025 Strategic Plan provides a vision for the council to achieve Pasir Gudang as a prosperous, smart, and low-carbon airport by 2025. In more detail, the plan brings together several things, including managing energy sources, reducing the release of greenhouse gases, and managing solid waste, as well as building green infrastructure and integrated transportation, among many others.

Appropriate steps taken include the implementation of the Low Carbon City Framework (LCCF), which focuses on green buildings, renewable energy, and low-carbon lifestyles, which, along with good governance and sustainable design principles, will ensure that development will not impose a burden on the environment. The challenge of promoting urban agriculture in residential areas, while involving local communities, exemplifies how local social and economic integration cannot be ignored as part of a broader low-carbon strategy, while simultaneously strengthening local food security. An assessment of the implementation status of various low-carbon city programs in Pasir Gudang shows positive progress, with most programs in the implementation or completion stages. This indicates effective project management and a commitment to realizing low-carbon goals at the local level.

In line with these findings, a study by Zhang et al. (2021) emphasized the importance of a holistic approach to low-carbon city development, combining spatial planning, green

technology, and community participation for optimal results. Furthermore, research by Seto et al. (2016) highlighted policy support and cross-sectoral collaboration as key factors in the successful implementation of low-carbon city strategies. Thus, Pasir Gudang's journey towards becoming a low-carbon city hinges not only on technical and policy aspects, but also on socio-economic integration and active community engagement. This underscores the need for a multi-sectoral and sustainable approach to offering climate change solutions at the city level.

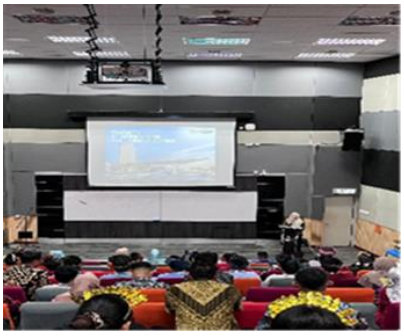


Figure 1. Activities

Conclusion

International student collaboration is a crucial instrument in supporting the implementation of low-carbon cities. Through joint research, knowledge exchange, and cross-border projects, students can make a tangible contribution to sustainable development. To strengthen this role, support from governments, universities, and international institutions is needed in providing funding, conducive regulations, and technological facilities. In this way, students can act as global agents in accelerating the transformation of cities towards low-carbon development. The implementation of the Low Carbon Port program in Pasir Gudang Airport demonstrates a strong commitment from the local government and relevant institutions to integrating sustainable development principles with greenhouse gas (GHG) emission reduction. Through a comprehensive and well-planned strategy, the program emphasizes energy efficiency, green space development, proper waste management, and the promotion of low-carbon lifestyles within the community. The active involvement of various parties, including universities and students, strengthens the program's implementation with a practical educational approach and cross-disciplinary collaboration. Despite challenges such as complex cross-border coordination, innovative solutions based on communication technology enabled smooth implementation. The experience in Pasir Gudang underscores the importance of integrating local policies with global climate change issues, as well as active community participation in implementing low-carbon strategies effectively. This success serves as an example for other cities adopting a holistic approach to sustainable development.

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