THE INDONESIA-AUSTRALIA COLLABORATION TO TACKLE PLASTIC WASTE THROUGH THE INDO-PACIFIC PLASTIC INNOVATION NETWORK (IPPIN) PROGRAM

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ABSTRACT

The management of plastic waste is a major challenge for the Indo-Pacific region, as 75% of plastic produced worldwide ends up in waste. Plastic waste is now regarded as a global crisis, and there are an estimated five to ten billion plastic pieces on the Indo-Pacific region's coastline. The plastic waste crisis has negative effects on human health, marine ecosystems, and local economies. To combat this, the Indo-Pacific Plastic Innovation Network (IPPIN) encourages cooperation among stakeholders, including governments, researchers, industries, and organizations. This paper provides an overview of the origin, aims, and initial impact of IPPIN. Highlighting the IPPIN's role in promoting innovative solutions for plastic waste reduction and management. There are two innovations on offer: a technology to convert abandoned fishing nets into high-quality, low-carbon materials, and a system to revolutionize plastic waste management in Indonesia. Stakeholders help in crossing obstacles given the pivotal role they play. While IPPIN has achieved significant progress, its success is dependent on funding, local capacity building, and ongoing engagement among stakeholders. This study is qualitative in design with data from study literature. Finally, this study emphasizes the importance of addressing these concerns through a coordinated and inclusive strategy. By combining the strengths of various stakeholders, the region can create scalable solutions that not only reduce plastic pollution but encourage sustainable development goals 17 of the Partnership Goals and 12 of Responsible Consumption and Production.

Keywords: *Indonesia, Australia, Plastic waste, Sustainable Development*

INTRODUCTION

One of the most complex problems is plastic waste. This can cause damage to the environment and marine ecosystems, endanger human safety, and have an economic impact. The Indo-Pacific oceans are abundant in natural resources, including fish species, coral reefs, and ocean minerals. However, the Indo-Pacific oceans are currently facing challenges related to the problem of plastic marine debris that pollutes the oceans and can threaten marine ecosystems. This is due to the increase in plastic production and high consumption of single-use plastics, causing these plastic wastes to be carried by large rivers from Southeast Asian countries and end up piling up in the Indian and Pacific Oceans (Puspita & Kresnawati, 2023).

The management of plastic waste is a major challenge for the Indo-Pacific region, as 75% of plastic produced worldwide ends up in waste. Based on the study "Changing Sails: Accelerating Regional Action for Sustainable Oceans in Asia and the Pacific" in 2020, the discharge of plastic waste into the ocean mostly comes from countries around the Indo-Pacific region (Puspita & Kresnawati, 2023). More than 400 million tons of plastics will be produced annually as products that support human life. Of this amount, as much as 14 million tons of plastic will end up in ocean waters every year due to careless disposal. Then six countries around the Indo-Pacific namely Thailand, Indonesia, Singapore, Vietnam, Malaysia, and the Philippines produced 243 million tons of waste in 2016 (ESCAP, 2022). According to data from a Our World Data, as much as 80% of the waste scattered in the ocean is plastic waste originating from land (Ritchie, Samborska, & Roser, 2022).

The result of the plastic waste problem in the Indo-Pacific oceans is the destruction of marine ecosystems. Plastic debris polluting the Indo-Pacific oceans can endanger more than 800 species, not only marine species. Of these 800 species, 40% are marine mammals and 40% are seabirds. Then based on the results of the UN Ocean Conference in New York in 2017, explained that plastic waste that pollutes the oceans can kill 1 million seabirds, sea turtles, 100 thousand marine mammals, and fish every year tahunnya (Sunyowati, Inayatun, & Camelia, 2022). Only 5% of the waste in the Indo-Pacific oceans is visible on the surface of the water and the other 95% is below the surface of the water (Puspita & Kresnawati, 2023).

Meanwhile, Indonesia is one of the countries with the largest plastic waste producers in the world after China (Ratnawati, Tahar, & Sidik, 2020). Indonesia produces around 7.8 tons of plastic waste every year, of which as much as 4.9 million tons of plastic waste is still not managed properly (World Bank Group, 2021). Then as many as 10 billion plastic bags equivalent to 85,000 tons will be polluted into the environment around the community every year (Ratnawati, Tahar, & Sidik, 2020). Based on data from the Oceanographic Research Center (P20) of the Indonesian Institute of Sciences (LIPI) explained that every year Indonesia's oceans are estimated to receive 70-80% of plastic waste left over from human consumption (Defitri, 2022). Some of the waste that pollutes Indonesia's oceans is plastic waste which causes harm to marine ecosystems.

Source: (Pratiwi, 2023)

According to data from the National Coordination Team for Marine Debris Handling (TKN PSL), the amount of plastic waste in Indonesia's oceans will be around 398,000 tons in 2022. In 2018, the amount of marine plastic waste was around 77,000 tons and this number increased by 14.77% to 88,374 tons (Pratiwi, 2023). The impact caused by the accumulation of plastic waste in Indonesia is by clogging the flow of the river and seawater. In addition, the large amount of plastic also has a negative impact on the lives of animals in the waters because they are often entangled in plastic waste and die, which can reduce their population in the waters (Pos ASEAN, 2018). Clogged rivers also cause communities to lose food sources and a access to clean water. Clogged rivers also trigger flooding which can be very detrimental to the community environment.

To combat this issue, the Indo-Pacific Plastic Innovation Network (IPPIN) encourages cooperation among stakeholders, including governments, researchers, industries, and organizations. This paper aims to learn about IPPIN's innovative programs to tackle plastic waste in Indo-Pacific. This study is inherently linked to previous research, as it compares and re-evaluates earlier findings to identify a research gap.

The following studies serve as references for this investigation: First, the article titled "Japan-ASEAN Cooperation in Reducing Marine Plastic Debris in the Indo-Pacific" by (Puspita & Kresnawati, 2023) discusses Japan-ASEAN collaboration through training programs on marine waste management, promoting marine debris reduction, coordinating marine waste issues, and joint action against marine waste in partnership with UNEP to mitigate marine litter in the Indo-Pacific. Second, the article "Environmental Potential of Recycling Plastic Waste in Australia Based on Life Cycle Assessment" by (Soenmez, Vankatachalam, Spierling, Endres, & Barner, 2024) highlights that Australia's plastic waste management strategies can reduce environmental impact and enhance resource recovery through recycling, thus presenting economic potential. Third, (Prabawati, Frimawaty, & Haryanto, 2023) analyze the importance of stakeholder partnerships in addressing plastic waste in Central Jakarta in their work titled "Strengthening Stakeholder Partnership in Plastic Waste Management Based on Circular

Economy Paradigm." Therefore, the novelty of this research lies in the selected case study, the partnerships analyzed, and the distinct approaches to plastic waste management employed.

As was previously said, the Indo-Pacific area is dealing with a serious plastic trash problem that threatens human health, marine habitats, and economic stability. The creation of the Indo-Pacific Plastic Innovation Network (IPPIN) is crucial to resolving this problem. Australia and Indonesia are two of the member nations in this Indo-Pacific partnership. The initiative's goal is to bring together companies, governments, and academic institutions to develop creative approaches and plans for efficiently handling plastic garbage. These research issues be addressed to create a complete strategy that goes above and beyond traditional plastic waste management techniques. Cutting-edge recycling technologies that break down plastics into their original monomers and allow for infinite recycling cycles are one source of potentially creative solutions. Through funding research and development for the management of plastic waste, IPPIN can facilitate the uptake of these cutting-edge technologies. Cross-border cooperation within the network can facilitate the sharing of best practices in recycling, waste management, and sustainable material development. Additionally, it can promote policy coordination to guarantee that local laws promote a decrease in the production and use of plastic. Activating nearby communities via awareness-raising initiatives will increase popular support for environmentally friendly behaviors. IPPIN can also look into the financial prospects for green jobs like waste management and recycling. IPPIN can bring about major improvements, significantly lowering plastic waste and promoting a sustainable future for the area by utilizing group knowledge and resources. This study looks at Indo-Pacific partnerships for managing plastic waste and looks into innovative technologies that fit into the IPPIN framework.

METHODS

In this research process, the authors will use qualitative research, based on the type of research that is suitable for this discussion's topic. The application of the qualitative method in this research aims to describe the urgency of the global waste plastic situation, the global impact caused by waste plastic on human health and ecosystems, also the relation of collaboration between Indonesia and Australia in dealing with phenomena that will be discussed through the IPPIN program as a resolution. According to (Fadli, 2021) qualitative research is research conducted through certain arrangements that occur in real or actual to be followed up in understanding the phenomena, why they occur, and how the phenomenon process occurs. By using the type of qualitative research, the authors use descriptive data as a data analysis technique to provide a description related to the object of research in the phenomenon to be discussed. There are data such as graphs and tables that will be used by the author in this research but only used as support or confirmation of the explanation regarding the meaning explained in descriptive. The data sources in this research are open source from the internet and secondary data through official government websites, administrative reports, journals, and books. The data selection process is carried out in

stages to obtain relevant data sources in achieving research objectives, therefore the data collection technique used by researchers is literature study. All forms of information presented in will be analyzed to obtain relevant information in providing explanations related to the topic of discussion**.**

RESULT AND DISCUSSION

Concept of Indo-Pacific Plastic Innovation Network (IPPIN)

The Indo-Pacific Plastic Innovation Network (IPPIN) is a collaborative regional network to bridge the gap between research, entrepreneurship, and investment in redefining the plastics cycle and creating a circular economy (CSIRO, 2024). IPPIN is a collaborative program of Australia's national science agency, the Australian Department of Foreign Affairs and Trade, the Indonesian Ministry of Education, Culture, Research and Technology, and the Indonesian National Plastic Action Partnership to develop sustainable innovations to reduce plastic waste and mitigate the impacts of climate change (Kedutaan Besar Australia, 2023).

In addressing this endless plastic waste problem, IPPIN not only runs its programs in Indonesia but also organizes them in Thailand, Vietnam, Laos, and Cambodia. In creating a sustainable world, IPPIN is supported by the Australian Government which is then implemented by Australia's national science agency, the Commonwealth Scientific and Industrial Research Organisation (CSIRO) through its partnership with the governments of Thailand, Indonesia, and Vietnam (CSIRO, 2024). The purpose of IPPIN is to support the design and scale-up of disruptive technologies to transform plastic waste management across the Indo-Pacific region. In addition, IPPIN also aims to reduce plastic waste entering the environment, especially in Australia, by 80% by 2030. This is one part of the "Ending Plastic Waste" mission as the first step taken by CSIRO (CSIRO, 2024).

IPPIN is an initiative under CSIRO's End Plastic Waste Mission and supports broader partnerships with the governments of Vietnam, Indonesia, and Thailand to reduce plastic waste entering the environment by 80% by 2030. This is in line with the commitment of the a Australian and Indo-Pacific governments to reducing marine plastic debris (CSIRO, 2024). IPPIN has 2 concepts to be able to run its program, namely innovative sustainable programs and collaborative stakeholders.

IPPIN's Innovative Programs to Tackle Plastic Waste

IPPIN has four innovative programs implemented in its collaboration with Indonesia to address plastic waste. First, The IPPINs Incubator that managed by CSIRO. This program is supported by the Australian Department of Foreign Affairs and Trade, as well as government partners. The IPPIN Incubator Program aims to help develop creative solutions to address plastic waste. This program is free and operates as an online initiative over five weeks. The goal is to assist participants in refining their concepts by finding customers and testing the market. The incubator program includes training and

workshops every week for five weeks. The targeted participants include startups at the idea stage, research teams, small and medium enterprises (SMEs), and other stakeholders focused on sustainable plastic alternatives. Although participants can come from anywhere in the world, their projects must be tailored to specific challenges related to Indonesia (CSIRO, 2022). The goal of the program is to transform the lifecycle of plastic waste by promoting better alternatives to the currently used plastics, enhancing the value of plastic utilization after its first use, and assisting people in making decisions based on reliable data. Participants will receive the following benefits: access to instruction and training. The opportunity to collaborate with other entrepreneurs and receive assistance in carrying out their projects. Customized support for communication skills and market readiness. The end of the program is an exhibition event where participants present their solutions to a panel of judges to receive feedback and information about potential progress in the accelerator program (CSIRO, 2022).

Second, The IPPIN Accelerator+ is a three-month program that assists verified startups and entrepreneurs focused on tackling marine plastic waste. This program is part of the CSIRO's Mission to End Plastic Waste and is a component of the Indo-Pacific Plastic Innovation Network (IPPIN). The IPPIN Accelerator+ program focuses on groups that can develop creative solutions for plastic waste management. The program outlines specific objectives for participants across various categories. First, validated start-ups are required to have demonstrated their products or concepts and are ready to advance to the business development phase. Additionally, entrepreneurs with initial business ideas are invited to present new plans aimed at reducing plastic waste in the ocean. Furthermore, research teams comprised of researchers with proven ideas are encouraged to develop their market solutions. Small and Medium Enterprises (SMEs) that are operational can participate if they wish to innovate, scale up, or adjust their practices to prioritize sustainability. Lastly, the program welcomes individuals and organizations from different industries seeking to enhance plastic waste management initiatives (CSIRO, 2022).

The IPPIN Accelerator+ program aims to achieve several key outcomes to aid participants in developing their plastic waste solutions. Participants are expected to enhance revenue growth by implementing effective strategies, while also building supplying partnerships to strengthen their market position. The program will increase investment readiness by familiarizing participants with funding opportunities, making them more attractive to investors. They will receive valuable feedback from mentors and judges to refine a their solutions and benefit from network enhancement through collaboration with industry experts and stakeholders. Access to Resource Support: Participants will have access to a collective fund of AUD$100,000 that can be used to accelerate the development of their solutions through services and support. This program aims to assist participants in achieving their business goals and addressing the issue of plastic waste management (CSIRO, 2024).

Third, The IPPIN Demo Day 2024. Demo Day, the last stage of the IPPIN program, provides participants with a chance to present their ideas to judges and the public. This

event aims to present creative approaches to the Indo-Pacific region's plastic waste problems. The IPPIN Demo Day 2024 in Indonesia will take place at the Shangri-La Hotel in Jakarta on October 29, 2024. Not only are presentations permitted at this event, but input from investors and professionals is also available. Reaching out to industry participants, encouraging fresh initiatives for teamwork and collaboration to cut down on plastic waste. It is intended that the participants can show how their concepts might improve plastic waste management in the area and promote a circular economy (CSIRO, 2024).

Lastly, the Indo-Pacific Plastics Innovation Network (IPPIN) Mentorship Program is a part of the network and provides guidance and a range of resources to members. Some crucial components of this mentoring program include the following: first Special Guidance: In areas including impact planning, financial review, marketing strategy, business analysis, and fundraising, participants will have access to knowledgeable coaches and mentors. Second, the program includes a range of workshops and training sessions designed to help participants improve their abilities in product development and sales. Third, individual approach mentorship lets teams select the kind of help that best suits their needs and is customized to meet those needs. Anticipated Results: Increased Revenue: The objective of this program is to help participants create practical plans to raise their revenue. Investment Readiness: Participants will be more equipped to draw in investors if they have a deeper comprehension of the funding options that are out there. Seeking Partnerships: This initiative assists participants in identifying strategic alliances that will strengthen their market position. As a result, the IPPIN mentorship program provides a crucial platform for entrepreneurs and creatives to refine their concepts into widely accepted approaches to managing plastic waste (CSIRO, 2024).

IPPIN Actor and Stakeholder

International partnerships are an essential component that cannot be avoided by countries or other international actors. The purpose of cooperation is to meet the interests of each country. Due to various international activities carried out by several countries in different fields, such as ideology, culture, the environment, social politics, economics, security, and defense, international cooperation can emerge. International partnerships are important to meet the needs of other countries that cannot be fulfilled by those countries themselves. Therefore, each country needs to collaborate with others to address the needs of other nations. International partnerships are defined as perspectives on how two or more interests, values, or goals that intersect are promoted and fulfilled by each party involved. In addition, several reasons why a country may want to collaborate with other countries globally are: (i) to enhance economic welfare by reducing costs and alleviating production limitations for various products needed by society; (ii) to optimize cost utilization and address shared security threats; and (iii) to mitigate losses caused by actions of one country that impact others (Holsti, 1988).

"Stakeholder" in international cooperation refers to individuals, groups, or organizations that have an interest, role, or influence in a project, policy, or international initiative and can be affected by that cooperation. Stakeholders in international partnerships typically have diverse interests and needs, and managing relationships with them requires a careful approach to ensure that all voices are heard and their interests are met. This is important for the success and sustainability of international partnerships. Indonesia is collaborating with Australia to reduce plastic waste through the Indo-Pacific Plastics Innovation Network (IPPIN) (CSIRO, 2024).

IPPIN is a network spread across the globe that helps entrepreneurs tackle the issue of plastic waste worldwide. IPPIN is a group of researchers, innovators, and investors redefining the plastic lifecycle from production to recycling. They do this by harnessing the power of science, innovation, and technology, as well as through long-lasting multi-sector cooperation. IPPIN collaborates with several stakeholders such as environmental communities and companies, including CSIRO (Commonwealth Scientific and Industrial Research Organisation) Australia, Australia's Department of Foreign Affairs and Trade, Geo Trash Management (GTM) Indonesia, Greenhope, University of Indonesia, and Padjajaran University (CSIRO, 2024).

Stakeholders involved in the IPPIN program are various, the first is the CSIRO Australia (Commonwealth Scientific and Industrial Research Organisation). CSIRO was established in 2019 as an Australian research institute that engages with a global community of practitioners, researchers, and policy leaders by experimenting with various models to achieve goals and challenges in the Australian environment and a global scale. Recognizing the increasing global problems related to plastic waste, CSIRO has a mission to end plastic waste to reduce waste entering the environment with a target of 80% by 2030 (CSIRO, 2022). The mission is aligned with the Indonesian government which has a similar target, so there is a bilateral relationship to achieve this goal. Another factor that strengthens the bilateral relationship between Indonesia and Australia in dealing with the plastic waste problem is the geographical location of maritime borders, hence impacts felt due to the leakage of plastic waste in the marine environment are a priority for both countries because it will cause a domino's effect if it is not immediately resolved. The role of CSIRO is crucial to the implementation of the IPPIN program. By developing technology and innovation in designing programs to reduce plastic waste, and convert plastic waste into resources that have more value through various scientific solutions offered. One of the things offered is substantial funding and resources in the program design, implementation, and research to provide collaboration facilities with various parties who want to be involved. The CSIRO encouraged individuals to participate in running this program with various benefits that can be obtained, one of which is becoming a global investor in the knowledge gained into real impact.

Following is Australia's Department of Foreign Affairs and Trade as one of the stakeholders in running the IPPIN program, especially in the implementation of the Demo Day event at Shangri La Jakarta on October 18, 2023, as the main event in the implementation of intensive training through the IPPIN Accelerator program. The

Accelerator program is an innovation program designed by IPPIN to support entrepreneurs in creating innovations to respond the current global problems, especially to transform the plastic problem in climate change that occurs as a new form of innovation in facing environmental challenges. This event was a collaboration between CSIRO, Australia's Department of Foreign Affairs and Trade, the Ministry of Education, Culture, Research, and Technology (Kedaireka) Indonesia, and the Indonesian National Plastic Action Partnership. The Demo Day was the grand finale after eight weeks of training, as the entrepreneurs were given mentoring and guidance on their ideas to build market competence. This event was also implemented in Vietnam and Thailand, therefore Australia's Department of Foreign Affairs and Trade has a role in coordinating activities and providing financial support in the implementation of the IPPIN programs. Another support provided is the Aus4Innovation program, which will be implemented in Indonesia in 2023 (Olsen-Boyd, Cooke, Pring, McBride, & Battaglia, 2023).

The Ministry of Education, Culture, Research, and Technology, or Kedaireka Indonesia also has an important role in this program through collaboration with Kemendikbudristek, CSIRO, and National Plastic Action Indonesia. Kedaireka's role is to provide a platform for collaboration between universities and the industrial world called the Kedaireka Platform. After being established on December 12, 2020, it gives an idea that there is an urgency to be associated between education and the world of industry or work to prepare students to face challenges in the future (Humas Ditjen Dikti Kementerian Pendidikan dan Kebudayaan, 2020). With the collaboration organized by Kedaireka, it is hoped that it can be a new thing that can play a role in reducing plastic waste through collaboration. In addition, the Kedaireka platform is intended to develop innovations to improve not only human resources but also the development of the industrial world. So this is not only beneficial for students in universities, but also to understand the needs of an increasingly varied society. As mentioned in the previous explanation there was a Demo Day event as one of the highlights of the IPPIN program, Kedaireka became one of the program accelerators in the event (Purnama, 2023). Through the event, it was recognized the potential of entrepreneurs in creating innovations towards the challenges in the industrial world in Australia and Indonesia.

The next stakeholder is the Kemitraan Aksi Plastik Indonesia known as the National Plastic Action Partnership (NPAP), which is a collaborative result of several parties from the government, the private sector, to the citizens. The supports of KAPNI in IPPIN are related to the same goal to achieve the reduction of plastic waste in Indonesia's marine environment. To be an active collaborator in developing innovations in handling plastic waste, KAPNI also helped approach the companies that participated in Demo Day to implement the innovations that have been made as consideration for the government. An example is Gulontam from RiverRecycle who comes from Finland, started the company in 2019, offering an innovative business model for sustainable river cleaning services without funding that must be spent continuously (Supriyanto, 2023). The initiative of the idea eventually created a company with this project in five countries, one of which is Indonesia. The existence of KAPNI further strengthens collaboration

between cross-sector, especially in Indonesia through government and society (Kementerian Koordinator Bidang Kemaritiman dan Investasi, 2019). This is confirmed by the Head of KAPNI, Sri Indrastuti Hadiputranto, that IPPIN plays an important role in developing entrepreneurs and startups to create long-term solutions to the increasing global plastic waste problem (Digdata, 2023). So that by joining KAPNI in IPPIN it can increase opportunities to reduce waste in Indonesia-Australia also globally.

IPPIN's journey was made more successful by the partnership between Geo Trash Management (GTM) Indonesia and an Australian process engineering company. This partnership was successful in realizing the construction of the first commercial-scale manufacturing process in Indonesia with the main focus on processing plastic waste into oil through a refining process (CSIRO, 2022). The innovation opens up new market opportunities by developing increasingly sophisticated recycling technologies to reduce plastic waste. Through this method, IPPIN provides financial support to GTM to continue developing plastic waste recycling technology to become an alternative energy source. The financial support will help GTM, especially the research team, to increase the production capacity of high-quality hydrocarbons from plastic waste, hopefully helping to reduce dependence on petroleum with an eco-friendly process. The head of GTM, Andrew Sinclair believes that this technology can accelerate the process of technology in adaptation in public. GTM was able to prove that despite its role in creating new technology through the IPPIN program, it also created a new market, especially for plastic and rubber waste that is difficult to decompose. In developing this program, GTM uses circular economy principles so that local people and communities can take advantage of the opportunities to increase their income (Batten, 2023). In fact, by the end of the project IPPIN and GTM were able to set up an operational demonstration facility to process more than 200 tons of plastic waste each year, ensuring that this could be an investment for the future (Batten, 2023).

IPPIN's Impact on Indonesia and Australia

In its journey, the Indo-Pacific Plastics Innovation Network (IPPIN) has had a significant impact on Indonesia and Australia through its innovative programs aimed at reducing plastic waste and promoting sustainable solutions. For Indonesia, IPPIN has several impacts: first, through IPPIN, Indonesia aims to reduce marine plastic waste by up to 70% by 2025. Second, IPPIN provides a bilateral initiative with CSIRO and the Ministry of Education, Culture, Research, and Technology, focusing on long-term alternatives, enhancing plastic innovation, and empowering decision-making through reliable and accessible information (CSIRO, 2022). Third, the Indonesian start-up Greenhope has successfully replaced 12 million plastic items with biodegradable plastics made from cassava, also benefiting 179 cassava farmers in Indonesia (CSIRO, 2022). Meanwhile, for Australia, besides advancing CSIRO's Plastic Waste Mission supported by IPPIN, the network directly fosters collaborative innovation in the ecosystem, strengthening connections between Australia, Indonesia, and other global partners. This relationship provides opportunities to develop solutions involving technology in plastic waste management (CSIRO, 2022).

The Indo-Pacific Plastics Innovation Network (IPPIN) generates a notable shared impact, particularly through its facilitation of cross-cultural networking and collaboration. Through active collaboration between scholars and entrepreneurs from participating nations, the IPPIN program fosters the sharing of ideas and experiences across cultural contexts. This exchange of ideas not only improves understanding between parties but also creates a vibrant, networked community committed to tackling the problems associated with plastic waste. Such cooperative settings provide a dynamic ecosystem where many viewpoints can come together to generate novel answers and increase our ability as a group to address global concerns (CSIRO, 2022).

Additionally, by encouraging creative and sustainable technological advancements, IPPIN contributes significantly to the advancement of technology. This emphasis on innovative solutions gives entrepreneurs great chances to interact directly with important stakeholders, such as investors, legislators, and leaders in the sector. IPPIN facilitates the links between entrepreneurs and the vital resources, insights, and funds needed to scale their ventures. This relationship makes it easier to put innovative techniques and technologies into reality, which advances the more general objectives of sustainable development and efficient management of plastic trash (Claridge, 2023).

CONCLUSION

Indo-Pacific Plastic Innovation Network or IPPIN is an idea designed by the collaboration with various parties to achieve the goal of reducing and developing plastic waste management by using the circular economy principle. The collaboration includes government and researchers including CSIRO, Geo Trash Management Indonesia, Kedaireka, and others. The main focus of IPPIN is the development of innovations in sustainable plastic waste reduction to minimize the negative impacts resulting from climate change. The main pillars of the program are the IPPIN incubator, IPPIN Accelerator+, and Demo Day which provides mentorship to entrepreneurs to gain innovation in facing the challenges of global issues to determine market readiness in the industry, also improve their skills.

Through IPPIN, many networks are formed from the collaboration that represents the importance of international partnerships in facing current global challenges, especially related to the management of increasing plastic waste. Through this collaboration which includes governments, research institutions, private sector companies, to the society involved in IPPIN, it can increase opportunities in overcoming the problem of plastic waste and can be seen as an innovative solution. The significant role of CSIRO, the Australian Department of Foreign Affairs and Trade, and the Indonesian Ministry of Education is proof that the collaborative results through IPPIN can be maximized in every action from funding to facilitating various activities performed.

The substantial impact of the innovation network through IPPIN is significant for both Indonesia and Australia, with innovations encouraging long-term solutions to the plastic waste problem. In Indonesia, the target is to reduce marine plastic waste by 70% in 2025, thus supporting local startups such as Greenhope with innovations to recycle plastic waste in alternative ways and provide benefits to local farmers. Meanwhile, in Australia, IPPIN continues to build on CSIRO's plastic waste mission by strengthening cross-border collaborative innovation and nurturing existing partnerships through the use of technology as a solution for effective waste management. Through this, it can create a dynamic community that focuses on the principles of handling plastic waste problems. IPPIN's position as a facilitator of stakeholders not only provides technological innovation but also generates resources and funding for pioneering entrepreneurs. Therefore, these actions have a wide-scale impact on sustainable development.

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