



**Asia-Pacific
Economic Cooperation**

PROJECT REPORT

**Empowering Indigenous Social Awareness
on Renewable Energy and Increasing
Inclusion Sustainability for Green Energy
Applications in APEC Regions**

22-24 MARCH 2023

APEC Energy Working Group

October 2023



**Asia-Pacific
Economic Cooperation**

APEC Workshop on Empowering Indigenous Social Awareness on Renewable Energy and Increasing Inclusion Sustainability for Green Energy Applications in APEC Regions

Chinese Taipei | 22 – 24 March 2023

APEC Energy Working Group

October 2023

APEC Project: EWG 14 2021A

Produced by

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EXECUTIVE SUMMARY

Indigenous people own unique social and culture that shares collective ancestral titing to their lands and natural resources. Consequently, the land and natural resources they depend on are inextricably linked to their identities, cultures, livelihoods, and physical and spiritual well-being. However, indigenous peoples often lack formal recognition of their lands, territories, and natural resources and are usually last to receive public investments in essential services and infrastructure. This legacy of inequality and exclusion has made indigenous communities more vulnerable to climate change and natural hazards.

The indigenous cultural heritage is very close to nature, such as making clothes or crafts and housing with cellulose-based agricultural plantations. Through this project, the indigenous will be trained on social awareness on accepting the dissemination of renewable technologies to use agricultural waste to become a renewable energy source for community self-sustaining using the Symbiosis energy concept. Symbiosis Energy is an innovative model for rural community development and social awareness. It has social and environmental benefits for the community to be self-sustained.

Currently, in APEC's developing economies, most indigenous people's land is located in remote rural areas, and it is not easy to connect to the centralized power grid for access to clean energy. Therefore, this project aims to demonstrate the best practice model for developing the indigenous green energy farm with a small-scale distributed renewable energy system. This project is to help APEC's developing economies build green energy farms with access to distributed renewable energy. Therefore, this project will help promote renewable energy, energy efficiency, security, and resiliency, including developing low-carbon technology and alternative energy sources.

The report consists of three key issues covering the following topics: (1) Aboriginal land planning and climate change; (2) Agricultural waste management and bioenergy in the Aboriginal area; (3) Renewable energy technology and regulations in the Aboriginal area. Brief descriptions and key findings for each section are as follows:

1. Aboriginal land planning and climate change.

Aboriginal land planning and climate change are interconnected issues affecting Indigenous communities worldwide. One crucial aspect of Aboriginal land planning is recognizing and integrating traditional knowledge systems. Indigenous peoples have accumulated knowledge

over generations about sustainable land use practices, resource management, and the interconnectedness of ecosystems. This traditional knowledge often includes observations of subtle environmental changes that can signal broader shifts in climate patterns. Incorporating this knowledge into land planning processes empowers Indigenous communities and enriches scientific understanding of climate change impacts and adaptation strategies. Community engagement and self-determination are also essential elements of Aboriginal land planning. Indigenous communities should have the right to actively participate in decisions that affect their lands and resources. By involving local communities in land planning processes, their unique perspectives, needs, and aspirations can be incorporated, resulting in more effective and culturally appropriate strategies.

2. Agricultural waste management and bioenergy in the Aboriginal area.

Agricultural waste management and bioenergy are crucial in promoting sustainable development and addressing environmental challenges in Aboriginal areas. These practices offer solutions for managing agricultural waste and opportunities for renewable energy generation and economic development. Effective agricultural waste management is essential for minimizing the environmental impact of farming activities. In Aboriginal areas, where agriculture is often a significant source of livelihood, proper waste management practices are crucial. Agricultural waste can be effectively managed and transformed into valuable resources by implementing composting, anaerobic digestion, and biochar production. These practices help reduce greenhouse gas emissions, prevent soil and water pollution, and enhance soil fertility. Agricultural waste can be utilized for bioenergy production, offering a sustainable alternative to fossil fuels. Through processes like anaerobic digestion, organic waste materials such as crop residues, manure, and food waste can be converted into biogas, which can be used for electricity and heat generation. Bioenergy derived from agricultural waste reduces reliance on non-renewable energy sources and contributes to greenhouse gas mitigation by offsetting emissions from conventional energy production. The implementation of bioenergy projects can have significant benefits. Beyond environmental advantages, bioenergy initiatives can create employment opportunities, enhance energy security, and support economic development within Indigenous communities.

3. Renewable energy technology and regulations in the Aboriginal area.

In Aboriginal areas, agriculture often serves as a significant source of livelihood. However, agricultural activities generate substantial waste, including crop residues, animal manure, and food

waste. Effective agricultural waste management is essential to minimize the environmental impact of these activities. Implementing strategies such as composting, anaerobic digestion, and biochar production can transform agricultural waste into valuable resources. These practices help reduce greenhouse gas emissions, prevent soil and water pollution, and improve soil fertility. Effective waste management practices can minimize environmental impacts and enhance soil fertility, while bioenergy production offers renewable energy solutions and economic benefits. These initiatives must be developed in consultation with Indigenous communities, respecting their traditional knowledge, cultural values, and aspirations.

The workshop was initially planned to be held in the physical mode in November 2022, and it will gather around 150 delegations, including speakers and participants from Chinese Taipei and 14 APEC member economies from Australia; Canada; Chile; Indonesia; Malaysia; Mexico; New Zealand; Papua New Guinea; Peru; The Philippines; Chinese Taipei; Thailand; United States; Viet Nam. The pandemic situation in Chinese Taipei, which occurred later than in other economies, caused the government to apply restricted regulations regarding this situation, which caused more difficulties for the participants from other economies to attend the APEC events in Chinese Taipei. Implementing quarantine regulations also takes part in this challenging situation because the participants need an extra budget and time while entering Chinese Taipei. Due to the uncertainties, after a lengthy discussion to sort out the situation by considering the reduction of quarantine regulations in Chinese Taipei, an application for changes was made to the implementation mechanism, timeline, and format of the Workshop; it has decided to extend the project to March 2023 which predicted that the pandemic situation has reduced to the lowest level.

The project will help build green energy smart farms in APEC's developing economies and build sustainable and resilient communities. The event allowed the development of recommendations to promote the dissemination of green energy technology to empower indigenous social awareness of renewable energy and to increase inclusion sustainability for green energy applications in APEC Regions. The participants for this event were primarily female (51%), including the speakers (53%), which allowed them to achieve the gender target of at least 30% women participation.

The APEC Energy Working Group funded this project: EWG 14 2021A.

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APEC Workshop of Empowering Indigenous Social Awareness on Renewable Energy and Increasing Inclusion Sustainability for Green Energy Applications in APEC Regions

22 – 24 March 2023

I. INTRODUCTION

Feng Chia University hosted a 3-Day Event (including Policy Dialogue, Workshop, Online Training Program, and Self-Fund On-site Learning) under the APEC project EWG 14 2021A – 2023 APEC Workshop.

To enhance the capacity building and to increase the social awareness and inclusion of sustainability of renewable energy technologies, Feng Chia University invited experts from the private sector, APEC EWG/EGNRET delegations, and the nominated indigenous participants from each APEC member economy to exchange their experiences on social awareness on accepting dissemination of renewable technologies to use the agricultural waste to become a renewable energy source for community self-sustaining using the Synergy concept, by delivering speeches, sharing current information, and providing comments during the event. The event provided networking opportunities and collaboration between policymakers, private sectors, experts, and young entrepreneurs.

The project's objectives are: (i) to build indigenous people's social awareness of renewable energy technologies by developing knowledge, ability, and skill through virtual training courses; (ii) to learn the basic skills of renewable energy technologies and get knowledge from the experts about the importance of reducing CO₂ emissions in daily activities; (iii) to understand how renewable energy can support economic growth and sustain the cultural heritage, and (iv) to provide the opportunities for cultural exchange with other APEC member economies to increase inclusions for green energy applications.

The workshop was initially planned to be held in the physical mode in November 2022, and it will gather around 150 delegations, including speakers and participants from Chinese Taipei and 14 APEC member economies from Australia; Canada; Chile; Indonesia; Malaysia; Mexico; New Zealand; Papua New Guinea; Peru; the Philippines; Chinese Taipei; Thailand; United States; and Viet Nam. The pandemic situation in Chinese Taipei, which occurred later than in other economies, caused the government to apply restricted regulations regarding this situation, which caused more difficulties for the participants from other economies to attend the APEC events in Chinese Taipei. Implementing quarantine regulations also takes part in this

challenging situation because the participants need an extra budget and time while entering Chinese Taipei. Due to the uncertainties, after a lengthy discussion to sort out the situation by considering the reduction of quarantine regulations in Chinese Taipei, application for changes was made to the implementation mechanism, timeline, and format of the Workshop; it has decided to extend the project to March 2023 which predicted that the pandemic situation has reduced to the lowest level.

The 3-day APEC Workshop Event was postponed to 22-24 March 2023 at Splendor Hotel, Taichung City, Chinese Taipei. There were approximately 80 participants attended the 3-Day Event at Chinese Taipei.

II. KEY ISSUES

There were **three key issues** became the main discussion in this workshop, as follows:

1. Aboriginal Land Planning and Climate Change.
2. Agricultural Waste Management and Bioenergy in the Aboriginal Area.
3. Renewable Energy Technology and Regulations in the Aboriginal Area.

These key issues were packaged in 3 Policy Dialogue topics, 6 Hybrid Training Course topics, and 8 workshop topics.

1. Aboriginal land planning and climate change.

Aboriginal land planning and climate change are interconnected issues affecting Indigenous communities worldwide. As custodians of vast territories rich in biodiversity and natural resources, Indigenous peoples have long recognized the importance of sustainable land management and have developed traditional knowledge systems that promote harmonious relationships between humans and the environment. In the face of climate change, Aboriginal land planning must prioritize resilience, adaptation, and the integration of traditional wisdom with scientific understanding.

One crucial aspect of Aboriginal land planning is recognizing and integrating traditional knowledge systems. Indigenous peoples have accumulated knowledge over generations about sustainable land use practices, resource management, and the interconnectedness of ecosystems. This traditional knowledge often includes observations of subtle environmental changes that can signal broader shifts in climate patterns. Incorporating this knowledge into land planning processes empowers Indigenous communities and enriches scientific understanding of climate change impacts and adaptation strategies.

Community engagement and self-determination are also essential elements of Aboriginal land planning. Indigenous communities should have the right to actively participate in decisions that affect their lands and resources. By involving local communities in land planning processes, their unique perspectives, needs, and aspirations can be incorporated, resulting in more effective and culturally appropriate strategies. Moreover, empowering Indigenous communities to lead in land planning allows for preserving and revitalizing cultural practices intimately connected to the land.

2. Agricultural waste management and bioenergy in the Aboriginal area.

Agricultural waste management and bioenergy are crucial in promoting sustainable development and addressing environmental challenges in Aboriginal areas. These practices offer solutions for managing agricultural waste and opportunities for renewable energy generation and economic development. Effective agricultural waste management is essential for minimizing the environmental impact of farming activities. In Aboriginal areas, where agriculture is often a significant source of livelihood, proper waste management practices are crucial. Agricultural waste can be effectively managed and transformed into valuable resources by implementing composting, anaerobic digestion, and biochar production. These practices help reduce greenhouse gas emissions, prevent soil and water pollution, and enhance soil fertility.

However, agricultural waste can be utilized for bioenergy production, offering a sustainable alternative to fossil fuels. Through processes like anaerobic digestion, organic waste materials such as crop residues, manure, and food waste can be converted into biogas, which can be used for electricity and heat generation. Bioenergy derived from agricultural waste reduces reliance on non-renewable energy sources and contributes to greenhouse gas mitigation by offsetting emissions from conventional energy production. The implementation of bioenergy projects can have significant benefits. Beyond environmental advantages, bioenergy initiatives can create employment opportunities, enhance energy security, and support economic development within Indigenous communities. Using local agricultural waste resources, bioenergy projects can contribute to self-sufficiency and reduce dependence on external energy sources. Moreover, these initiatives can foster partnerships between Indigenous communities, government agencies, and private sector stakeholders, promoting collaboration and knowledge exchange.

It is important to note that any agricultural waste management and bioenergy projects in Aboriginal areas must be developed in consultation and partnership with the local communities. Aboriginal peoples have traditional knowledge and a deep understanding of the land, which

should be respected and incorporated into project planning and implementation. Indigenous communities should be actively involved in decision-making, ensuring their cultural values, practices, and aspirations are respected and considered.

3. Renewable energy technology and regulations in the Aboriginal area.

In Aboriginal areas, agriculture often serves as a significant source of livelihood. However, agricultural activities generate substantial waste, including crop residues, animal manure, and food waste. Effective agricultural waste management is essential to minimize the environmental impact of these activities. Implementing strategies such as composting, anaerobic digestion, and biochar production can transform agricultural waste into valuable resources. These practices help reduce greenhouse gas emissions, prevent soil and water pollution, and improve soil fertility.

Moreover, agricultural waste can be utilized for bioenergy production, offering a sustainable alternative to fossil fuels. Through processes like anaerobic digestion, organic waste materials can be converted into biogas, which can be used for electricity and heat generation. Bioenergy derived from agricultural waste reduces reliance on non-renewable energy sources and contributes to greenhouse gas mitigation by offsetting emissions from conventional energy production.

Agricultural waste management and bioenergy present significant opportunities for sustainable development in Aboriginal areas. Effective waste management practices can minimize environmental impacts and enhance soil fertility, while bioenergy production offers renewable energy solutions and economic benefits. These initiatives must be developed in consultation with Indigenous communities, respecting their traditional knowledge, cultural values, and aspirations. Aboriginal areas can move towards a more sustainable and self-reliant future by integrating agricultural waste management and bioenergy.

III. POLICY RECOMMENDATION

Researchers from Chinese Taipei and Indonesia analyze the mitigation of CO₂ emission, agricultural waste management, and renewable energy technology and regulations for the indigenous people and concluded the **Policy Recommendations** as follows:

1. Aboriginal Land Planning and Climate Change.

- a. Consultation and Collaboration: Establish a collaborative framework that includes Aboriginal communities, indigenous organizations, and government agencies to ensure meaningful participation in land planning processes related to climate change.
- b. Traditional Knowledge Integration: Recognize and incorporate traditional ecological knowledge Aboriginal communities hold into land planning and climate change adaptation strategies through partnerships with indigenous knowledge holders and the inclusion of traditional practices in land use planning.
- c. Capacity Building: Provide financial and technical support to Aboriginal communities to enhance their capacity in land planning and climate change adaptation. This can include training programs, workshops, and educational initiatives tailored to the specific needs and aspirations of Aboriginal communities.
- d. Sustainable Land Management: Encourage sustainable land management practices promoting biodiversity conservation, restoration, and carbon sequestration. Implement incentives and regulations to discourage unsustainable land use practices and promote climate-friendly alternatives. Develop guidelines and standards for infrastructure development in Aboriginal lands that consider climate change impacts.

2. Agricultural Waste Management and Bioenergy in the Aboriginal Area.

- a. Waste Reduction and Recycling: Encourage Aboriginal communities to adopt waste reduction and recycling practices in agricultural activities. Implement waste management systems that promote agricultural waste materials' separation, reuse, and recycling.
- b. Bioenergy Production: Support the development of bioenergy projects in Aboriginal areas by providing financial incentives, technical assistance, and access to renewable energy funding programs. Promote agricultural waste as feedstock for bioenergy production, such as biogas generation or biomass pellet production.
- c. Research and Development: Build the research and development initiatives focused on improving agricultural waste management techniques and bioenergy technologies suitable for Aboriginal communities. To drive innovation and knowledge transfer, Foster partnerships between research institutions, indigenous organizations, and industry stakeholders.
- d. Capacity Building and Training: Provide training programs and capacity-building initiatives to Aboriginal communities, enabling them to effectively manage agricultural waste and participate in bioenergy projects. This should include technical skills training, entrepreneurship support, and knowledge sharing platforms.

- e. Collaboration and Partnerships: Collaborate Aboriginal communities, government agencies, and private sector entities to establish sustainable agricultural waste management and bioenergy projects. Encourage partnerships that respect indigenous rights, promote economic self-sufficiency, and create employment opportunities for Aboriginal communities.

3. Renewable Energy Technologies and Regulations in the Aboriginal Area.

- a. Community Ownership and Benefits: Encourage Aboriginal communities to actively participate in renewable energy projects by promoting community ownership models. Ensure Aboriginal communities benefit directly from renewable energy developments through revenue sharing, employment opportunities, and capacity-building initiatives.
- b. Regulatory Framework: Develop a regulatory framework that supports deploying renewable energy technologies in Aboriginal areas. Streamline permitting processes, address potential legal barriers, and facilitate grid connection for renewable energy projects.
- c. Cultural Considerations: Recognize and respect the cultural significance of land and natural resources in Aboriginal areas during the planning and implementation of renewable energy projects. Engage with Aboriginal communities to ensure that renewable energy developments align with their cultural values and priorities

IV. HIGHLIGHTS OF THE WORKSHOP

The 3-day event of the APEC Workshop (Programme as per Annex 1) consists of three (3) policy dialogue sessions and six (6) hybrid training course sessions on the first day, eight (8) workshop sessions on the second day, and three (3) case studies sessions during the Green Farm on-site learning on the third day.

Day 1. Policy Dialogue

On the first day's Policy Dialogue, Prof. Dr. Chen-Yeon Chu, the Project Overseer, the Director of the Institute of Green Products, Feng Chia University, and Dr. Chi-Wen Liao, APEC EGNRET Chair and Dr. Chung-Hsien Chen, Director of Bureau of Energy, Chinese Taipei all gave an opening speech to the participants. Feng Chia University was pleased to invite experts to deliver speeches and share their experiences and research outcomes for the APEC region's private and public sectors.

The Policy Dialogue contained three main topics:

1. Aboriginal land planning and climate change
2. Agricultural waste management and bioenergy in the Aboriginal area

3. Renewable energy technology and regulations in the Aboriginal area .

Feng Chia University invited six speakers within the APEC region to share their insights, and there are two experts for the panel discussion following the presentation. At the beginning of the first topic, Dr. Fang-Chih Chang, Research Fellow, NTU, Chinese Taipei, shared his knowledge about the utilization of thinning timber and its residues in the experimental forest in Chinese Taipei. Later on, Dr. Francesco Petracchini, Director CNR - IIA, Italy, introduced the Institute of Atmospheric Pollution Research on the issues of climate change and EU Green Deal policy and exemplified biogas development and Nimby issues in Italy.

Representing Chile, Mr. Francisco Merino, Head of the Dialogue Processes and Indigenous Consultation and Participation Unit of the Ministry of Energy, thoroughly introduced Chile's energy policy and highlighted how to reduce gaps in the energy sector among indigenous peoples and rural areas. From Chung Hsing University, Chinese Taipei, Keng-Tung Wu, PhD, delivered his speech regarding capacity building on bioenergy and described how the portable microgrid system was implemented in aboriginal areas.

In the last session of policy dialogue, Prof. SANGKERTADI, Vice Rector of Sam Ratulangi University, Indonesia, introduced the green architectures of Indonesia, from governmental buildings to traditional dwellings, most of the green constructions are regulated by the Indonesia Act No 28, which certified the buildings in both government sector and private sector. The last speaker of the policy dialogue was Dr. William Yi-Yuan Su, Chief R&D Officer and Chief Legal Counsel Incigt Inc., Chinese Taipei. He focused on indigenous architecture from the perspective of law and regulation. Ultimately, Dr. Su provided insight to enhance the capacities and promote awareness of the indigenous area.

The last session of Policy Dialog was concluded in the Panel Discussion with two panelists: Assoc. Prof. Dr. Weerapon Thongma, President of MaeJo University, Chiang Mai, Thailand, and Ms. Liza V. Pangilinan, the Science Research Specialist from the Department of Energy, Philippines. During the Panel Discussion sessions, Dr. William Yi-Yuan Su served as the moderator to raise questions to speakers, extending the breadth of issues and increasing the depth of contents, which allowed the audience to easily acquire as much knowledge as they could from professional fields.

Day 1. Hybrid Training Course

The training course begins with Dr. Cindy Hsueh, from s.School, Feng Chia University from Chinese Taipei, who introduced SDGs, specifically described the implementation of SDGs in Feng Chia University. The second speaker was Ms. Denise Yeazul Fernández Rojas, from

Urban Planning, UNAM, Mexico, talked about green energy applications in rural Mexico through sun dryers, geothermal dehydrators, and biomass, all of which could achieve cost-effective monitoring and control of distributed energy resources.

The third speaker, Dr. Reiny Antonetha Tumbol from Indonesia, Head of the International Office at Sam Ratulangi University, raised the water hyacinth problems in Lake Tondano. The water hyacinth eradication program facilitated in the area demonstrated the method as an alternative energy resources approach. As the fourth speaker, the former Rector of Sam Ratulangi University, Indonesia, Prof. Dr. Ir. Ellen Joan Kumaat, delivered her speech with a case study regarding banana fiber in the Manado region. In terms of degradation of environmental concern, the Indonesian government has used banana stem fiber as an alternative energy resource. The usage, process, and difficulties were discussed in this speech.

The last training course lecturer is Dr. Ir. Alicia Sinsuw, Assistant Professor at Electrical Engineering Dept., Universitas Sam Ratulangi, from Indonesia. She shared the implementation of a biogas production pilot plant in the rural community, the pilot plant demo, and the training center of HyMeTek. This bioenergy system could be another alternative option for renewable energy resources.

Day 2. Workshop I

Welcome by Prof. Dr. Chen-Yeon Chu, the project overseer, the Day-2 Workshop invited several speakers from different APEC economies to share research, cases, and project implementation by applying the latest green technology. This day's event began with Dr. Liny Tambajong's research in Biodigester, a technology for processing organic matter with the microorganism bacteria. Dr. Liny revealed how biodigester technology was implemented in the Manado area. Manado City sees the sheer amount of organic waste as an opportunity if appropriately treated. In 2020, Manado City exercised a project called Bioman (Biogas Manado), which can process organic waste, mainly household waste, into biogas using easily attained materials. Bioman is piloted to process organic waste into biogas in a simple and easy way to apply even by persons without expertise in biogas. As a result, over the two years from 2020 until 2023, 52 Bioman have been installed and run. This pilot project has tried to reduce GHG emissions and alleviate economic pressures on the underprivileged by using biogas for households cooking up to 1.5 hours daily.

Next, Dr. Hanilyn Hidalgo from the Department of Agribusiness Central Bicol State University of Agriculture discussed green tourism in the Philippines. The case of green tourism in the Bicol Region, the Philippines, provides insight into how the participation and collaboration

of tourism value chain key players could be embraced to develop the economic inclusiveness of the sector in the community. The third Speaker for the Workshop was Mr. Yuan-Horng, manager of Jin-Du restaurant in Puli township of Chinese Taipei. He introduced the cuisines from restaurants as sustainable cuisine. Next, Dr. Cristhian Chicaiza-Ortiz, from Amazon Regional University IKIAM, Ecuador, shared his experience in biomass valorization for energy, physicochemical, biological, agricultural, and environment. Later on, Dr. Eros Manzo from CNR-IIA, Italy's international cooperation, shared his energy equity and justice research. The last speaker of the morning session was Distinguished Prof. Dr. Dwi Susilaningsih, a Senior Researcher at the BRIN, Indonesia. She introduced agricultural wastes in Indonesia, electricity from waste biomasses conversion, cooking gas from cattle dung, and full from biomasses conversion.

The workshop was continued to the afternoon session after the lunch break. The first speaker for the Workshop's afternoon session was Dr. Ching-Ming Lai. He was in Japan for the research program, and the online presentation discussed the potential applications of green vehicles in rural areas, raising the pros and cons of EV application and the disadvantages of utilities. In the end, Dr. Lai introduced the outcomes of NCHU Electric Mower as an achievement.

Next speaker is Mr. Kenny Tseng, CEO of Mobii Green Energy Co., Ltd., Chinese Taipei. Mr. Tseng mentioned the ESG and digitalization ecosystem goal in an attempt to develop renewable smart grid solutions. CEO for Zolargus Co. Ltd., Chinese Taipei, Dr. Pi-Fuang Chen, referred to the certification system and introduced the energy seeds to utilize green energy. The qualified candidates will be able to install the green energy technology through the certification system.

At this event, the Project Overseer invited Mr. Yosifu Kacaw, an indigenous artist from Chinese Taipei. He shared his collections and how the arts integrated with contemporary architecture. The last speaker of the workshop was Dr. Wei-Chieh Hua, General Manager, Splendid Marketing Ltd., Chinese Taipei. He focused on SME Entrepreneurship, introducing coffee Whole Tree as an example and the coffee industry, training courses, and demonstrations.

Day 3. On-site Learning

On the third day, the participants headed to Nantou County, Chinese Taipei, to attend the On-site Learning (Self-Fund). The Green Farm is famous for using ecological energy, such as biomass materials. After the Demo Site, the participants explored the tourist spot, Sun Moon Lake.

V. GENDER AND INDIGENOUS PARTICIPANTS

The participants for this event were primarily female (51%), including the speakers, which allowed them to achieve the gender target of at least 30% women participation. All participants came from 9 APEC member economies, including Chile; Indonesia; Malaysia; Mexico; Russia; the Philippines; Chinese Taipei; Thailand; and Viet Nam; for non-APEC economies, Ecuador and Italy. For this event, 9 of the 14 invited speakers were female. In total, 39 of 77 participants were female, which reached the gender requirements.

Six of the 14 speakers were Indigenous people from Chile; Indonesia; Mexico; The Philippines; Chinese Taipei; and Ecuador, which is 43% of the indigenous speaker/participants requirements for at least 33%.

VI. CONCLUSIONS

Given the ease of border control in Chinese Taipei, Feng Chia University held the 3-day physical event, allowing overseas and local participants to gather at the venue, prompting the diversity, depth, and breadth of contents all contributed to the event's success.

The experts of First's Policy Dialogue concentrated on "Aboriginal land and climate change" and "bioenergy and agricultural waste management in the Aboriginal area," generously sharing research and observations on the current bioenergy demands and potential development in their economies, all of which would become a foundation for public sectors and private agents to discuss policy recommendations and to enact further new policies and regulations for a more sustainable environment through renewable energy technology.

Extending from Policy Dialogue, the afternoon session of the first day, the Online Training Course, introduced relative topics such as SDGs, renewable energy, waste management, and techniques that would be applied in the aboriginal regions among APEC economies. The speaker raised the Symbiosis Energy model for a thorough introduction to how the technique can increase value-added resources and cost-effectiveness for agricultural applications. The participants, including the experts and government representatives, could receive knowledge and stimulus from unfamiliar fields and integrate the techniques and theories for policy development.

The workshop was held on the third day and allowed the APEC Region to share insights from industrial perspectives. Speakers from Chinese Taipei have introduced multiple domains, from green vehicle applications to solar PV and SMEs. Furthermore, the last day of the Green On-Site Learning brought the event to a perfect end with unforgettable experiences.



Group photo of speakers and participants attending the 2023 APEC Workshop.
The Splendor Hotel, Chinese Taipei.

ANNEX 1: Agenda

Agenda



EWG 14 2021A

**APEC Workshop of Empowering Indigenous Social Awareness
on Renewable Energy and Increasing Inclusion Sustainability
for Green Energy Applications in APEC Regions**

22-24 March, 2023 | Taichung City, Chinese Taipei

Wednesday, 22 March 2023 – Day 1	
08:30 – 09:20	Registration
09:20 – 09:50	Welcoming Remark <ul style="list-style-type: none">• Dr. Chi-Wen Liao, APEC EGNRET Chair• Dr. Chung-Hsien Chen, Director, Bureau of Energy, Chinese Taipei.• Prof. Dr. Chen-Yeon Chu, Project Overseer, Director of Institute of Green Products, Feng Chia University• Group Photo
Policy Dialog	
09:50 – 10:30	Topic 1: Aboriginal land planning and climate change Utilization of thinning timber and its residues in indigenous cultural area of the Experimental Forest Speaker 1: Dr. Fang-Chih Chang, Research Fellow, NTU, Chinese Taipei. Speaker 2: Dr. Francesco Petracchini, Director CNR - IIA, Italy.
10:30– 10:40	Coffee Break
10:40 – 11:20	Topic 2: Agricultural waste management and bioenergy in the aboriginal area Speaker 1: Mr. Francisco Merino, Head of the Dialogue Processes and Indigenous Consultation and Participation Unit of the Ministry of Energy, Chile. Speaker 2: Assoc. Prof. Keng-Tung Wu, NCHU, Chinese Taipei.
11:20– 12:00	Topic 3: Renewable energy technology and regulations in the aboriginal area - Green Architecture in Indonesia Speaker 1: Prof. SANGKERTADI, Vice Rector, UnSRAT, Indonesia Speaker 2: Dr. William Yi-Yuan Su, Chief R&D Officer and Chief Legal Counsel Incigt Inc., Chinese Taipei.

12:00– 12:30	<p>Panel discussion (Moderator: Dr. William Yi-Yuan Su) Expert 1: Assoc. Prof. Dr. Weerapon Thongma, President of Maejo University, Thailand. Expert 2: Ms. NGUYEN Thi Hieu, Multilateral Trade Policy Department, Ministry of Industry and Trade, Viet Nam. Expert 3: Ms. Liza V. Pangilinan, Supervising Science Research Specialist, Department of Energy, Renewable Energy Management Bureau, Philippines.</p>
12:30 – 14:00	Lunch
Virtual/Physical Training Course	
14:00 – 14:20	<p>Topic 1: Introduction to SDGs Lecturer: Dr. Cindy Hsueh, s.School, Feng Chia University, Chinese Taipei.</p>
14:20 – 14:40	<p>Topic 2: Introduction to renewable energy - GREEN ENERGY APPLICATIONS IN RURAL AREAS AND AWARENESS ON RENEWABLE ENERGY IN MEXICO Lecturer: Ms. Denise Yeazul Fernández Rojas, Urban Planning, UNAM, Mexico.</p>
14:40 – 15:00	<p>Topic 3: Indigenous cultural lifestyle Lecturer: Dr. Reiny Antonetha, TUMBOL, HEAD of International office in UnSRAT, Indonesia.</p>
15:00 – 15:20	Coffee Break
15:20 – 15:40	<p>Topic 4: Increasing indigenous inclusions of renewable energy technology and regulations for green energy applications Lecturer: Dr. William Yi-Yuan Su, Chief R&D Officer and Chief Legal Counsel Incigt Inc., Chinese Taipei</p>
15:40 – 16:00	<p>Topic 5: Agricultural waste management from indigenous cultural activities Sustainability of building material: A study case of fiber banana reinforced concrete in Manado region. Prof. Dr. Ir. ELLEN JOAN KUMAAT, Former Rector, Sam Ratulangi University, Indonesia.</p>
16:00 – 16:20	<p>Topic 6: Symbiosis energy model in the rural area Ir. Alicia Sinsuw, MT, Ph.D(cand), Assistant Professor, Electrical Engineering Dept., Universitas Sam Ratulangi, Indonesia.</p>
16:20 – 16:30	Closing Remark & survey
16:30 – 18:00	Spare time
18:00 – 20.30	Dinner (invited only)
Thursday, 23 March 2023 – Day 2 Workshop I	
08:30 – 09:00	Registration
09:00 – 09:30	<p>Topic 1: Bioenergy from Biomass for Rural Community- BIOMAN. Biogas Manado Dr. Liny Tambajong, Manado Eco Green Community & Circular Economy, Indonesia</p>

09:30 – 10:20	Topic 2: Green Cultural Life Speaker 1: Prof. Dr. Hanilyn Aguilar Hidalgo, Professor, College of Economics and Management, Central Bicol State University of Agriculture, Philippines. Speaker 2: Mr. Yuan-Horng, NA, Manager, Jin-Du Restaurant, Chinese Taipei.
10:20 – 10:40	Coffee Break
10:40 – 11:10	Topic 3: Sustainable Renewable Energy for Indigenous People Speaker 1: Dr. Cristhian Chicaiza-Ortiz, Assistant professor at the Universidad Regional Amazónica IKIAM (Amazon Regional University IKIAM), Ecuador.
11.10 – 12:00	Topic 4: SME Entrepreneurship Speaker 1: Dr Eros Manzo, Responsible of international cooperation of CNR-IIA, Italy. Topic 8: Scale-up Agricultural waste of bioenergy technology Prof. Dr. Dwi Susilaningasih, Senior Researcher at the BRIN, Indonesia.
12:00 – 13:30	Lunch
13:30 – 14:00	Topic 5: Green Vehicles Application in rural areas (On-line) Assoc. Prof. Dr. Ching-Ming Lai, NCHU, Chinese Taipei.
14:00 – 14:30	Topic 6: Microgrid applications in the rural area; Topic 9: Integration of Renewable energy into microgrid system Mr. Kenny Tseng, CEO for Mobii Green Energy Co., Ltd., Chinese Taipei.
14:30 – 15:00	Topic 7: Scale-up of solar PV in the rural area Dr. Pi-Fuang Chen, CEO for Zolargus Co. Ltd., Chinese Taipei.
15:00 – 15:20	Coffee Break
15:20 – 15:50	Topic 2: Green Cultural Life Introduction to Taiwan Indigenous Tribe Contemporary Artist (Indigenous speaker) Speaker 3: Mr. Yosifu Kacaw, Taiwan Indigenous Amis tribe Contemporary Artist, Chinese Taipei.
15:50 – 16:20	Topic 4: SME Entrepreneurship (Indigenous speaker) Speaker 2: Dr. Wei-Chieh Hua, General Manager, Splendid Marketing Ltd., Chinese Taipei.
16:20 – 16:50	Closing Remark & survey
18:00 – 20.30	Dinner (Banquet)
Friday, 24 March 2023 – Day 3 (Workshop II & Green Farm On-Site Learning)	
09:00 – 09:30	Gathering at the Hotel Ground floor
09:30 – 10.30	Heading to Nantou county (on the bus together)
10:30 – 11:00	Case Study 1: Real case practice Demo site learning (CEO of Green Birth Farm)
11:00 – 11:30	Case Study 2: Utilizing Symbiosis energy of renewable energy in the indigenous area (Green Birth Farm staffs)
11:30 – 12:00	Case Study 3: Experience sharing of biogas pilot plant in the rural area

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	(PhD Cand. Mr Arlex Chen)
12:00 – 13:30	Lunch at Jin-Du Restaurant and Group Photo
13:30 – 14:30	Heading to Sun-Moon Lake
14:30 – 16:30	Sun-Moon Lake Indigenous Village Visit
16:30 – 18:00	Back to Taichung city
18:30 –	Free Time

ANNEX 2 : Policy Recommendation Review

The APEC Legislation And Policy Framework For The APEC Green Energy In The Indigenous Communities

Topic 1: Aboriginal Land Planning and Climate Change

Source of indigenous people's rights: UN Declaration on the Rights of Indigenous Peoples (UNDRIP). This Declaration, adopted by the UN General Assembly in 2007, recognizes and respect for "indigenous knowledge, cultures and traditional practices contributes to sustainable and equitable development and proper management of the environment". Article 31 states that "Indigenous peoples have the right to maintain, control, protect and develop their cultural heritage, traditional knowledge and traditional cultural expressions, as well as the manifestations of their sciences, technologies and cultures, including human and genetic resources, seeds, medicines, knowledge of the properties of fauna and flora, oral traditions, literatures, designs, sports and traditional games and visual and performing arts." The second paragraph of this Article also requires the "States shall take effective measures to recognize and protect the exercise of these rights". Indigenous buildings or architectures are the combinations of indigenous culture, knowledge, arts, identification, technologies, etc. Therefore, the governments shall take any measures to prevent and provide redress for any actions that deprives indigenous people of cultural values, ethnic integrity. UN Convention on Biodiversity (UNCBD) established the goals of conservation, sustainable uses, and equitable benefit sharing, especially the use of their lands or territories and other resources from the indigenous people or tribes. Article 8 (j) requires the States "to respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities.....and promote their wider application with the approval and involvement of the holders of such knowledge, innovation and practices". The government has to ensure the participation of indigenous to elaborate and negotiate an international regime on access to genetic resources and benefit-sharing with the aim of adapting an effective implementation of this Article.

The UN proposed the Sustainable Development Goals in 2015 and the 7th Goal is affordable and clean energy. The indigenous building and communities shall also consider the local renewable energy development priority and assist its economy to achieve its renewable energy development goal. However, the government shall also consider whether the implementation of renewable energy facilities on the Aboriginal buildings or architectures could fit for the standards from the Construction Laws.

Europe

In Europe, the majority of indigenous people can be found within the Arctic region, including the Samoyed, Saami, Inuits, Crimean Tatars, Krymchaks and Crimean Karaites, Komi, Circassians and Uralic Nenets of the Siberian Arctic, and Russia's indigenous people.

The definition of architectural heritage includes monuments, groups of buildings, and sites. The monuments represent all buildings and structures of conspicuous historical, archaeological, artistic, scientific, social or technical interest, including the fixtures and fittings. The groups of buildings are identified as homogeneous groups of urban or rural buildings conspicuous for their historical, archaeological, artistic, scientific, social or technical interest which are sufficiently coherent to form topographically definable units. The sites indicate the combined works of man and nature, being areas which are partially built upon and sufficiently distinctive and homogeneous to be topographically definable and are of conspicuous historical, archaeological, artistic, scientific, social or technical interest. The EU member states are required by the Convention for the Protection of the Architectural Heritage of Europe¹ to take statutory measures to protect the architectural heritage.

European Union (EU) has established their renewable energy usage target to account for 20% of total energy consumption by 2020, and achieve 32% developing target by 2030. The Renewable Energy Directive II also clearly established that renewable energy generation shall achieve 80% of electricity by 2050, and 19.7% usage in heating and cooling from renewable energy by 2018. The Directive on the promotion of the use of energy from renewable sources also planned to adopt large scale bioenergy on transportation, heat and electricity industry sectors.

So far, there is no EU Regulations or Directive to provide greater protections to aboriginal communities or to promote renewable energy usage on the indigenous architectures. The EU has not yet established a centralized historical heritage conservation system or measures to protect those indigenous architectures or buildings. Those EU member states in Central and Eastern Europe own more experiences and held the heritage administration. The further protection of Aboriginal communities or buildings depends on local regulations.

In 1975, the Committee of Ministers of Council of Europe adopted the European Charter of the Architectural Heritage. The architectural heritage consists monuments, groups of buildings, and characteristic villages in the natural or manmade settings (Article 1). It recognizes the architectural heritage is an expression of history and helps people to understand the relevance of

¹ Convention for the Protection of the Architectural Heritage of Europe. <https://rm.coe.int/168007a087>.

the past life.² The Council of Europe adopted four conventions to preserve cultural heritage, including the Convention for the Protection of the Architectural Heritage of Europe in 1985, the European Convention on the Protection of the Archaeological Heritage in 1992, the European Landscape Convention in 2000 and the Council of Europe Framework Convention on the Value of Cultural Heritage for Society in 2005.

Article 3 of the Treaty of the European Union³ shows their respect for the EU's cultural diversity and ensures all cultural heritage will be well protected. Since most of the cultural heritage is located within the jurisdiction of the EU member states, the EU can only encourage cooperation among states and provide necessary support and supplement their conservation activities and safeguard cultural heritage of European significance. The Article 167 of the Treaty on the functioning of the European Union⁴ mentioned the protection of cultural heritage shall apply the principles of subsidiarity, proportionality and mainstreaming. The protection actions shall be taken by precautionary approach and preventive action to mitigate environmental damage.

Based on the Article 1 of the Convention for the Protection of the Architectural Heritage of Europe⁵, the architectural heritage is defined as “permanent properties” including monuments⁶, groups⁷ of buildings and sites⁸. Each Party of this Convention shall not only take statutory measures to protect the architectural heritage but also take specific measures or provisions by State or region to protect monuments, groups of buildings and sites. Therefore, the traditional buildings or communities of the European indigenous people could be protected by this Convention.

² Amsterdam Declaration, adopted at the Congress on the European Architectural Heritage. 1975. <https://rm.coe.int/090000168092ae41>

³ O.J. C 326, 13, 26.10.2012. Consolidated Version of the Treaty on European Union. 17. “It shall respect its rich cultural and linguistic diversity, and shall ensure that Europe's cultural heritage is safeguarded and enhanced.” https://eur-lex.europa.eu/resource.html?uri=cellar:2bf140bf-a3f8-4ab2-b506-fd71826e6da6.0023.02/DOC_1&format=PDF

⁴ O.J. C 202, 47, 7.6.2016. Treaty on the functioning of the European Union, 121. https://eur-lex.europa.eu/resource.html?uri=cellar:9e8d52e1-2c70-11e6-b497-01aa75ed71a1.0006.01/DOC_3&format=PDF

⁵ No. 25705. Convention for the protection of the architectural heritage of Europe. Concluded at Granada on 3 October 1985. European Treaty Series (ETS) No. 121. Protection of the architectural heritage, 3.X. 1985. <https://rm.coe.int/168007a087>

⁶ *Id.*, Article 1, paragraph 1, The monuments include “all buildings and structures of conspicuous historical, archaeological, artistic, scientific, social or technical interest, including their fixtures and fittings.”

⁷ *Id.*, Article 1, paragraph 2. The groups of buildings include “groups of buildings: homogeneous groups of urban or rural buildings conspicuous for their historical, archaeological, artistic, scientific, social or technical interest which are sufficiently coherent to form topographically definable units.”

⁸ *Id.*, Article 1, paragraph 3. The sites include “the combined works of man and nature, being areas which are partially built upon and sufficiently distinctive and homogeneous to be topographically definable and are of conspicuous historical, archaeological, artistic, scientific, social or technical interest.”

Indonesia

The Indigenous architecture of Indonesia combines ancient wisdom and constitutes elements of roots of woven reeds, paddy rice, or coconut leaves. Most of the houses and buildings are tall for considering the frequent heavy rain during monsoon season. The materials are wood or bamboo from the forest and are used as structures and non-rigid walls. These natural materials are easily accessed but lack of resilience against natural disaster, such as wildfires, earthquakes, typhoons, or other extreme weather events. These traditional houses also need extra energy for cooking, cooling, and lighting. Under the energy efficiency improvement and GHG emission reduction demands, it is necessary to introduce renewable energy into these traditional houses and buildings. However, whether these wooden or bamboo structures can support the weight of those extra renewable energy facilities is a great concern. The installation of renewable energy shall not only consider the strength of the structures but also need to prevent changing the unique outlook and appearance of these traditional houses.

The total greenhouse gas emission of Indonesia is 1543MtCO_{2e} in 2021, it is 37.7% increasing compare with the emission in 2010-2021 period. The building and construction are responsible for almost 26% of total energy consumption and process-related emissions in 2020. The building sector contribute 4% of energy-related CO₂ emissions. The Indonesian government submitted its economy determined contribution as 29% reduction against business-as-usual (BAU) by 2030, which is equal to 2,869 GtCO_{2e}. In order to reduce GHG emission, the building sectors needs to implement renewable energy facilities and reduce their energy consumption. The government also established the following laws and regulations to improve energy efficiency of the building and construction sectors.

Energy Efficiency Laws and Regulations in Indonesia

	Laws
1.	Law No. 28 of 2002 on Building (“Law of Building”).
	Regulations
1.	Presidential Regulation No. 22 of 2017 concerning the General Economy Energy Plan.
2.	Minister of Energy and Mineral Resources Regulation No. 14 of 2012 concerning Energy Management.
3.	Regulation No. 70 of 2009.
4.	ESDM Regulation No. 13.
5.	ESDM Regulation No. 7.
6.	Governmental Regulation No.16/2021 on Buildings.
7.	Regulation No. 21/2021 on The Assessment of Green Building Performance
8.	Minister of Energy and Mineral Resources Regulation No. 18 of 2014.
9.	Minister of Energy and Mineral Resources Regulation No. 57 of 2017.

The Green Building Council Indonesia (GBCI) learned and introduced the USA Leadership in Energy and Environmental Design (LEED) system for saving energy usage of the new buildings and reducing pollutions in the atmosphere. The new building projects are required to get LEED certification after the construction is finished. However, the traditional and indigenous buildings are not covered by this new suggestion.

These energy efficiency laws and regulations are targeted at new buildings. The materials and technology standards are also targeting the new buildings, including the usage of cement, iron and steel, aluminum, ceramics, plastic, and paints. Very few regulations provide safety standards for wooden structures and materials. Especially those traditional and aboriginal buildings are protected as historical heritage, and those new energy regulations might not be able to apply to these unique structures. Therefore, the Indonesian government might need to learn legislative experiences from other economies and establish regulations to protect these traditional cultural heritages.

In Indonesia, the government passed the Law Number 28 of 2014 Regarding Copyright.⁹ Article 40 (L) defined the scope of protected architectural works as “physical form of buildings, structuring the layout of buildings, technical drawings of buildings and models or models of buildings.” It covers the protection of Indonesian traditional architectures and recognizes them as a specific category of Copyright,¹⁰ and defines the Copyright on the Expression of Traditional Culture belongs to the government. Individual expression or creativity is protected by this Law. This Copyright Act adopted concepts of UNCBD (UN Convention on Biological Diversity) and protects the work of traditional cultural expressions, including traditional architecture. However, the work of expression of traditional culture is disappearing and the Copyright Law protection measures is not originated from the indigenous people. Furthermore, the indigenous people’s culture identities and sacred traditional architectural works cannot be duplicated without serving specific rituals and ceremonies and these processes and operations are not protected by the Copyright Law. Hence, the government shall work with Provincial government to provide more legal protection on traditional sacred architectural works combine with traditional cultural expressions.

⁹ the Law Number 28 of 2014 Regarding Copyright ("UUHC") . [https://wipo-int-res.wipo.int/edocs/lexdocs/laws/en/id/id064en.pdf](https://wipo.int/res.wipo.int/edocs/lexdocs/laws/en/id/id064en.pdf)

¹⁰ **Christine S.T Kansil, Abdul Gani Abdullah, Simona Bustani**, Urgency of Protection of Communal Rights of the Community of Yogyakarta Central Java on the Copyright of the Traditional Architecture Works Reviewed Under Law Number 28 of 2014 Regarding Copyright. Vol.24, Special Issue 1, **JOURNAL OF LEGAL, ETHICAL AND REGULATORY ISSUES** (2021). <https://www.abacademies.org/special-issues/volume-24-special-issue-1-title-business-ethics-and-regulatory-compliance.html>

Japan

All of the building constructions in Japan must follow Building Standard Law, enacted in 1950, and related regulations. The competent authorized agency is Ministry of Land, Infrastructure, Transportation and Tourism. All building construction in Japan must follow the code and the administration processes, however, some regional governments can have further requirements because of their special regional needs, such as snow accumulation or earthquake concerns.

The Japan government use the Law for the Protection of Cultural Properties by specific measures for preservation and utilization of their cultural properties and traditional techniques or skills. The indispensable traditional techniques or skills that requires further protection are designed as Selected Conservation Techniques. The cultural properties are separated as tangible and intangible properties. Tangible cultural properties include works of fine arts, crafts, buildings, and folk materials, and the protection measures are preservation, disaster protection and acquisition. The intangible cultural properties are performing arts, craft techniques, manners and customs, and folk performing arts with protection measures including subsidies for programs for training successors or for compiling records. Both tangible and intangible cultural properties are required to register in a designation system. This Law provides notification, guidance, and advice to the cultural properties owners and encourages them to protect and preserve those cultural properties on voluntary bases. The competent authorized agency on designation, selection and registration of cultural properties is the Ministry of Education, Culture, Sport, Science and Technology.

Based on the Law, the cultural properties include tangible properties, intangible properties, folk cultural properties, monuments, cultural landscapes, groups of traditional buildings, conservation techniques for cultural properties and building cultural properties.¹¹ The municipalities can designate a Preservation District for Groups of Traditional Buildings and develop a preservation project with municipal-level preservation ordinances. The municipal government can also apply to the economy government and promote the municipal “Preservation District for Groups of Traditional Buildings” to the “Important Preservation District for Groups of Traditional Buildings”. Currently, the Japan government already designate 110 Important Preservation District for Groups of Traditional Buildings in 90 municipalities in 43 prefectures, however, only 3 or 2 of them is related to the indigenous people or tribes in Yaeyama County of

¹¹ Barra E. Thornbury, *The Cultural Properties Protection Law and Japan’s Folk Performance Arts*. 53 *Asian Folklore Studies* 211, 211 (1994). And Chapter VI, Preservation and utilization of cultural properties.
<https://dl.ndl.go.jp/view/prepareDownload?itemId=info%3Andljp%2Fpid%2F11017639&contentNo=7>

the Okinawa Prefecture.¹²

In 1997, Japan government established the “Ainu Cultural Promotion Law” to provide legal authority and recognition of Ainu’s traditional usage right in fish and forest resources, and the promotion of Ainu culture and language.¹³ Based on the Law, the Ainu traditional culture includes language, woodcarving and textile making. However, this Law did not explicitly recognize the group right of indigenous communities. The traditional buildings called as *casi*, which is used as defensive fortresses, treasuries, sanctuaries for ceremonies. It is also a group right of the Ainu people and might not be protected by the Ainu Cultural Promotion Law. Therefore, the Ainu traditional buildings are not protected by the Japanese government.

Malaysia

The indigenous peoples living in the Peninsular Malaysia are Orang Asli, Orang Ulu and Anak Negeri groups constitute the indigenous population of Malaysia, they were accounted for 13.8% of the total Malaysia economy population. Although the Malays also aboriginal people to Malaysia, they constitute the majority of the population and also are dominant in politics, economic and main stream of the society. Therefore, they are not categorized as indigenous peoples to Malaysia.

Malaysia has diverse heritage buildings with cultural influence of Malay, Chinese, Indians and colonial architecture.¹⁴ The parliament established Economy Heritage Act in 2005¹⁵ to conserve and preserve domestic heritage buildings. The definition of heritage in this Act describes Economy Heritage, sites, objects and underwater cultural heritage. The cultural heritage also includes “tangible and intangible form of cultural property, structure or artefact and may include a heritage matter, object, item, artefact, formation structure, performance, dance, song, music that is pertinent to the historical or contemporary way of life of Malaysians, on or in land or underwater cultural heritage of tangible form but excluding natural heritage”.¹⁶ This Act did not specifically mention the indigenous buildings or architectures because the indigenous traditional buildings could be qualified as the elements of “their architecture, their homogeneity

¹² Agency for Cultural Affairs, Government of Japan. List of Important Preservation Districts for Groups of Traditional Buildings. Available at

https://www.bunka.go.jp/english/policy/cultural_properties/introduction/historic_buildings/list.html

¹³ Tessa Morris-Suzuki, Performing Ethnic Harmony: The Japanese Government’s Plan for a New Ainu Law.

16 The Asia-Pacific Journal 1, 1(2018). https://www.coah-repat.com/system/files/atoms/file/Performing_Ethnic_Harmony.pdf

¹⁴ GOH POI SZE, Conservation of Buildings in Malaysia with a Look at the Economy Heritage Act 2005. 3 (2015). https://www.umlawreview.com/uploads/8/8/9/7/88973184/thesis_paper.pdf

¹⁵ Law of Malaysia, Act 645, Economy Heritage Act 2005.

<https://gtwhi.com.my/wp-content/uploads/2020/12/Economy-Heritage-Act-2005.pdf>

¹⁶ Article 2, Economy Heritage Act 2005.

or their place in the landscape, are of outstanding universal value from the point of view of history, art or science” and identified as tangible cultural heritage¹⁷. These indigenous buildings or architectures could be nominated and registered as “cultural heritage significance” by this Act. The Malaysian government shall provide conservation policies and measures to those cultural heritage significances, including preservation, restoration, reconstruction, rehabilitation and adaptation or any combination.

The Ministry of Energy and Natural Resources of Malaysia (KeTSA) plans to reach 70% of renewable energy share in the economy installed capacity mix by 2050, and setting the target to reach 40% of renewable energy in the power mix in 2035. They usage of renewable energy can reduce 45% of GHGs emissioin intensity in the power sector to assist Malaysia to meet its 2030 NDC target and meet the carbon neutralily target by 2050. Malaysia Green Building Council (Malaysia GBC) also identify its promotion policies to achieve net zero buildings by 2050. These new regulations and policies are focus on new buildings, the heritage buildings are not covered by these renewable energy promotion targets. The conservation and maintainance of these heritage buildings are required to prepare the conservation plan and the prior permit application and acquirement are necessary procedure requirements. However, when these heritage buildings need to respond the energy efficiency improvement or need to install renewable energy facilities to improve their lighting system, cooling and heating system, or others, the introduction of these renewable energy plans might cause conflicts on the original conservation/preservation plan. The renewable energy implementation shall also consider the standards from the related Construction Act and regulations, such as the Malaysian Construction Industry Development Board Act 1994 (CIDB).¹⁸ There are several different procedures and permit application among bureaus. Therefore, a further combination or cross-agency communication is needed.

Chinese Taipei

The Indigenous People Basic Law (IPBL) in 2005 is the upstream and major legal sources to protect fundamental rights of indigenous people living in the Chinese Taipei. The major spirits and concepts of UNDRIP provided nutritious, guidelines and principles when establishing the IPBL. Indigenous peoples refer to the traditional peoples who have inhabited in the Chinese

¹⁷ Article 2, Interpretation, Economy Heritage Act 2005, Act 645, Law of Malaysia, 16. “cultural heritage significance” means cultural heritage having aesthetic, archaeological, architectural, cultural, historical, scientific, social, spiritual, linguistic or technological value;”

¹⁸ Laws of Malaysia, An act to form the Malaysian Construction Industry Development Board (CIDB) in 1994.

Taipei and are subject to its jurisdiction, including Amis, Atayal, Bunun, Hla'alua, Kavalan, Kanakanavu, Paiwan, Puyuma, Rukai, Taroko, Tsou, Tsao, Saisiyat, Sakizaya, Seediq, Yami, and any other tribes who regard themselves as indigenous peoples and obtain the approval of the central indigenous authority upon application. There are about 575,067 indigenous people, accounting for 2.4% of the total population. The 16 tribes established different building styles based on the function needed and the natural environment background. These traditional indigenous houses and buildings can be protected and preserved by the Cultural Heritage Preservation Act, established in 2016, and recognized as tangible cultural heritage as described in the Article 3, paragraph 1. The tangible cultural heritage includes monuments, historic buildings, commemorative buildings, group of buildings, archaeological sites, historic sites, cultural landscapes, antiquities, natural landscape and natural monuments. The Article 13 especially states the indigenous people's cultural heritage shall adopt the Regulations for the Treatment of Indigenous people's Cultural Heritage. The regulation states the central competent authority shall proceed and conduct a comprehensive survey of Aboriginal traditional buildings that features ethno-cultural characteristics and cultural differences of Indigenous people. These traditional buildings could also be nominated by individuals or groups. The central competent authority shall establish a review committee to provide field investigation and on-site interviews and complete meeting minutes as the record. These identified cultural heritage will be registered in the Registry system for tracking and could be free access by the general public. Article 24 also requires the management and conservation of the cultural heritage to prepare and complete both the conservation and restoration plans.

Chinese Taipei estimates its total greenhouse gas emission to be 214MtCO_{2e} (million tonnes of carbon dioxide) by 2030, and it plans to achieve carbon neutrality by 2030 and net zero emission by 2050. According to statistics, the CO₂ emission of the residential sector is 29.72MtCO₂ in 2020, accounting for 11.55% of the total emission of all sectors. The commercial sector is 26.64MtCO₂ in 2020, accounting for 10.35% of the total emission of all sectors. The government will require the residential sector to reduce 1.61MtCO₂, and the commercial sector will reduce 2.15MtCO₂ during 2021-2025¹⁹. In order to achieve the net zero target by the year 2050, the new buildings will reduce 100% of GHGs emission and existing buildings will reduce 85% of emissions.

Based on the promoted policy, it is clear to know the GHGs reduction responsibility did not cover the cultural heritage and traditional buildings. However, the traditional buildings,

¹⁹ Ministry of Interior and Ministry of Economic Affairs, Chinese Taipei. Second Phase GHGs Emission Control Action Project on Residential and Commercial Sectors. September 2022.

especially indigenous people traditional buildings, need extra energy for cooking, lighting and cooling. They also need to use extra energies and construction for maintenance and preservation process. Although the government provide subsidies to owners of those traditional buildings on renewable energy facilities installatioin or energy efficiency improvement, the usage rate and result remains low. The extra financial assistant or investment on these cultural heritages are necessary. Furthermore, the installation of renewable energy facilities might damage the structure or change the lootlook of the cultural heritage. More safety standards are needed especially the tradional buildings were built from natural materials such as woods or rammed earth. The energy saving, conservation and preservation, safety standard on the materials shall be considered as a combined solution for the traditional building protection, especially saving the indigenous people’s traditional buildings.

Thailand

The estimated indigenous population in Thailand is 5 million and accounts 7.2% of the total Thailand populations. The living geographical region in Thailand makes the indigenous people separated as four groups: (1) fisher communities called “Chao Ley”, including groups of the Mogan, Moglen and Urak Lawoi; (2) hunters living in the South called “Mani”; and (3) “Chao-Khao” indigenous people who is living in the Lorat plateau and different highland; and (4) the nine “hill tribes” including the Hmong, the Karen, the Lisu, the Mien, the Akha, the Lahu, the Lua, the Thin, and the Khamu are also recognized as indigenous people.

The Thailand parliament ratified the UN Convention on Biological Diversity (UNCBD) in 2003. Thailand voted in favor on the UN Declaration on the Right of Indigenous People (UNDRIP) during the General Assembly in 2007; however, its Constitution Section 70 used the term of “Ethnic group” but not indigenous people. In 2014, they further established the Council of Indigenous Peoples in Thailand (CIPT).

Thailand passed the Act on Acient Monuments, Antiques, Objects of Art and Economy Museums ²⁰ in 1934 & 1961 to protect their economies cultural heritage, and the central competent authority was assigned to the Fine Art Department²¹. Based on the terminology used in the Act, the traditional buildings and cultural heritage are not covered in this Act. Since the government had not recognized the indigenous people in that time, the “ancient monument” or

²⁰ Government Gazztte, vol. 78, No.66. August 29, 1961.

https://en.unesco.org/sites/default/files/thailande_act_1961_engl_orof.pdf

²¹ Weeraphan Shinawatra, The Conservation and Management of the cultural Heritage of Thailand: The Drafting of the Charter. 9 *JOURNAL OF HUMANITIES* 95 (2006).

<http://www.manusya.journals.chula.ac.th/wp-content/uploads/2021/06/6-95-102.pdf>

“object of art” defined in this Act did not include the traditional buildings of Thailand’s indigenous people. The concept of “cultural heritage” was accepted by the King Rama IV during late 19th centuries, and then gradually adopted by the government after their participation on the UNESCO conference for protection of tangible and intangible cultural heritage management during 2002²². The Restructuring of Government Agencies Act 2002 established Ministry of Culture, together with ten agencies, to engage on Thai culture protection. The Section 66, Section 80 of the Constitution of Thailand 2007 (B.E. 2550) provides full elements and associated laws to protect Thailand’s cultural heritage.

The cultural heritage management is divided into tangible and intangible cultural heritage. The tangible cultural heritage includes ancient sites, monuments, architecture, buildings, group of buildings, local urban sites, old towns, historic sites, archaeological sites, historic landscapes, cultural landscapes, ancient objects and various forms of art. However, the cultural heritage was focus more on the royal structures and Buddhist images and temples in early 20th centuries²³. Unless those indigenous traditional buildings are full with unique architectural features of the structures or outlook, it is not been able to be nominated as economy cultural heritage of Thailand. The regulations and policies show their rare protection on the Thai indigenous people’s traditional houses and buildings, even the government agreed the UNDRIP and other international conventions. The protection on the indigenous people remains weak and limited.

Conclusions and suggestions

The comparative study among the APEC member economies shows the protection of indigenous people’s traditional buildings and construction technologies are limited. More financial assistant and investment is needed because both protection of traditional structures and maintainness of utilization of indigenous buildings consume rich sources and technologies. Especially those indigenous peoples traditional building are located at remoted area, the infrastructure construction became extra expenses for the governments. It might not be enough for the government to keep using subsidies or compensation policies to support those owners and indigenous people. The government shall raise the Fit-in Tariff (FIT) price in indigenous people’s area. This price raising policy will encourage the private sectors to provide more economic benefits to the indigenous communities.

²² Ratchaneekorn Sae-Wang, Cultural Heritage Management in Thailand: Common Barrier and the Possible Way to Survive. 17 Silpakorn University Journal of Social Science, Humanities, and Arts 133, 141 (2017). <https://www.thaiscience.info/journals/Article/SUIJ/10986844.pdf>

²³ Worrasit Tantinipankul, Thailand’s neglected urban heritage: challenges for preserving the cultural landscape of provincial towns of Thailand. 3 Int. J. Tourism Anthropology 114, 117 (2013). <https://soad.kmutt.ac.th/wp-content/uploads/2018/10/2013IntJ1.pdf>

For better protection of the indigenous people and also improve the utilization of green energy technologies, the governments shall open the participation of the private sectors in renewable energy fields. The participations will also promote the new knowledge and assist the development of the safety standards. Second, the government shall promote and implementing adequate technologies within the indigenous people's communities. They should be able to select a proper renewable energy technology which can fit for their needs and such selection is done through their self-determination. In order to make self-decision, more education and promotions on renewable energy science and technologies shall be given to the local communities.

Topic 2: Agricultural Waste Management and Bioenergy in the Aboriginal Area

1. BACKGROUND

Indigenous Peoples are distinct social and cultural groups that share collective ancestral ties to the lands and natural resources where they live, occupy, or from which they have been displaced. Consequently, the land and natural resources on which they depend are inextricably linked to their identities, cultures, livelihoods, as well as their physical and spiritual well-being. In the APEC's developing economies, most indigenous people's land is located in remote rural areas. However, indigenous peoples often lack formal recognition of their lands, territories, and natural resources and are usually last to receive public investments in essential services and infrastructure face multiple barriers to participating fully in the formal economy, enjoying access to justice, and participating in political processes and decision making. This legacy of inequality and exclusion has made indigenous communities more vulnerable to the impacts of climate change and natural hazards [1].

Forests and agriculture are the main sources that cannot be separated from the lives of indigenous people. A wide variety of plants can be found in indigenous areas, which are used for various purposes other than food. For example, the use of tree wood as a raw material for houses, the use of certain types of plants to make traditional clothing materials, and others. In addition, indigenous people manage their agricultural land by planting rice, wheat, and other plants that are used for their daily needs and even for sale as economic value. In the management of this agricultural land, especially during harvest and after taking plant parts needed for a particular purpose, the remaining unused plant material will become waste. If it is managed properly, these agricultural wastes will become a source of renewable energy to support the lives of communities in indigenous areas.

In May 1996 WWF adopted a statement of principles on Indigenous Peoples and Conservation. These principles are meant as guidelines for the partnership between WWF and indigenous peoples' organizations for conserving biodiversity within indigenous peoples' territories and promoting sustainable use of natural resources. Reading through the principles it becomes clear that recognition of indigenous rights is considered important only insofar as they contribute to WWF's main mission, which is to conserve nature and ecological processes by:

- preserving genetic, species, and ecosystem diversity;
- ensuring that the use of renewable natural resources is sustainable for both now and in the future;

- promoting actions to reduce pollution and the wasteful exploitation and consumption of resources and energy [2]. Three main aspects are essential in implementing renewable energy technologies in the indigenous area, that is (1) Citizen participation is fundamental for the construction of the public policy - it provides legitimacy and allows working with a long-term horizon; (2) There is a need to balance the role of the government and the society - the government must play an active role, the private sector also has a role to play; and (3) Renewable energies and sustainable development represent an opportunity - for a better quality of life for all in harmony with the environment [3].

2. FOCAL POINT

2.1. Agricultural Waste Management in Indigenous Area

Indigenous peoples, the descendants of maritime and agricultural people who settled far and wide, developed methods for using plants for many purposes, including food, medicine, textile, household utensils, and construction. In each indigenous community, there were curative recipes to treat illnesses and injuries, which were passed down by oral tradition. The mountain forests were like an enormous pantry where they could go for resources at any time, on condition that they took only what they needed, leaving the rest for future generations.

Agricultural waste is generally defined as waste produced from various agricultural activities [4]. Agricultural waste is generated from the production processes of farming and livestock husbandry. Without proper management, agricultural waste may cause environmental risks.

Indonesia:

Indonesia has a population of approximately 260 million people, and the government recognizes 1,331 ethnic groups which are 95% of the population are indigenous peoples. During Indonesia's "Green Revolution" of the 1970s, farmers were encouraged by the government to adopt commercial agricultural practices. However, many indigenous people avoided this wave of modernity and still use traditional methods, and so-called heritage or heirloom seeds. Recent laws and government decrees use the term Masyarakat adat to refer to Indigenous Peoples. Law No. 27/2007 on the management of coastal and small islands and Law No. 32/2010 on the environment use the term Masyarakat Adat and use the practical definition of AMAN. The Constitutional Court confirmed the constitutional rights of Indigenous Peoples over their lands and territories in May 2013, including their collective rights over traditional forests. On 6 September 2017, President Joko Widodo signed Presidential Regulation No. 88 of 2017 on

Land Tenure Settlements in Forest Areas. The Presidential Regulation states that the Government will carry out land tenure settlements in forest areas controlled and used by the community.

Like many other aspects of Indonesians' life, farming has influenced the indigenous communities. Balinese coordinate farming communities according to nature. Farmers who irrigate their fields from the same spring or water source belong to the same community. Those communities organize the development of farming, solve issues, control water distribution, and arrange religious ceremonies. The traditional system is still in operation in Bali today. Rice terraces similar to those found in Bali can also be found in other parts of Indonesia, such as Sumatra and Sulawesi. However, they follow different philosophies because different belief systems are dominant in these areas. The organization and farming of rice terraces in those areas reflect local wisdom about how to farm in mountainous areas while preserving water. Javanese people are very philosophical about farming. Traditional Javanese farmers view farming as labor and a spiritual and existential duty. The farmers know what, where, and how to plant, and follow traditional seasonal rules, about what to plant at certain times for maximum results while preserving the balance of nature. The Javanese also continue to use traditional farming tools.

Forests are the main source that guarantees the life needs of indigenous peoples. In the past, the forest provided community members with most of their needs – from food to rattan. However, today the forest itself has been permanently altered. Various Indonesian laws, starting in 1999, require companies wishing to develop businesses to consult local communities at every stage of the process to obtain government permits. Many activities, especially logging, mining, and plantations, enter the indigenous areas. As a result of these activities, the natural environment of indigenous peoples becomes polluted and damaged [10]. The management and implementation of forests and agriculture activities in Indonesia already exist in the law, but more serious supervision is needed to avoid erroneous management because currently there is still a lot of forest burning when certain parties start clearing forests to carry out agricultural development or new businesses. Hence, waste management including agricultural waste is still one of the major problems in Indonesia.

There is an untapped potential for bioenergy using dedicated crops and residual flows such as forestry and agricultural residues, organic municipal solid organic waste, offal, sewage sludge, and landfill gas. Blending mandates on transport fuels drive the market for biofuels (E15 and B20 by 2025). Indonesia has a large potential for the use of alternative biofuel crops and for used cooking oil and animal fats for biodiesel production. Sustainable use of land remains a major challenge.

Chinese Taipei:

Currently, there are 16 officially recognized indigenous tribes in Chinese Taipei: Amis, Atayal, Paiwan, Bunun, Puyuma, Rukai, Tsou, Saisiyat, Yami, Thao, Kavalan, Truku, Sakizaya, Sediq, Hla'alua, and Kanakanavu. Every tribe has its own distinct culture, language, customs, and social structure. The population of indigenous numbers was 573,086 people (2020), or 2.42% of the total population of Chinese Taipei most of the tribes live in mountainous areas and about 287,789 lived in an Indigenous community [5]. Agriculture is one of the main industries in Chinese Taipei. It contributes to the food security, rural development, and conservation of Chinese Taipei.

Indigenous cultures in Chinese Taipei were deeply rooted in three dimensions: nature, object, and spirit which need to be accounted for in the renewal of cultural heritage. Community practices provide the cultural mechanism to accomplish this. The most significant is nature, which deals with food, land, and ecology [6]. As previously explained, the main natural resource is agriculture, either it is farmed or grows wild in the forest. Both have a function to support the life of indigenous communities. For example, at harvest time, the people will choose good crops to sell or consume, while the rotten ones will be left behind. Likewise, with rice or wheat and grains, after processing and cleaning, the unused residue will be left in the fields and becomes agricultural waste. In utilizing it for daily needs, there is bound to be a lot of agricultural waste, which if not managed properly will become a serious problem.

The agricultural waste of Chinese Taipei mainly includes rice husks, straws, and discarded mushroom bags. There are many ways to manage agricultural waste, which can be simply classified into two major categories: energy recovery and material recycling [7]. In general, most farming wastes were reused on farms, such as plowing/burying, bedding, or feeding. Some of these were materials recovered by composting for organic fertilizers and only a few were recovered by firing, incineration, or landfill to get energy from fuel or biogas.

The legal requirements of waste management and government policy measures have more or less promoted the development of recycling technology. Before 2018, an account of the regulatory constraints, most of the energy recycling of agricultural waste in Chinese Taipei focused on using livestock waste as input materials [8]. Recently, in response to the promotion of renewable energy, Chinese Taipei's recycling management measures and related regulations are revised. The Council of Agriculture has provided the regulation of the qualifications and behaviors of recycling organizations for recycling agricultural waste based on the Waste Disposal Act. The last amended date and major revision were in February 2019, which simplifies the application process of using agricultural land for waste recycling facilities, adding reuse

options for livestock manure, and encouraging energy recycling of agricultural waste [9]. The revised recycling management measures are expected to provide a convenient environment for improving the recovery efficiency of agricultural waste. The Waste Disposal Act, the Agricultural Waste Recycling Management Measures, and the Renewable Energy Development Act are the three main regulations that lead the development of Chinese Taipei's agricultural waste recycling, which are respectively regulated by three ministries of Chinese Taipei in Environmental Protection Administration (EPA), Council of Agriculture (COA), and Ministry of Economic Affairs (MOEA).

2.2. Bioenergy Development Potential in Aboriginal Area

Energy is the lifeblood of social-ecological systems. Without a local supply human community must depend on distant energy production and distribution systems, which typically have significant externalities, vulnerabilities, and limits. Before petroleum, biomass energy, particularly wood, was the most important source of energy to humankind. Bioenergy development effects on the well-being of Indigenous communities vary depending on the region and biomass source. Biomass is a renewable and potentially carbon-neutral source of energy. Plants harvested sustainably for fuel can grow again thereby sequestering carbon from the atmosphere [11]. Biomass has been considered a carbon-neutral fuel because the carbon dioxide (CO₂) emitted when it is burned is equal to that absorbed during growing through the photosynthesis route. The largest proportion of renewable energy in Chinese Taipei is biomass energy. With the promotion of policies and increased recycling awareness, agricultural waste recycling has become a growing business in Chinese Taipei.

Indonesia:

Indonesia is an archipelago economy that consists of more or less 17,000 islands from the western to the eastern part. Indonesia is the home of an estimated 50 to 70 million Indigenous Peoples. Currently, renewable energy share in the primary energy supply is dominated by biomass, hydro, and geothermal. Indonesia's Economy Master Plan for Energy Conservation (RIKEN) sets a goal of decreasing energy intensity by 1% annually between 2015 and 2025. Biomass is used to supply energy requirements, including power generation, home energy, fuel vehicles, and industrial facilities. Biomass production in Indonesia is approximately 146.7 billion tonnes per year. The amount of solid biomass waste potential in Indonesia is 49,807.43 MW. Solid biomass waste from forestry, agriculture, and plantations is the most potent waste e.g. rice,

maize, cassava, coconut, oil palm, and sugar cane. In addition to forestry and agricultural waste, livestock waste and urban waste obtain from processed biomass energy producers. Biomass production in Indonesia is approximately 146.7 billion tonnes per year [14]. Biomass energy policy in Indonesia follows Presidential Regulation No. 5/2006 on Economy Energy Policy as the basis for biomass energy development. It set the targets for an optimal energy mix in 2025, where renewables contribute more than 15% of the total energy mix. Thus, biomass energy is expected to contribute about 5–10% of the total energy mix in 2025.

There is considerable agricultural waste from both planting and livestock discharged into the environment, which needs better carbon and resource supply management. Nowadays, livestock waste management in smallholder farms is not enforced or monitored. A lack of awareness about the importance of waste treatment also factors into indigenous community-level decisions. Biogas was a considerable solution for waste management and energy resources, especially in rural areas, to benefit farmers in transforming animal manure into a source of energy and fertilizer. Biogas technology had the potential in reducing animal waste's negative impacts, and poverty-reducing agricultural support, energy, and fertilizer provided, to decline firewood consumption to keep a clean environment. Biogas can be generated from different biomass resources worldwide, including sewage and organic wastewater, landfills, livestock manure, organic solid wastes, and energy crops.

An advanced biogas pilot plant project was run at the end of the year 2018 in Manado City, North Sulawesi Province, Indonesia. Manado City is one of the capital cities in Indonesia province, located at 1.48 latitudes and 124.85 longitudes, with a population of 451,893 people and most are indigenous people. It is the collaboration between Feng Chia University, Chinese Taipei, and the Manado City government, through APEC ACABT. An innovative symbiosis energy (Symnergy) model for developing rural communities was investigated by embedding a two-stage biogas production pilot plant. It found that the slaughterhouse wastewater has value added for the pilot plant in Manado Slaughterhouse, Indonesia. The environmental and social impacts were investigated before and after the pilot plant was installed. It also found that the cowshed's 25-30 heads cows can produce biowaste 10-30kg/day and wastewater 2 m³/day as a substrate for biogas production in the pilot plant. The biogas of 1.3m³/day was collected to replace the LPG and save the money around USD 90.78/year. The villagers can gain an extra income of around USD 130.08/year from alternative bioelectricity production. In addition, the community may profit about USD 400-500 per year from selling chili by applying biofertilizers produced from the pilot plant. The transition to bioenergy technology can significantly reduce the consumption of kerosene and firewood in rural communities. It also may replace the usage

of LPG in the household for cheaper expenses. It revealed that the application of biofertilizers to chili plantations can increase the income of the rural community as the economic benefits. The other benefits found from this study showed that the symbiosis energy model can create jobs and provide educational capacity building to academic institutions and rural communities. The results showed that the Symnergy model was successfully verified as suitable for self-sustained rural communities [15].

Chinese Taipei:

Chinese Taipei's government announced its energy development plan in 2017 and decided to promote a no-nuclear power policy by the year 2025. The government will also promote and use renewable energy to generate electricity to 20% of total electricity generation by 2025. Renewable energy resources, including solar, wind, biomass, and geothermal, become the indigenous power resources to reduce dependence on imported energies since more than 99% of Chinese Taipei's energy is imported and the energy alternative is limited. The competent authority of the "Renewable Energy Development Act" (REDA) was assigned to promote and encourage the energy diversification and usage. Biomass is one type of renewable energy which identified by the REDA [12].

In order to sort out the power shortage problem in the Aboriginal area, an innovative bioenergy technology is to convert agricultural waste into electricity through a small-scale gasification power system without tar and wastewater problems. Afterward, the portable batteries charged from the above system are sent to the microgrid systems for supplying electricity to residential communities. For example, a 120kWe gasification power system can convert 500kg/hr of agricultural waste into 120kWh of electricity. One hundred of 1.2kW portable lithium batteries charged from the above system are installed into 20 sets of 5kW microgrids system. For the aboriginal area in Southeast Asia, a 5kW microgrid system can provide sufficient electricity to support 20 households of 4-member families and two street lamps. As a result, a decentralized power system for a 400-household village can be constructed. Moreover, by employing portable batteries, there is no need to install a gasification system for each community. The installation cost can also be reduced considerably.

To promote the use of bioenergy, the Bureau of Energy still focuses on biogas generated from the use of manures from pig farms. Those new anaerobic digestion systems with a total installation capacity between 30kW and 500kW are built on sewage, general wastes, and industrial waste treatment sites. Biogas can be produced through the anaerobic digestion of micro-organisms such as animal excrement and agricultural waste. According to the report on

guidelines for developing bioenergy research written by the Energy Commission in 1985, about 120 million tons of biomass are produced each year in Chinese Taipei, a large portion of which is not treated and utilized effectively.

A small pilot project of the advanced Biogas system has been installed in the indigenous farming land, called Green Birth Farm, which is located in Meixi Tribe, Nantou County, in the central part of Chinese Taipei, and is also known as the Seediq Tribe's seat. Green Birth Farm is implementing the concept of a "natural agriculture system," a sustainable farming approach that was learned from Master Han Kyu Cho of the Janong Natural Farming Institute. Green Birth Farm raises native hens and pigs in addition to producing various kinds of exotic fruits and veggies on a vast scale. Pig and fowl feed is made from mildly fermented natural materials. This farm produces fodder from agricultural wastes generated by a natural farming technique which are collected and mixed with soybean meal and organic kitchen wastes obtained from the Puli area using a mixer before being fed to the livestock [13].

The Advanced Biogas Pilot Power Plant system designed for the Green Birth Farm is similar to the biogas pilot power plant that existed in Manado City, Indonesia since 2019. The system consists of a collecting tank, a mixing tank, two anaerobic digestion tanks, a sediment tank, an aeration tank, and a final sediment tank. The final residue of this process will flow through the sediment/liquid separator, whereby the sediment residue will be channeled back to the first anaerobic digestion tank and the liquid residue can be used directly as a free natural fertilizer. This mechanism is called a closed-loop system. The Advanced Biogas Power Generator in Green Birth Farm was built with a 5kW capacity and can run for 3 hours per day. This pilot plant can provide 15kWh of electricity daily. Since the Green Birth Farm was located in the open area, it is developed to integrate with a solar PV system power capacity was built of 5kW and the system can run an average of 6 hours per day. Hence, the solar panel system can provide 30kWh of electricity. In total, these systems can provide 45kWh of electricity per day in Green Birth Farm. Besides bio-circular economy purposes, this project aims to be a new educational tourism spot that can provide new knowledge about the Green Synergy Solutions system. Biomass is, after all, the most complex form of renewable energy and has been given the least positive attention, but if handled correctly, it might well come to play a key role in a low-carbon economy.

2.3. Indigenous Social Awareness of Renewable Energy

Technologies that are technically and economically feasible in a given context may not be successfully implemented due to social resistance, and lack of awareness of the technology. Public opposition could then delay or obstruct the implementation of sustainable technologies and measures, such as renewable energy projects. However, in addition to these technical and economic aspects, it is essential to include an analysis of the social aspects that influence the acceptance of clean technologies and measures, including renewable energy generation technologies. 'Acceptance' is a concept that involves a reaction to something which is proposed externally, whereby acceptance is 'the act of accepting' and thus 'to give an affirmative reply to' something. Social or public acceptance is generally defined, as a positive attitude towards technology or measure, which leads to supporting behavior if needed or requested, and the counteracting of resistance by others. Acceptance that only covers an attitude without supportive behavior may be described as 'tolerance' [16]. Social acceptance is influenced by both the awareness of climate change and its impacts and the knowledge of renewable energy technology. Apart from awareness about climate change, the public must be sufficiently familiar with renewable energy technology. The perceived fairness of the preparatory and decision-making processes influences the people on the project evaluation. Procedures are considered to be fair when it's open and transparent, the public and stakeholders have a voice in decisions, and these inputs are considered by the decision-makers.

The indigenous cultural heritage is very close to nature, such as making clothes or crafts and housing with cellulose-based agricultural plantations. To balance both environmental sustainability and energy transition, the Chinese Taipei government started to develop the green energy industry in 2017 by promoting the Green Energy Industry Innovation Program and encouraging private participation in green energy investment. In 2021, the government launched Green Energy Industry Innovation Promotion Program 2.0 and continued to focus on energy conservation, creation, storage, and system integration. The goal is to be proactive in the above four areas and transform Chinese Taipei into a green energy center in Asia-Pacific. However, as renewable energy has grown, so too have associated sociopolitical complexities. For example, the common phenomenon of a not-in-my-backyard (NIMBY) mentality concerning renewable energy development [3], although many people support the idea of renewable energy in principle when faced with such developments that they perceive as potentially disruptive of or intrusive to their own lives, they may still resist such installations. One challenge faced by Indigenous communities is looking to move from preliminary, government-funded, feasibility studies, and community energy plans to bring to mind past experiences with industry partnerships in other

resource sectors. As with other more impactful resource developments, communities have to decide on the size and scale with which they are comfortable as it is increasingly recognized that large-scale renewable energy installations can also have negative impacts on surrounding human communities and ecosystems. Communities should not blindly embrace renewable energy development as a perfect no-impact solution and must also consider fundamental questions related to energy use. The indigenous communities that decide to pursue renewable energy projects may also expand and form partnerships with the stakeholders. Those interested in developing renewable energy projects in Indigenous communities also need to bear in mind the links between cultural and ecological restoration.

The APEC EWG14 2021A project is one of the capacity-building workshops and training to empower the indigenous people's social awareness of renewable energy and increase inclusion and sustainability for Green Energy Applications. The training was delivered by experts from different APEC economies. Through this project, the indigenous were trained on social awareness on accepting the dissemination of renewable technologies to use agricultural waste to become a renewable energy source for community self-sustaining using the symbiosis energy concept [17]. The event allows indigenous people to learn the basic skills of renewable energy technologies and get knowledge from experts about the importance of reducing CO₂ emissions in daily activities. The technical visit to the Green Birth Farm to experience the biogas pilot plant has widened the knowledge and understanding of the participants. From the Workshop, the participants clearly understand how renewable energy can support economic growth and sustain the cultural heritage.

A strategic partnership is a management approach used by two or more organizations to achieve specific goals by increasing the effectiveness of each participant's resources. It requires an open, trusting relationship between partners to achieve common goals. Chinese Taipei promotes and uses renewable energy to generate electricity to 20% of total electricity generation by 2025. To reach these targets, the increase of renewable energy share in production and consumption needs to be accelerated. The centralized energy production systems and corresponding regulatory frameworks need to be restructured towards a more flexible approach. Creating indigenous renewable energy partnerships supports the energy model of the future. It increases regional energy security. Additionally, it enables flexible policies for integrated working with multilevel communication. Partnerships provide access to green energy from local sources to urban consumers. Indigenous and rural areas will gain additional income, and infrastructure investments as well as financial and professional resources. Investing in renewable energy by local stakeholders means investing in local growth and creating local value. As long

as populations in indigenous areas see benefits instead of burdens, the energy transition will succeed.

3. CONCLUSIONS

Indigenous Peoples are distinct social and cultural groups that share collective ancestral ties to the lands and natural resources where they live, occupy, or from which they have been displaced. Forests and agriculture are the main sources that cannot be separated from the lives of indigenous people. Agricultural waste is generated from the production processes of farming and livestock husbandry. The agricultural waste of Chinese Taipei mainly includes rice husks, straws, and discarded mushroom bags. The simple way to manage agricultural waste has been classified into two major categories: energy recovery and material recycling. In some APEC economies, such as Indonesia and Viet Nam, there is considerable agricultural waste from both planting and livestock discharged into the environment, which needs better carbon and resource supply management. Nowadays, livestock waste management in smallholder farms is not enforced or monitored. A lack of awareness about the importance of waste treatment also factors into indigenous community-level decisions.

Chinese Taipei's government announced its energy development plan in 2017. To reduce carbon emissions, the government of Chinese Taipei set goals of gradually abandoning nuclear power plants by the year 2025 and proposed an energy composition plan by adopting 50% from natural gas, 30% from coal, and 20% from renewable energy, respectively. Biomass is a renewable and potentially carbon-neutral source of energy. To promote the use of bioenergy, the Bureau of Energy still focuses on biogas generated from the use of manures from pig farms.

The Local Energy mechanism is promoted by public policy, as a way to overcome the biggest difficulties around energy projects, such as lack of consideration for local community rights, and local economic and social development. In this sense, Local Energy means a socio-technic rearrangement of the frame or energy transition, generated through civil participation at the local, regional, and economy levels. Five elements are thought to determine the level of acceptance: awareness of climate change; fairness of the decision-making process; the overall evaluation of costs, risks, and benefits; the local context; and trust in decision-makers. Three main aspects are essential in implementing renewable energy technologies in the indigenous area, that is (1) Citizen participation is fundamental for the construction of the public policy - it provides legitimacy and allows working with a long-term horizon; (2) There is a need to balance the role of the government and the society - the government must play an active role, the private sector also has a role to play; and (3) Renewable energies and sustainable development represent

an opportunity - for a better quality of life for all in harmony with the environment.

Strategic partnerships between the Indigenous peoples with stakeholders from the government, private sectors, and academia are needed to be jointly involved in sustainably developing renewable energy. Indigenous and rural areas will gain additional income, and infrastructure investments as well as financial and professional resources. With the partnership, the indigenous people will be included in developing renewable energy with the local stakeholders by means of investing in local growth and creating local value. The Indigenous peoples can keep their heritage and culture, but they also can accept and learn about technology and knowledge.

REFERENCES

1. Nesterova, Y., *8 Whole-community approach as. Identities, Practices and Education of Evolving Multicultural Families in Asia-Pacific*, 2022.
2. Persoon, G., *Isolated groups or Indigenous peoples; Indonesia and the discourse*. Journal of Humanities and Social Sciences of Southeast Asia and Oceania, 1998. DOI: **10.1163/22134379- 90003899**.
3. Van der Horst, D., *NIMBY or not? Exploring the relevance of location and the politics of voiced opinions in renewable energy siting controversies*. Energy policy, 2007. **35**(5): p. 2705-2714.
4. OECD, *Glossary of statistical terms: Agricultural waste, 2021*, <https://stats.oecd.org/glossary/detail.asp?ID=77> (accessed 05 April 2023).
5. *Indigenous People Council., Council Confirmed Tribe Area*. Available Online: <https://www.cip.gov.tw/portal/docList.html>. (accessed on 05 April 2023).
6. Yeh, J.H.-y., et al., *Indigenous cultural heritage and revitalization: Community practices and local development*. Sustainability, 2021. **13**(4): p. 1799.
7. Hsu, E., *Cost-benefit analysis for recycling of agricultural wastes* Waste Management, 2021. **120**: p. 424-432.
8. Tsai, W.-T., *Regulatory promotion and benefit analysis of biogas-power and biogas-digestate from anaerobic digestion livestock industry*. Fermentation, 2018. **4**(3): p. 57.
9. COA, *2019a, Agricultural Waste Recycling Management Measures*. Laws and Regulations Retrieving System, Agricultural and Food Agency, Council of Agriculture, R.O.C., <https://law.coa.gov.tw/glrnewsout/LawContent.aspx?id=FL014744> (accessed 05 April 2023).
10. Plant, R., *Indigenous peoples/ethnic minorities and poverty reduction: Regional report*. 2002.
11. Lippke, B., et al., *Life cycle impacts of forest management and wood utilization on carbon mitigation: knowns and unknowns*. Carbon Management, 2011. **2**(3): p. 303-333.
12. Su, Y.-Y., *Economy Strategies for Integration of Bioenergy and High Shares of Renewables*. FFTC Agricultural Policy Platform, 2020.
13. Marcia, I., *Nature Go Back to Nature: Small Advanced Biogas Plant Using Natural Agricultural Wastes in Green Birth Farm*. FFTC Agricultural Policy Platform, 2022.
14. Kanugrahan, S.P., D.F. Hakam, and H. Nugraha, *Techno-economic analysis of Indonesia Power generation expansion to achieve economic sustainability and net zero carbon 2050*. Sustainability, 2022. **14**(15): p. 9038.
15. Sinsuw, A.A.E., C.E. Wuisang, and C.-Y. Chu, *Assessment of environmental and social impacts on rural community by two-stage biogas production pilot plant from slaughterhouse wastewater*. Journal of Water Process Engineering, 2021. **40**: p.

101796.

16. Batel, S., P. Devine-Wright, and T. Tangeland, *Social acceptance of low carbon energy and associated infrastructures: A critical discussion*. Energy Policy, 2013. **58**: p. 1-5.
17. *2023 APEC Workshop, Empowering Indigenous Social Awareness on Renewable Energy and Increasing Inclusion Sustainability for Green Energy Applications in APEC Regions [EWG 14 2021 A]*.

Topic 3: Renewable Energy Technology and Regulations in the Aboriginal Area

Abstract

This proposal aims to promote the synergistic development of renewable energy technologies by involving Aboriginal people to reduce global gas emissions to achieve net-zero emissions by 2050 to protect the earth from climate change issues. Each economy, especially in the APEC region, faces its own challenge in implementing renewable energy technologies and policies to meet efficient energy generation. The inappropriate approach and method of applying renewable energy technologies in the communities could lead to the failure of the implementation of the desired and potent technologies. This project provides the prospective topics for the policy dialogue including the policy recommendation on implementing renewable energy technologies by involving the Indigenous, rural, and remote communities. The Australian, Canadian, and U.S. strategies could be the baseline for promoting the regulation and policy related to renewable energy in Aboriginal areas. Increasing the funding, initiatives, and ownership opportunity followed by the networking initiation and good partnership practice between government, investors, developers, and Indigenous people potent improve the implementation of renewable energy technologies in Indigenous, rural, and remote communities. This policy framework review includes two main issues: The involvement of Indigenous, rural, and remote communities in renewable energy technology; and the Challenges and opportunities for renewable energy in aboriginal communities.

Background

This year, 2023, the world is on track to be at a critical tipping point in renewable energy. For the first time, greenhouse gas (GHG) emissions from the power sector, the world's largest source of emissions, are expected to decline. This is even though the world's electricity demand is still rising. Emissions are declining because the expansion of renewable energy (RE) sources, such as solar and wind power, is increasing demand [1].

This situation has been helped by new wind power and solar PV systems becoming cheaper than new coal and natural gas power. The new solar and wind power generation is getting cheaper than the existing fossil fuel power generation. Nevertheless, there are still huge difficulties to

overcome to implement massive renewable energy technologies to reach a huge community in the world, especially in APEC economies [2]. All these challenges include grid upgrades, dealing with the socioeconomics of the transition, dealing with vested interests, and electricity market restructuring. There's a lot that needs to be done [1].

As a result, economies have been more deliberate about developing and implementing policies for reducing GHG emissions from fossil fuels and promoting renewable energy. Provisions related to energy supply, such as the use of renewable energy resources, account for more than half of all climate legislation. In addition, more than 40% of legislation is introduced to improve energy efficiency on the demand side, such as the New Energy Vehicle Industry Development Plan and the 2020 New Energy Vehicle Promotion Subsidy Plan adopted in China in 2020, which is linked to a regulation to increase the share of new energy vehicles to more than 50% of sales by 2035 [3]. Unfortunately, companies are reluctant to internalize the environmental privilege of renewable energy and the externalities of fossil fuel energy because renewable energy initially costs more than conventional energy. Governments should address this market failure by adopting policies to bring down RE costs to levels below those for conventional energy. Energy legislation can stimulate institutions to innovate in renewable energy technologies, ultimately making renewable energy cost-competitive with fossil fuels [4].

On the other hand, about 20% of the world's population does not have access to a major electricity grid, and we also face the challenge of providing energy to remote communities. This tends to be the rural population in the developing world, to which the major grid networks do not extend [5]. Diesel or fossil fuels are used for heat and power in many Indigenous, rural and remote communities. While diesel is a reliable and familiar energy source, it can also impact the environment and communities [6]. Transitioning to zero emissions energy source continues to be important to Indigenous communities and needs to be considered by the Government. An optimal system for producing and distributing renewable energy is needed to reduce economic and energy poverty. The better capability of the RE system for remotes and rural areas consisting of the independent system with wind-hydro-solar energy are needed to support the Indigenous community in tackling their difficulties [7]. In this case, the green energy independent generation becomes one of the promising technologies that can be implemented for many Indigenous, rural and remote communities that need to be supported by the local government and policy making.

A. Potential Renewable Energy in APEC Economies

1. Emerging technologies in generating renewable energy.

With the overlapping goals of advancing net zero transitions, strengthening energy security, and competing in the new global energy economy, most economies worldwide are stepping up efforts to expand clean energy technology manufacturing. The current global energy crunch has become the defining moment for clean energy transitions around the world, and it will drive investment across multiple industries in the years ahead. Developing secure, resilient, and sustainable clean energy supply chains is essential [8]. Here is the list of potential renewable energy sources in some of the Asia-Pacific economies that could support their program to achieve net zero emissions.

Australia: In 2022, renewable energy more than doubled from 2017, accounting for 35.9 percent of Australia's total electricity generation. Rooftop solar, with 2.7 GW added throughout 2022, once again led Australia's renewable energy sector in terms of capacity added. In terms of generation capacity, wind accounted for 35.6% of all renewable energy sources and 12.8% of total energy generation in Australia [9].

Canada: Canada possesses one of the best wind energy potentials in the world. Canada's most rapidly growing source of electricity, wind power, produces 3.5% of Canada's electricity and is second only to hydro as a source of renewable energy. It is projected that by 2035, renewable energy sources such as wind, biomass, geothermal and solar will account for 12% of total electricity generation [2].

Chile: Chile's solar potential is especially noteworthy and is a global leader. There are several opportunities for solar, hydrogen and wind energy projects in Chile's environment. In Chile's efforts to reduce its carbon footprint, renewable energy sources such as solar and wind power play a significant role [10]. While the energy supply from biofuels and waste will be Chile's highest renewable energy source [11].

Indonesia: The total potential of renewable energy generation in Indonesia is predicted to reach 3,686 GW, which is dominate Individuals or groups could also nominate these traditional buildingss lower than hydropower and biomass energy which made up 43.1% and 24.6% of all resources, while solar energy have only 2.2% contribution [14].

Mexico: It leads geothermal energy and has significant hydro, wind, and solar potential. Between 2015 and 2019, Mexico will almost triple its electricity generation from wind and solar combined, as it has large untapped wind and solar resources. The number and scale of

renewable energy projects in Mexico have increased significantly over the last few decades due to the area's favorable conditions for renewable energy production [2], [15].

Chinese Taipei: Renewable energy is expected to count for Chinese Taipei's total electricity generation this year [12]. Solar power will contribute the most with 10.7 million MWh, followed by hydropower, waste-to-energy, and wind power with 5.8 million, 3.6 million, and 3.5 million MWh, respectively [13].

The United States (USA): Hydroelectric power is the largest source of renewable energy generation in the United States. Wind power, which currently accounts for about 43% of total renewable energy, offers the most tremendous potential for growth and is the largest renewable energy generator. Solar resources vary by region in the US, with total installed solar photovoltaic (PV) capacity projected to reach 135 GW by 2030. The potential for biomass and biogas technologies in the U.S. is also significant, potentially reaching 84GW in 2030 [2].

2. Regulation to Support Renewable Energy Implementation: Climate Commitment Targets Achieving Net-Zero Emissions and Current Supporting Regulation

The Paris Agreement on Climate Change in 2016 became a great moment for our community when the 55 Parties, including most of the APEC economies, agreed and committed to respond to the threat of climate change, all economies have committed to addressing this and not allowing the temperature to rise further to 1.5 degrees Celsius. As we know, each economy has problems in its territory in managing resources and solving the socio-economic problem, each economy has its target and strategies to fit with the Paris Agreement to respond to the bad effect of climate change issue. Here's a list of some economies' climate commitments to achieve net-zero emissions, in line with the Paris Agreement and the UN's Sustainable Development Goals (SDGs).

Australia: The Australian government is committed to responding to climate change by achieving net-zero emissions by 2050 or earlier and reducing greenhouse gas emissions by 48% from 2005 levels by the end of 2030. Each state in Australia is also required to meet this commitment by also targeting emissions reductions by 2030. The state of Tasmania has achieved net-zero emissions since 2015, while the state of Australia Capital Territory (ACT) has achieved 100% renewable energy since 2020, and so on. In Australia, several strategies have been planned to achieve this goal through the implementation of three key strategies: Rewiring the Economy (RWN), the Economy Electric Vehicle Strategy (NEVS), and the

Economy Rebuilding Fund (NRF). In the RWN, the government is investing USD224 million, USD102 million, and USD20 billion, respectively, to provide batteries for rooftop solar PV systems, the Solar Bank for unreachable households with rooftop solar panels, and to rebuild the grid system. The goal is to increase the share of renewable energy in the Economy market to 82% by 2030. For NEVS and NRF, the government supports more affordable electric vehicles and invests in clean energy manufacturing such as wind turbines, solar cells, battery manufacturing also hydrogen electrolyzers, etc. Australia also builds up a bilateral network with other APEC economic members, such as Indonesia, Japan, Papua New Guinea, the Republic of Korea, Singapore, and Vietnam, to collaborate on reducing GHS emissions. Australia also connects to Germany and the United Kingdom (UK) for a bilateral technology agreement related to hydrogen energy generation and drive low emissions solutions [16].

Canada: With the present electricity generation from renewable energy sources by 18.9%, Canada targeted to achieve a 40-45% emissions reduction of 2005 levels by 2030 which followed by an entirely emission-free of electrical sector by 2035, then Net-Zero Emissions by 2050. To achieve this optimistic target, one of its big targets of Canada is to provide affordable green energy with four main programs including energy innovation, energy efficiency, clean electricity and electrification, also clean fuels. This program implements the following three indicators: energy saved per year, total energy consumed per capita, and the ratio of energy produced by nonrenewable and renewable technologies. As a world leader in low-cost, sustainable, and reliable energy, the Canadian government is building a network with international organizations and other parties and economies to promote the growth of green energy technologies in every part of the world. Similar to Australia, Canada connects with the member of G7 and G20 also other APEC members including China, India, Japan, Mexico, the United States, also European economies [17].

Chile: Chile has an optimistic goal to reduce emissions after the Paris Agreement, aiming to generate 70% of energy from all renewable sources using green technologies to support the needs of communities by 2030. The economy law in 2022, called the Chilean Climate Change Framework, has stated to achieve net-zero emissions by 2050 and also regulated the maximum gas emissions of each sector in its economy development. As a leading economy in solar energy potential and the most affordable green hydrogen-based energy in the world, there are three important keys to accelerate this condition, which are to leverage the public-private partnership for energy transition, establish collaboration with

other parties and economies, and also give the similar opportunity to participate in a political activity related to renewable energy. For example, the Chilean government has established a program called "*Energía+Mujer*", which means "Energy+Woman", to reduce the stigma of male domination, especially in the economy energy sector [18].

Indonesia: As stated by The Economy Research and Innovation Agency (BRIN), Indonesia has committed to reducing GHG emissions by 43.2% with all efforts by 2030. The climate commitment of Indonesia to respond to the climate change threat was targeted in 2060 or even sooner to achieve Net-Zero Emissions [22]. To support this target, the Indonesia Minister of Energy and Mineral Resources has released regulation No. 2 by 2023 about the Implementation of Carbon Capture and Storage, as well as Carbon Capture, Use, and Storage in Upstream Oil and Natural Gas Business Activities. In line with this commitment and regulations, PT Pertamina (Persero), Indonesia's biggest Economy Energy Company, also implements some strategies for reducing GHG emissions while generating energy supplying economy needs by using renewable sources. Stick to the economy commitment, Pertamina also targeted Net-Zero Emissions by 2060. Pertamina is confident about reaching this target which showed by decreasing its emissions by 29.09% since 2010 also has a target to generate energy of 60 GW by 2060 from renewable energy sources including solar, wind, hydroelectric, and geothermal power generation. For example, in 2020, Pertamina built three biogas plants for energy generation in North Sumatra for treating palm oil mill effluent (POME) from the palm oil processing industry. As the largest economy for palm oil production, as represented by Pertamina, Indonesia chooses the strategies of Waste-to-Energy (WtH) by converting the POME into biogas. Three biogas plants were in Deli Serdang, Langkat, and Sei Mangkei regency which an energy generation capacity of 1000, 1000, and 2400kW per year with a total reduced gas emission of approximately 177,000 tons of USD_{eq} in a year [23].

Mexico: Renewable energy in Mexico contributed approximately 24% of the total energy source in 2019. With this achievement, Mexico has an optimistic target to have a 35% contribution of renewable energy by 2025 and achieve 50% by 2050 with Net-Zero Emissions by 2050. Since 2010, Mexico has been actively investing in increasing the capacity of renewable energy generation, including the provision of electricity subsidies to households [2].

Chinese Taipei: Heading to achieve Net-Zero Emissions by 2050, the Chinese Taipei Government released the "12 Key Strategies" as part of their energy transition. In general,

those strategies are clustered into four groups, they are Energy Technology, Industrial, Lifestyle Transition, and Social Transition. The listed 12 keys strategies are (1) Wind Solar PV; (2) Hydrogen; (3) Innovative Energy; (4) Power Systems Energy Storage; (5) Energy Saving; (6) Carbon Capture, Utilization, and Storage (CCUS); (7) Carbon Free Electric Vehicles; (8) Resource Recycling and Zero Waste; (9) Carbon Sinks; (10) Green lifestyle; (11) Green Finance; (12) Just Transition. The twelfth key strategy, named Just Transition, became an interesting program due to it showed that Chinese Taipei would give active participation in decision-making regarding emission reduction that supports the developing economies in achieving Net-Zero Emissions [19]. In line with this regulation and target, as the world's largest semiconductor chip manufacturer, TSMC (Chinese Taipei Company) has established the program named "Net Zero Project" by applying green technologies to run their company also implementing renewable energy activities with a target Net-Zero Emission practice by 2050 [20]. Supporting key strategy number 7 about Carbon Free Electric Vehicles, Gogoro Inc. (the world's leading battery-swapping for electric vehicles based in Chinese Taipei) and Enel X have collaborated to expand the battery-swapping station network by installing 2,500 new stations in more than 1,000 locations across Chinese Taipei [21].

The United State (USA): The U.S. has committed to achieving 100% clean electricity and net-zero emissions by 2030 and 2050, respectively, to reduce gas emissions to 50-52% below 2005 levels by 2030. Onshore wind, which has the greatest potential for energy generation in the U.S., is targeted to reach 25 GW by 2025, while offshore wind is targeted to reach 40 GW by 2030. The fast-growing development of renewable energy in the U.S. has been supported by efficient and effective policies related to the sector, which have implied lowering the cost of green technologies in the U.S [2]. One interesting project called Community Power Accelerator has been established to facilitate solar developers, philanthropists, investors, and community-based organizations to collaborate on developing the solar PV system to provide low-cost green energy in the community. On the other hand, the Wind Energy Technologies Office also contributes to increasing the accessibility and affordability of wind-based energy by releasing two kinds of funding. First, wind power system manufacturing for more Americans by amount USD28 million. Second, research funding on enhancing the efficiency of wind energy technologies for future applications [24].

B. Potential renewable energy technology application in Indigenous, rural, and remote communities.

1. Involvement of Indigenous, rural, and remote communities.

As a great purpose of APEC which is to create greater prosperity for the people of the region by promoting many live aspects including sustainable and secure growth as well as accelerating regional economic integration, the APEC have also created some projects to support the Indigenous and rural communities to promote their economy by expanding the international exposure of their local products and recognizing the sustainable management and energy efficiency in their area.

Energy is one of the most important aspects of human life. It is also essential to the livelihoods of Indigenous, rural, and remote communities. In line with any projects to reduce the total gas emissions, each economy in the world, especially in Asia-Pacific region, must consider about the renewable energy supply for Indigenous people who usually live in rural and remote area. In view of their natural condition of economies, the potential renewable energy technology could be applied for energy source will be affected by the characteristic of specific region of the Indigenous people living area. Here are some of the examples of renewable energy technology implementation for Indigenous communities in different economies.

Australia: Tiwi Islands, located in northern Australia, known as the "Island of Smiles" has been dominated by Indigenous population of around 2,500 people who lived mainly in Bathurst and Melville Island. Even though the solar and wind power will be the largest contribution for renewable energy in Australia, these two technologies have low efficiency to be applied in Tiwi Islands community due to their extreme weather especially during summer and winter. The solar photovoltaic (PV) power and batteries also their operation is not cost effective for Tiwi Islands. There are two potential technologies suitable for the Tiwi Islands communities which are direct combustion of woody biomass and bio-oil production through pyrolysis. Both technologies have been applied to the bioenergy production system using wood chips and waste from the local acacia (*Acacia mangium*) plantation to meet the energy needs of the area [5].

Canada: Atlin is a community located in British Columbia, northwestern Canada, which is dominated by Indigenous people from Indian groups. In this area, the source of energy is dominated came from hydropower since they are close to the Atlin Lake [25]. Another example came from the Métis village that is in Green Lake, dominated by the First Métis

community, owned the solar PV generation system. They have installed 96 panels in the system to support their community's energy needs in this solar energy project [26].

Chile: The Indigenous communities of Chiloé Island, located on the southern coast of Chile, showed the great practice of circular economy in some aspect, including waste management, local products, and energy generation. The Indigenous people are so creative to recycle the waste to become household utensils and furniture. This behavior is also coupled by applying renewable technology, such as wind and wave energy harvesting, for generating electricity on their island [27].

Indonesia: As a large tropical economy, Indonesia has great potential to generate renewable energy from various natural resources, including biomass waste. As a developing economy, some provinces in Indonesia still have rural communities that do not have access to the main energy supply. More than 16,000 biogas plants have been installed in ten provinces, including some provinces in Java Island, Bali, Lampung, Nusa Tenggara region, also South Sulawesi, to promote the use of massive biomass waste in rural areas [29]. Wind energy farms are also installed in some rural communities with an energy generation capacity of more than 200kW per year. For example, wind farms in Nusa Penida, Bali, and Sangihe, North Sulawesi, have the potential to generate 735kW and 240kW of energy, respectively [30].

Mexico: The Tehuantepec, a region in Oaxaca, is one of the most highly populated by Indigenous people in Mexico. The Indigenous population in this area made up 43.7% of the total population which relies on renewable energy generated by wind turbine power. As identified as one of the fitted places for wind farming, their system possibly generates up to around 6,200 MW in a year [31]. Some rural communities in the Nayarit region of Mexico may also use the sun dryer to treat their agricultural products. This sun dryer is a solar-powered machine used to dry and blend fruits to apply zero-emission production practices [32].

Chinese Taipei: The *Taromak* tribe, one of the Aboriginal communities in southern Chinese Taipei, has been using renewable energy generated by hydroelectric power since 1941 with a capacity of 200kW. The hydroelectric power generation remains active until now and the capacity has been upgraded to 800kW. To achieve 100% energy consumption from self-renewable energy generation, a solar PV system with a capacity of 10kW has been installed in this Aboriginal area [28].

The United States of America (USA): The total calculation of the potential renewable energy generation capacity in Indigenous communities, including American Indian tribes and Alaska Natives, across all 48 states in the U.S., showed a contribution of 6.5% to the total economy capacity. When calculated for the extended Tribal area, the figure reached 13.3% contribution to the economy generation. The solar PV system was the largest contributor of renewable energy in the U.S. Tribal area with 13,281 GW, followed by wind energy with a value of 1,816 GW per year [33].

Based on the above description, the indigenous, rural, and remote communities have great potential to apply emerging renewable technology for independent energy generation. The characteristics of each area, including the availability of resources, have a great impact on the selection of green technology to achieve an efficient production process. The success of projects in certain areas of indigenous communities in different economies could be inspiring and also provide a real example of how to manage natural resources in different communities.

2. Challenges and Opportunities for Renewable Energy in Aboriginal Communities

Canada has become recognized as a leader in engaging Indigenous communities in renewable energy generation efforts. There is a growing consensus on the importance of involving Indigenous peoples in all aspects of energy projects that affect their subsistence activities. This approach is consistent with broader policy and legal advances since 2004, including relevant court rulings on Aboriginal engagement. Canada's Economy Determined Contribution (NDC) explicitly recognizes the leadership of Indigenous communities in addressing climate change. The NDC facilitates and encourages Indigenous Peoples to determine their potential actions related to climate change issues, which also contributes to the economy renewable energy project. The Canadian government also gives access to Indigenous communities for achieving any kind of funding source for renewable energy projects to provide equal opportunities. The common practice applied by the Indigenous communities was the formation of consortia consisting of different Indigenous groups for sharing their resources to achieve equality in valued projects [2].

Indigenous communities own the second largest number of renewable energy assets after the Crown and private utilities. They are actively involved in more than 197 green energy initiatives. It is important to note, however, that not all forms of participation are consistent with the principles of self-determination and energy reconciliation. Approaches

include full ownership, financial benefits, royalty agreements, partnership arrangements, Indigenous funding, co-ownership, revenue sharing agreements, impact benefit agreements, and leasing agreements. Of these initiatives, the option of full or majority ownership has only provided a 41% share to Indigenous peoples in Canada. In addition, the Inuit communities have only six co-owned renewable energy projects, while the First Economies group has worked on the remaining projects. In this regard, some of the listed projects, particularly those in Saskatchewan, have been criticized for their co-ownership structures. Their argument is based on the perspective that resources should benefit all Saskatchewan residents [2].

To support the implementation of renewable energy generation among the Aboriginal communities, some funds are managed by the institution as part of the Canadian government such as BC First Economies Clean Energy Business Fund (FNCEBF) and Northern Responsible Energy Approach for Community Heat & Electricity Program (REACHE). The FNCEBF is provided by the Clean Energy Act. as part of the Canadian government to the First Economies communities specifically located in British Columbia. With a similar purpose to the FNCEBF, the REACHE program targets the Indigenous communities located in the northern part of Canada that is registered under Crown-Indigenous Relations and Northern Affairs Canada [2]. The funding provided was not limited to government sources. To encourage Indigenous communities in renewable energy, the funding also came from a local non-profit organization that has the same vision of reducing emissions from all sectors and socio-economic groups. For example, Indigenous Clean Energy (ICE) Social Enterprise has established some funding schemes such as Catalyst Program, ICE Network, and Global Hub. Under these schemes, the indigenous communities will achieve an opportunity for clean energy transition and connection with other groups to maximize the local potential including international relationships [34].

Like Canada's ICE Social Enterprise, Australia has established the First Economies Clean Energy Network (FNCEN) to support Indigenous communities in the economy energy transition to zero-emission technologies. Although the FNCEN ensures partnerships between First Economies peoples and renewable energy companies, it also provides some support in other aspects, including community organizations, legal advisors, and technical experts related to renewable energy systems. With guidance from the FNCEN in the form of expertise related to renewable energy manufacturing, business, and investment, the Indigenous people have the equal opportunity to get any jobs in this sector. Besides the jobs opportunity, this Network also provides projects to educate the communities for enhancing

their negotiating skill with potential investors such as the government and prospective industry [35].

As optimistic as the FNCEN, Indigenous Energy Australia (IEA) - a profit-for-purpose organization of Aboriginal people in Australia, has established a joint project with the Institute for Sustainable Futures, the University of Technology Sydney, to implement the renewable energy generation system in Aboriginal ownership land. Located in Longford, Victoria, the *Ramahyuck* Solar Farm is completely operated by Indigenous communities and supported by funding from the Australian Government. In this farm, the potential energy generation was calculated to achieve 4.9 MW which connects to the electricity grid in Victoria state. The profit from energy generation using renewable technology has been used for supporting the education of Indigenous people and also investing in health programs in this area [36]. The Government of Australia also stated to support a strategic project for creating clean energy facilities for the First Economies communities with total funding of USD5.5 million. Under the Department of Climate Change, Energy, the Environment, and Water, the Australian Government makes connections and partnerships with two reliable organizations on supporting the Indigenous communities across Australia which are the Economy Indigenous Australians Agency and the First Economies Clean Energy Network [37]. The U.S. policy for handling Indigenous-owned green energy facilities aims to facilitate the manufacturing of their localized energy generation and enhance their economy through applying some projects such as direct funding and grants, capacity building also training, and technical advisory for American Indian peoples also Native Alaskan communities. This kind of support was responsible to the United States Department of Energy (DOE) Office of Indian Energy that works since 2010 on managing around 200 Indigenous renewable energy generation facilities. Under this project, the U.S. Government has invested more than USD 114 million to cover all Indigenous communities in the U.S. Nevertheless, during the implementation of the project, some challenges were reported from the Indigenous community's perspective such as poor management of government agencies, long review times, and other bureaucratic obstacles [2].

In other places, such as Chile and Mexico, there were some conflicts between Indigenous people and developers of clean energy projects that can be an example to consider the approaching method to Indigenous communities. These conflicts happened specifically in the *Pililín* wind farm, located in Los Ríos, Chile, between the local Mapuche communities with Acconia Energy, a Spanish industrial company, due to the potential disruption in their area especially the *Mapuche's* sacred land and the rainforest of Valdivian

which also potentially affect their local tourism. As planned since 2015, this wind farm project from Acconia Energy is still suspended even have revised their Environmental Impact Assessment three times with adjustments by the local communities there. The *Pililín* local communities were not satisfied with their offer regarding the proposed plan, especially in the rainforest treatment that might be more than 2,000 years old. Even worse than the *Pililín* wind farm, some developers on renewable energy projects in the Tehuantepec region, part of Oaxaca, Mexico, acquired the Indigenous-owned land using inappropriate methods for building their wind farming system. Unethical methods such as intimidation and violence against the Indigenous communities were used by developers in constructing the wind parks on the ancestral ground of communal Indigenous-owned land. The construction and operation of the wind farm in this area have extremely good potential for power generation. That's why the developers tried so hard to acquire this land. A similar case occurred with the construction of the *Guuna Sicarú* wind farm in Mexico, which was canceled due to a lack of acceptance by the *Unión Hidalgo*, an indigenous community located in the area. Potentially becoming the largest wind farm in Latin America, the *Guuna Sicarú* wind farm project handled by the EDF (*Électricité de France S.A.*), a French company, not had sufficient consultation with the Indigenous communities due to the improper negotiation methods. The individual negotiations were selected and considered less representing the whole Zapotec communities of Unión Hidalgo. In this struggle for legalization, the EDF contract has been canceled by the Mexican Government on the *Guuna Sicarú* wind farm [2]. Lessons learned from these cases include the success of communication and negotiation with indigenous communities surrounding potential renewable energy sites. The good approach has been shown by the projects in Canada and Australia, which are linked to their economy organization that networks the Indigenous communities for smoother communication and negotiation. Also, the construction of renewable energy projects has focused on full or shared ownership with indigenous people, not just caring for the developers of these facilities.

Good and successful renewable energy projects have been achieved through collaboration between an Irish company called Mainstream Renewable Power (MRP) and investors from Chile. Under this program, 14 projects have been realized from 2014 to 2020 in partnership with Indigenous communities. Following the agreement, the MRP has committed to building the onshore wind farm named *Negrete Cruel* and *Puelche Sur* Wind Power including the community development fund that targets surrounding peoples. By carefully considering the aspects of environmental assessment with any adjustment

regarding the Indigenous communities' concerns, followed by the well-informed people, both localized wind farms were successfully built and remain active in energy generation [2]. The *Taromak* tribe, an Aboriginal community in southern Chinese Taipei, also become a good example of running a green energy project, in the form of hydroelectric power and solar PV system, that facilitates by the government and collaborates with Indigenous people. In Chinese Taipei was established the *Indigenous Peoples Basic Law* which protects the rights of various tribes in Chinese Taipei that are identified as Indigenous Communities, including equal access to education and even the facilities regarding the economy energy transition [28]. As stated in the *Indigenous Peoples Basic Law*, the participation and involvement of the Indigenous communities are required in realizing the renewable energy projects in the Aboriginal area, including the Indigenous ownership of land. Not only engaging the communities in the running projects but the profit shared must also be considered in case the projects will take any benefits from the Indigenous community's side, such as local resources, land, etc. Ignoring these aspects, which are clearly stated in *Indigenous Peoples' Basic Law*, could lure criticism and protest from the Indigenous communities nearby the renewable energy project and lead to the failure of the project. For example, the Taitung County Government has launched a project on manufacturing the solar PV system in Zhiben Wetlands which the *Katratripulr* tribe people declare the traditional territories since the 17th century. The protest from the *Katratripulr* clan, including *Ruvaniaw*, *Pakaruku*, and *Mafaliu*, happened in front of the local government building to withdraw the decision on constructing the solar PV system on their traditional territories without proper engagement approach to the Indigenous communities [38].

Different cases were found in Indonesia regarding the development of renewable energy facilities, especially in rural and remote areas. As a huge area occupation with more than 17,000 islands, the participation of local government in the realization of renewable energy implementation in the community is crucially needed. Unfortunately, the lack of legislation from the Central Government on the autonomy of local government at the level of province and below is dragging down the establishment of renewable energy facilities, especially in rural and remote communities. These conditions can be observed from the data on economy potential energy generation from renewable resources reach 442 GW in 2018, but the real energy generated in the same year was only 8.8 GW or approximately 2%. In the following year, this condition did not show any improvement. To promote energy generation from renewable resources that optimize the local potential of each area and community, the Central Indonesia Government has launched Presidential Decree No. 11, 2023, concerned

with Additional Concurrent Government Affairs in the Energy and Mineral Resources (ESDM) Sector in the Renewable Energy Sub-sector. Following the Presidential Decree, the involvement of local government in enhancing renewable energy generation on their territory has been secured by that legislation. In this Decree, the Central Government has the authority to provide any recommendations for geothermal business activities, supply and utilization management of biomass and/or biogas, including authority on managing the various renewable energies, including solar, wind, hydroelectric power, and energy conservation in all across the Indonesia territory. While the authority of the regional and local government covers the utilization of renewable resources within their autonomous territory, including biomass, solar, wind, and hydropower. The establishment of this legislation gives a positive impact on the development of renewable energy projects in rural and remote communities by encouraging regional and local government funding in this sector. Following this specific funding, the generation of renewable energy in each province and region potentially increases in the following years, which also supports the reduction of emissions in the communities, especially those living in rural and remote areas [39].

C. Proposed Topics for Policy Dialogue and Policy Recommendations

The development of renewable energy technology and regulations concerning the Aboriginal area, including Indigenous, rural, and remote communities, in the APEC territory, must be increased to achieve equitable success in every socioeconomic group. Derivates from various conditions and development levels in APEC territory related to renewable energy, here is the list of proposed topics for the next policy dialogue and also a recommendation policy for enhancing the Aboriginal community's involvement.

1. Increasing the opportunity for Indigenous ownership of renewable energy technologies to support their daily needs and promote the energy independent.
2. Providing funding programs and other initiatives that target the Indigenous community members to enhance the renewable energy generation in their area.
3. Ensure that funding and initiatives are achieving their goals and not falling short by designing monitoring methods and mechanisms.
4. Establishing the legislation that ensures the involvement of Indigenous people in renewable energy technology development.
5. Encouraging the Indigenous people to establish the non-profit organization to network the Indigenous communities with economy coverage.

6. Enhancing the collaborations between researchers, university academicians, government, private sector industry, and investors, and the Indigenous communities in renewable energy environment.
7. Mapping and planning of the local potential of renewable energy resources around the Aboriginal communities to respond to the problem of climate change.
8. Promoting the research on enhancing the efficiency of each technology in energy generation that involves technology and resource sharing across economies.
9. Creating good relationships, communication, and appropriate approach method between stakeholders, including both local and international developers.
10. Giving authority to the regional and local government to organize the specific resources in their Aboriginal, rural, and remote areas including the benefit sharing implementation.

Considering on involvement of the Indigenous, rural, and remote communities in renewable energy technology development and manufacturing during the energy transition, shortly gained equality in reducing gas emissions to achieve Net-Zero Emissions by 2050 to keep the Earth against climate change issue.

References

- [1] M. Henriques, “The clean energy milestone the world is set to pass in 2023,” *BBC*, Apr. 15, 2023. [Online]. Available: <https://www.bbc.com/future/article/20230414-climate-change-why-2023-is-a-clean-energy-milestone>
- [2] Institute for Human Rights and Business, “Community Ownership of Renewable Energy: How it Works in Nine Countries,” *IHRB*, Feb. 21, 2023. [Online]. Available: <https://www.ihrb.org/focus-areas/just-transitions/community-ownership-of-renewable-energy-how-it-works-in-nine-countries>
- [3] S. M. S. U. Eskander and S. Fankhauser, “Reduction in greenhouse gas emissions from economy climate legislation,” *Nat. Clim. Chang.*, vol. 10, no. 8, pp. 750–756, Aug. 2020, doi: 10.1038/s41558-020-0831-z.
- [4] Y. Liu and C. Feng, “Promoting renewable energy through economy energy legislation,” *Energy Econ.*, vol. 118, p. 106504, Feb. 2023, doi: 10.1016/j.eneco.2023.106504.
- [5] J. B. Trombley, K. K. Sangha, A. N. Andersen, and S. N. Thennadil, “Utilizing Locally Available Bioresources for Powering Remote Indigenous Communities: A Framework and Case Study,” *Energies*, vol. 16, no. 2, p. 666, Jan. 2023, doi: 10.3390/en16020666.
- [6] Government of Canada, “Clean Energy in Indigenous, rural and remote communities,” 2023. <https://www.canada.ca/en/services/environment/weather/climatechange/climate-plan/reduce-emissions/reducing-reliance-diesel.html> (accessed May 23, 2023).
- [7] N. Kumar, K. Namrata, and A. Samadhiya, “Techno socio-economic analysis and stratified assessment of hybrid renewable energy systems for electrification of rural community,” *Sustain. Energy Technol. Assessments*, vol. 55, p. 102950, Feb. 2023, doi: 10.1016/j.seta.2022.102950.
- [8] IEA, “Energy Technology Perspectives 2023,” Paris, 2023. [Online]. Available: <https://www.iea.org/reports/energy-technology-perspectives-2023>

- [9] Clean Energy Council, “The Clean Energy Australia report provides a comprehensive overview of the Australian clean energy sector,” Melbourne, 2023. [Online]. Available: <https://www.cleanenergycouncil.org.au/resources/resources-hub/clean-energy-australia-report>
- [10] A. Raihan, “Toward sustainable and green development in Chile: Dynamic influences of carbon emission reduction variables,” *Innov. Green Dev.*, vol. 2, no. 2, p. 100038, Jun. 2023, doi: 10.1016/j.igd.2023.100038.
- [11] IEA, “Chile data explorer,” Paris, 2023. [Online]. Available: <https://www.iea.org/countries/chile>
- [12] Taipower, “Overview of the Development of Renewable Energy,” 2023. <https://www.taipower.com.tw/en/page.aspx?mid=4495#:~:text=Installed capacity,power generation is 632 MW.> (accessed May 29, 2023).
- [13] C. Lin and J. Chin, “Renewables to contribute 10% of energy this year,” *Taipei Times*, Taipei, Jan. 29, 2023. [Online]. Available: <https://www.taipetimes.com/News/front/archives/2023/01/29/2003793293>
- [14] ESDM, “Renewable Energy Potential in Indonesia,” Feb. 04, 2023. [Online]. Available: [https://www.esdm.go.id/id/media-center/arsip-berita/miliki-potensi-ebt-3686-gw-sekjen-rida-modal-utama-jalankan-transisi-energi-indonesia#:~:text=Sekretaris Jenderal Kementerian Energi dan,potensinya 3.686 gigawatt \(GW\).](https://www.esdm.go.id/id/media-center/arsip-berita/miliki-potensi-ebt-3686-gw-sekjen-rida-modal-utama-jalankan-transisi-energi-indonesia#:~:text=Sekretaris Jenderal Kementerian Energi dan,potensinya 3.686 gigawatt (GW).)
- [15] S. Banacloche, M. A. Cadarso, F. Monsalve, and Y. Lechon, “Assessment of the sustainability of Mexico green investments in the road to Paris,” *Energy Policy*, vol. 141, p. 111458, Jun. 2020, doi: 10.1016/j.enpol.2020.111458.
- [16] A. O. of F. Management, “Australian Government Climate Change Commitments, Policies and Programs,” 2022. [Online]. Available: https://www.aofm.gov.au/sites/default/files/2022-11-28/Aust Govt CC Actions Update November 2022_1.pdf
- [17] Government of Canada, “Sustainable Development Goal 7: Affordable and clean energy,” 2023. <https://www.canada.ca/en/employment-social-development/programs/agenda-2030/affordable-clean-energy.html> (accessed May 30, 2023).
- [18] W. E. Forum, “How Chile is becoming a leader in renewable energy,” Jan. 04, 2023. <https://www.weforum.org/agenda/2023/01/how-chile-is-becoming-a-leader-in-renewable-energy/> (accessed May 30, 2023).
- [19] Economy Development Council, “2050 Net-Zero Emissions,” Taipei, 2023. Accessed: May 30, 2023. [Online]. Available: https://www.ndc.gov.tw/en/Content_List.aspx?n=B927D0EDB57A7A3A
- [20] TSMC, “TSMC Commits to Reach Net Zero Emissions by 2050, Acting on Responsibility to Environmental Sustainability,” 2021. <https://pr.tsmc.com/english/news/2865> (accessed May 30, 2023).
- [21] Gogoro, “Gogoro and Enel X Accelerate Chinese Taipei’s Energy Transition with Integration of Virtual Power Plant and 2,500 Battery Swapping Stations Across 1,000+ Locations,” Taoyuan, Apr. 18, 2023. [Online]. Available: <https://www.gogoro.com/news/enelx-2023/>
- [22] BRIN Public Relations, “Indonesia Targets Achieving Net-Zero Emissions by 2060,” Oct. 23, 2022. [Online]. Available: <https://brin.go.id/en/news/110605/indonesia-targets-achieving-net-zero-emissions-by-2060>
- [23] Pertamina, “Pertamina Power Indonesia: Biogas Power Plant,” 2020. <https://pertainapower.com/pembangkit-listrik-tenaga-biogas> (accessed May 30, 2023).
- [24] Office of Energy Efficiency & Renewable Energy, “Making Clean Energy More Accessible and Affordable,” Washington, DC, 2023. Accessed: May 30, 2023. [Online]. Available: <https://www.energy.gov/eere/articles/making-clean-energy-more-accessible-and-affordable>

- [25] Government of Canada, “The Atlas of Canada - Remote Communities Energy Database,” 2018. <https://atlas.gc.ca/rced-bdece/en/index.html> (accessed May 29, 2023).
- [26] Climate Atlas of Canada, “First Métis community-owned solar project in Canada,” Mar. 05, 2019. [Online]. Available: <https://climateatlas.ca/video/first-metis-community-owned-solar-project-canada>
- [27] UN Development Programme, “How Indigenous Communities in Chile can Inspire Global Action on the Circular Economy,” 2022. <https://www.undp.org/news/how-indigenous-communities-chile-can-inspire-global-action-circular-economy> (accessed May 29, 2023).
- [28] H.-L. Lai, “Situating community energy in development history: Place-making and identity politics in the Taromak 100% green energy tribe initiative, Chinese Taipei,” *Geoforum*, vol. 100, pp. 176–187, Mar. 2019, doi: 10.1016/j.geoforum.2019.01.006.
- [29] E. Rianawati *et al.*, “The potential of Biogas in Energy Transition in Indonesia,” *IOP Conf. Ser. Mater. Sci. Eng.*, vol. 1143, no. 1, p. 012031, Apr. 2021, doi: 10.1088/1757-899X/1143/1/012031.
- [30] D. L. Pristiandaru and N. A. Pambudi, “Wind Energy in Indonesia: Current Status, Potential, Challenge, Opportunities, and Future Policy,” *Indones. J. Energy*, vol. 2, no. 2, pp. 65–73, 2019.
- [31] P. Velasco-Herrejón, T. Bauwens, and M. Calisto Friant, “Challenging dominant sustainability worldviews on the energy transition: Lessons from Indigenous communities in Mexico and a plea for pluriversal technologies,” *World Dev.*, vol. 150, p. 105725, Feb. 2022, doi: 10.1016/j.worlddev.2021.105725.
- [32] S. Messina *et al.*, “Solar powered dryers in agricultural produce processing for sustainable rural development worldwide: A case study from Nayarit-Mexico,” *Clean. Circ. Bioeconomy*, vol. 3, p. 100027, Dec. 2022, doi: 10.1016/j.clcb.2022.100027.
- [33] A. Milbrandt, D. Heimiller, and P. Schwabe, “Techno-Economic Renewable Energy Potential on Tribal Lands,” Denver, 2018. [Online]. Available: <https://www.nrel.gov/docs/fy18osti/70807.pdf>
- [34] Indigenous Clean Energy, “Powering an Indigenous-led Clean Energy Future,” 2023. <https://indigenouscleanenergy.com/> (accessed May 30, 2023).
- [35] ARENA, “Reconciling Indigenous communities with the clean energy revolution,” May 31, 2022. [Online]. Available: <https://arena.gov.au/blog/reconciling-indigenous-communities-with-the-clean-energy-revolution/>
- [36] N. Heidi and C. Briggss, “How can Aboriginal communities be part of the NSW renewable energy transition?,” *The Conversation*, May 05, 2022. [Online]. Available: <https://theconversation.com/how-can-aboriginal-communities-be-part-of-the-nsw-renewable-energy-transition-181171>
- [37] Australian Government, “First Economies Clean Energy Strategy,” 2023. [Online]. Available: <https://www.energy.gov.au/government-priorities/energy-and-climate-change-ministerial-council/working-groups/economy-energy-transformation-partnership/first-economies-clean-energy-strategy>
- [38] Y. C. Chuang and C. S. Tsai, “Behind The Zhiben Solar Farm Controversy,” *New Bloom*, Jul. 21, 2021. [Online]. Available: <https://newbloommag.net/2021/07/21/zhiben-farm-controversy/>
- [39] A. P. Perdana, “Through the Presidential Decree, Local Governments are given the Authority to Manage Renewable Energy (translated from Bahasa Indonesia),” *Kompas*, Jakarta, Feb. 22, 2023. [Online]. Available: <https://www.kompas.id/baca/ekonomi/2023/02/22/lewat-perpres-daerah-diberi-kewenangan-kelola-energi-terbarukan>

ANNEX 3 : List of Speakers and Participants

SPEAKERS

Fang-Chih Chang	Chinese Taipei
Keng-Tung Wu	Chinese Taipei
William Yi-Yuan Su	Chinese Taipei
Cindy Hsueh	Chinese Taipei
Pi-Fuang Chen	Chinese Taipei
Yosifu Kacaw i	Chinese Taipei
Yuan-Horng NA	Chinese Taipei
Wei-Chieh Hua	Chinese Taipei
Kenny Tseng	Chinese Taipei
Francisco Merino	Chile
Cristhian David Chicaiza Ortiz	Ecuador
Dwi Susilaningsih Sumbito	Indonesia
Ellen Joan Kumaat	Indonesia
Sangkertadi	Indonesia
Liny Tambajong	Indonesia
Reiny Antonetha	Indonesia
Alicia Sinsuw	Indonesia
Francesco Petracchini	Italy
Eros Manzo	Italy
Denise Yeazul Fernandez Rojas	Mexico
Liza V. Pangilinan	The Philippines
Weerapon Thongma	Thailand
Nguyen Thi Hieu	Viet Nam

PARTICIPANTS

Oktovian Sompie	Indonesia	Kuan-Yin Pan	Chinese Taipei
Ari Sutanto	Indonesia	Yu-Xuan Liu	Chinese Taipei
Rima Yunica Tahir	Indonesia	Tsung-Hsien Chen	Chinese Taipei
Ahmad Suryono Wibowo	Indonesia	Raymond Chen	Chinese Taipei
Hieryco Manalip	Indonesia	Yu-Ting Song	Chinese Taipei
Grace Natalie Wicaksono	Indonesia	Chiung-Hao Tseng	Chinese Taipei
Khyrania Aldera	Indonesia	Cheng Han Michael Liu	Chinese Taipei Hui
Ivy Latief Soehono	Indonesia	Chen Renee Chiu	Chinese Taipei Lin Yu
Rayhan Landep Wiastomo	Indonesia	Chun	Chinese Taipei
Jayen Aris Kriswantoro	Indonesia	Ting-Wu, Ko	Chinese Taipei
Ivana Marcia Florence	Indonesia	Shih-Yun Chang	Chinese Taipei
Tiziana Davanzo	Italy	Min-Chen, Pan	Chinese Taipei
Yoshiki KITANO	Japan	Matías Lin	Chinese Taipei
Takuma Suzuki	Japan	Pin Chun Chen	Chinese Taipei
Dra. Neftali Rojas Valencia	Mexico	Tsai Wan Yu	Chinese Taipei
Peer Mohamed	Malaysia	Joy	Chinese Taipei
Hanilyn A. Hidalgo	The Philippines	Chang, Chi-Fang	Chinese Taipei
Keith Eduard S. Hidalgo	The Philippines	Chen Bo Jyun	Chinese Taipei
Rameshprabu Ramaraj	Thailand	Wu-Han-Xuan	Chinese Taipei
Yuwalee Unpaprom	Thailand	Jenifer Kristanto	Chinese Taipei
Winitra Leelapattana	Thailand	Liao Yuan-Yin	Chinese Taipei
Panate Manomaivibool	Thailand	Lena Chang	Chinese Taipei
Nuttapon Chanpichaigosol	Thailand	Yu-Shu,Chen	Chinese Taipei
Prakaidao Pomdaeng	Thailand	Tai-Hsiang, Tseng	Chinese Taipei
		Wei-Chun Chang	Chinese Taipei
		Shu-Chan, Lu	Chinese Taipei
		Rong-Rong, Lin	Chinese Taipei
		Yiu Cho,Tam	Chinese Taipei

ANNEX 4 : Slides

POLICY DIALOG – TOPIC 1

Aboriginal land planning and climate change Utilization of thinning timber and its residues in indigenous cultural area of the experimental forest

Speaker 1 : Dr. Fang-Chih Chang, Research Fellow, NTU, Chinese Taipei.

EWG 14 2021A – APEC Workshop
March 22-24, 2023, Taichung, Taiwan

Utilization of thinning timber and its residues in indigenous cultural area of the Experimental Forest, NTU

Ming-Jer Tsai^{a,b}, Shing-Wang Liu^a, Wei-Hsin Yeh^a, Chiang Wei^a, Fang-Chih Chang^a

^a The Experimental Forest, National Taiwan University
^b School of Forestry and Resource Conservation, National Taiwan University
March 22, 2023

Empowering Indigenous Social Awareness on Renewable Energy and Increasing Inclusion Sustainability for Green Energy Applications in APEC Regions

Outline

- Introduction of The Experimental Forest
- Utilization of thinning timber and its residues
- Co-prosperity Project
- Future prospects

Introduction

- Established in 1901 as the "Taiwan Practice Forest" (Tokyo Imperial University)
- In 1949, the forest was entrusted to NTU
- In 2002, re-named as College of Bio-Resources and Agriculture

Introduction

- lies in central Taiwan and administratively belongs to Lugu, Shuili and Kinyi townships
- from 220 to 3,952 meters covering 32,764 ha
- Aborigines: Bunun (93.5%) and Tsou (2%)
- living in Xinxiang, Luona, Jumei, Wangxiang and Dongpu tribes

Introduction

- Major objectives
 - Academic research
 - Teaching and field practice
 - Resources conservation
 - Demonstration in forest management

Millet Restoration

Introduction

Forest Resources

- Conifers like spruces and firs grow at high elevation, and five forest types are recognized as Fir-Spruce, Hemlock, Cypress, Pine and others.
- Hardwood forests (Ficus-Machilus, Machilus-Castanopsis and Quercus) are located at lower elevation almost all below 2,500 m.

Introduction

Wild Animals

- Large scale forests are important habitats for Taiwan's wild animals.

Classification	Number of Species
Mammals	23
Birds	128
Beetles	437
Amphibians	33
Butterflies	106
Moths	318

Thinning timber

Wood self-sufficiency in Taiwan

Year	Felling of the Trees (m ³)	Timber Imports (m ³)	Self-sufficiency rate (%)
2008	5118	674029	0.76
2009	4281	389668	0.66
2010	32799	6610699	0.49
2011	36913	6433426	0.55
2012	46230	6383219	0.68
2013	42219	5736194	0.63
2014	62271	6108417	0.92
2015	51608	5791572	0.76
2016	47043	5836356	0.67
2017	37964	4448104	0.58
2018	38265	5176953	0.27
2019	46914	4295517	0.70
2020	39943	4132160	0.59
2021	45261	5132102	0.67

Target: 5% (indicated by a green arrow)

Thinning timber

Thinning

- 1,800 m³/yr
- Promote the renewal of bad forest stands
- Adjust the growth space of trees
- Improve the composition and structure of the overall forest stand
- Promote the growth of the shape and quality of the remaining trees

Thinning timber

Relationship between annual average stocking volumes per hectare and forest age for Sugi artificial forest

Thinning timber

Box-Whisker plot of annual average stocking volumes per hectare for Sugi artificial forest

Location A- Akita, B- Akita & Yamagata, C- EXFO, Mate, D- Nara, E- Eastern Fujian & F- Pengzhou Sichuan, and G (EXFO, NTU)

Thinning timber

Annual average stocking volumes per hectare for Sugi artificial forest

Location	Annual average stocking volumes per hectare (m ³ /ha)
A	1.7428
B	1.7428
C	1.7428
D	1.7428
E	1.7428
F	1.7428
G	1.7428

Thinning timber

Carbon sequestration

Tract	Annual carbon sequestration of above-ground biomass per plant (kg plant ⁻¹ yr ⁻¹)	Annual carbon sequestration of above-ground biomass per hectare (ton ha ⁻¹ yr ⁻¹)	Annual carbon sequestration of above-ground biomass (ton yr ⁻¹)
Sitau	12.5	10.8	10013.2
Dungayue	10.4	12.6	30408.8
Hehe	12.4	12.7	35347.7
Shuili	5.2	4.3	1400.40
Neuacuo	11.3	11.9	18754.8
Changshuizong	0.9	3.1	2317.9
Total	52.8	55.5	98242.7

Thinning timber

Carbon emissions from building materials

	Import (kg CO ₂ /m ³)	Processing (kg CO ₂ /m ³)	RE (80%) (kg CO ₂ /m ³)	Distance (km)	Transport (kg CO ₂ /m ³)	Total carbon emission (kg CO ₂ /m ³)
Steel plate	1910.00	411.20	940.86	194	48.50	989.36
Aluminum plate	8225.00	724.59	2366.00	133	33.25	2399.25
Plastic plate	406.57	1038.98	1445.55	100	25.00	1470.55
Wood board		151.29		24.62	4.06	155.35

Thinning timber

Wood self-sufficiency in Experimental Forest, NTU

Year	Domestic timber	Exotic species
2017	488.77	18.77
2018	481.98	12.54
2019	481.11	2.40
2020	617.46	11.23
2018	478.10	1.72

Co-prosperity Project

Wooden pestle for music practice for elementary school and association of community development.

Co-prosperity Project

U-bunna ruzing
Bunna ruzing interpretative board of the migration history
Construction of the Bunna ruzing house education center

Co-prosperity Project

Makakas joint carpenter workshop
Training seeded aboriginal carpenter
Class-C Wooden Furniture Certification

Co-prosperity Project

Tsou traditional building

Wood residues

	100	95	90	80
WRR (%)	0	5	10	20
Calorific value (cal/g)	4,436,511.2	4,726,344.6	5,030,132.79	5,397,00.56
Ash (%)	3.0620.31	3.4720.07	5.2520.23	3.3920.10
Nitrogen (%)	0.0820.01	0.0820.01	0.0820.01	0.0820.01
Sulfur (%)	N.D.	N.D.	N.D.	N.D.
Combustion efficiency (%)	96.9	97.2	97.5	97.5

Wood residues

Steel slag dumping

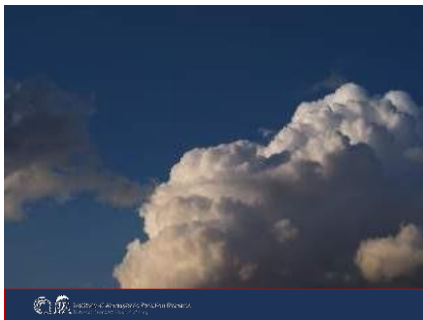
Future prospects

- Improving economic development
- Preserving the traditional culture
- Implementing the resource co-management
- SDGs & USR

THANK YOU FOR YOUR ATTENTION !

The End

Speaker 2 : Dr. Francesco Petracchini, Director CNR - IIA, Italy.



KNOWING ABOUT AND UNDERSTANDING THE QUALITY OF THE AIR MEANS ACTING TO SAFEGUARD FUTURE GENERATIONS, TOWARDS DECARBONISATION AND BELIEVING IN SUSTAINABLE DEVELOPMENT.

HEADQUARTER

- MONTELABATE (NA)

DIVISIONS

- FLORINZA
- ORSAIA (CA)
- ROCCA

INTERNATIONAL

- ORSAIA
- 20 permanent staff

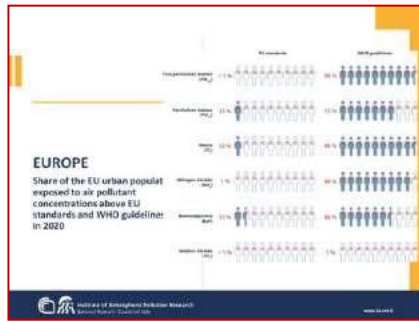
Relevant thematic areas

INTERDISCIPLINARY ACTIVITY OF THE INSTITUTE IN THE SPHERE OF TECHNOLOGICAL RESEARCH AND DEVELOPMENT



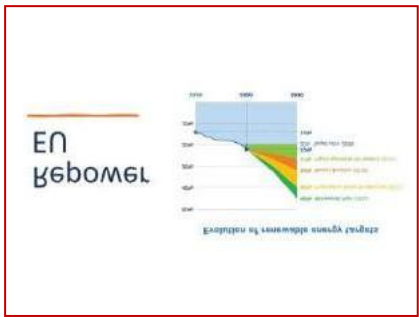
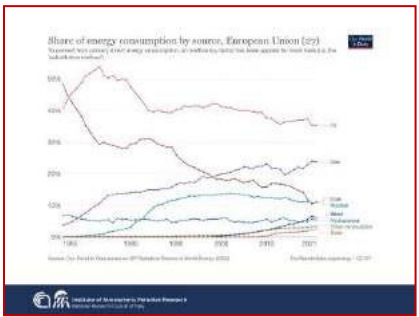
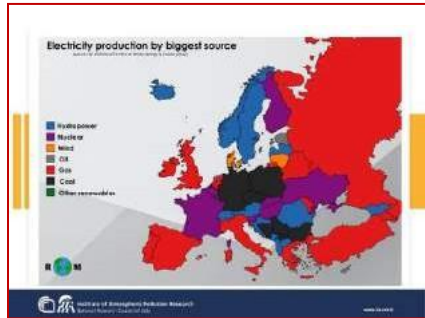
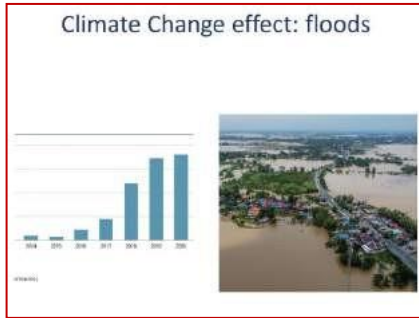
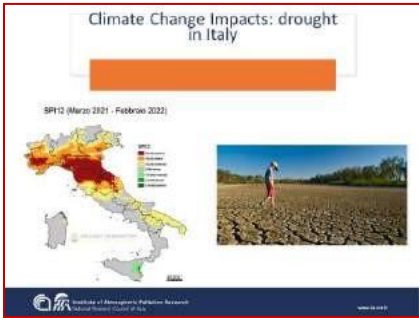
RESEARCH FIELDS

- ANTHROPIC IMPACTS ON THE ATMOSPHERE
- TECHNOLOGIES FOR MONITORING AND SHARING DATA ON ATMOSPHERIC POLLUTION
- GLOBAL CHANGES AND ECOLOGICAL TRANSITION

These describe and highlight the complexity of the Institute's national and international research and technological development activities to study, monitor and improve air quality, and to safeguard ecosystems and human health.

Climate Change: Glacier Melting

The Green Deal is a set of policy initiatives by the European Commission with the overarching aim of making Europe climate neutral by 2050.

- The goal is to reduce EU's greenhouse gas emissions for 2030 to at least 50% and towards 55% compared with 1990 levels.
- It will pave the way for new legislation on the circular economy, building renovation, biodiversity, farming and innovation.

The European Union to become the world's first "climate-neutral bloc" by 2050.

- Its goals extend to many different sectors, including construction, mobility, energy, transport and food.

Green new deal

We have a NIMBY problem in Europe

Social acceptance, defined as the active or passive approval by the public of a certain policy (Bertisch et al., 2015), is one of the most significant barriers toward achieving renewable energy targets.




NIMBY problem

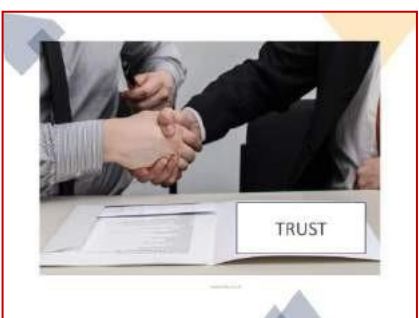


The study

Our study includes the qualitative analysis from 25 case studies to identify the prominent drivers of social and general social acceptance of renewable energy projects in communities in Europe.

We discuss the prominent drivers of social acceptance evidenced by the twenty-five studies in the following order:

- Trust
- Siting and technology
- Distributional Justice
- Effect socio-demographic factors on social acceptance

Trust in Governance and Procedural Justice

A transparent process and the dissemination of information improve the level of mutual trust between the developer and the community, thereby increasing social acceptance.

Distrust in the community has been shown to often be caused by a lack of knowledge on the efficacy of renewable energy and the process of development.

The studies indicate that community participation helps alleviate the community's concerns and increase the level of mutual trust. Disseminating information is crucial to correct any misconceptions about RES and REP. It is also important to mitigate the concerns about siting, environmental and human ecological impact, and the perceived benefits and costs.



Distributional Justice and benefits

- Distributional justice ensures that the benefits and costs of the project are fairly distributed.
- The literature suggests that distributional justice is an institutional determinant of social acceptance for every community across Europe.
- It is important that the perceived benefits and costs of an REP are equally distributed among all participants in a community. The results also affirm that financial compensation in some form is a powerful incentive for the local acceptance of an REP that may inconvenience the public. The trend shown by the results is that a financial community benefit will increase the public's support for a REP plant.



Siting and technology

Many issues related to siting are unique to REP and are caused by its specific physical characteristics. For instance, a common concern regarding biogas is the disrupting odour. Another frequent complaint regarding the physical characteristics of wind farms is the noise pollution. These findings suggest that further effort is needed to disseminate the knowledge in the best practices to alleviate these concerns.

In relation to the disrupting odour of biogas REP, several successful applications of odour control technologies are reported in recent literature, showing that smell can be efficiently avoided. Smells mostly depend on leakage and are affected by distance and wind speed.

Socio-Demographics

socio-demographic factors affect the local acceptance in varying ways depending on the specific community and the country.

Preliminary demographic studies could help overcome public opposition and better formulate a strategy for an increased rate of acceptance of REP by knowing the size and composition of the target audience most likely to be based or opposed.

Based on this literature review, the trend indicates that higher levels of acceptance and awareness correlate positively with a higher level of education and a younger age.

Results

Trust in principal actors remains a significant driver in local acceptance, trust in local authorities and developers must be gained by the public.

The information shared with the public should be of high technical quality, including data related to the economic and environmental impacts including cost-benefit analysis of technological solutions adopted by developers for a specific REP.

Factors such as education and income of residents are key factors affecting public acceptance of any REP installation.

Economic and social advantages due to the installation of a REP would certainly favour public acceptance and would foster. Compensation measures such as reduced energy costs for residents, the development of recreational infrastructures, increased environmental quality, and foreseen increases of the tourism industry are all factors that have a strong influence on public opinion and acceptance.

Biogas Nimby in Italy

Context

Italy: 2^o European Biogas producer
More than 1550 plants

- Prejudices on:
 - Health
 - Pollution
 - Smells
 - Economic speculation

SCHOOL TOUR:
7 REGIONS
1000+ STUDENTS

ABR PROTOTYPE
INSTALLED ON
TRUCK

COMIC
ADVENTURE
(APP)

Benvenuto in Arborea ne parla
la cittadinanza discute di biogas e biometano.

Benvenuto in Andria ne parla
la cittadinanza discute di biogas e biometano.

ISOLE SOSTENIBILI
per energie pulite e mobilità

Energy, Circular Economy, Water, Mobility
The challenges for Italian islands and how practices from the world

Smart island projects in Italy

ITALIAN SMALL ISLANDS: PRESENT CONDITION

- Over sized power generation plants
- Low presence of renewable sources
- High presence of electricity in end use
- Poor diffusion of energy efficiency solutions and energy saving techniques
- Dependence on mainland for fuel, water, raw materials and waste disposal
- Need to separate separate collection and waste disposal systems

CHALLENGES FOR THE SMALL ITALIAN ISLANDS

To increase the production of energy from renewable sources and accompany it with energy efficiency measures in all uses, so as to gradually reduce the power stems from existing fossil sources until they are closed definitively within a few years.

- 1 To close the material cycle, through a careful chain of separate collection, recovery and reuse that covers all possible materials (paper, plastics, metals, etc.) and the enhancement of the organic fraction for production of compost and biomethane / biogas.
- 2 The creation of a virtuous model of water resource management, precisely because water is a scarce and most precious resource on the islands and its careful management and recovery is fundamental.
- 3 To sustainable mobility, because the smaller islands have accessibility and travel management problems in particular in the months most frequented by tourists.

CNR-IRA and The Clean Energy for EU Islands Secretariat

During Summer 2019, the Secretariat selected national contacts for each Member State in which there are islands.

In Italy this role has been assigned to the CNR-IRA.

CNR-IRA and the Secretariat have signed an agreement with the following objectives:

- Dissemination
- Engagement platform
- Cooperation between the different levels of governance
- National Feedback (Netherlands Transition Program)

SMART ISLAND LAMPEDUSA

Goal of the project: to develop an innovative model of Smart Island. Lampedusa will be a completely innovative socio-economic system compared to other small islands, no longer based on a centralized energy network and monopolistic production, but on a progressively multilateral system with a plurality of productive poles and active users able to interact with an intelligent network (smart grid).

Today the grid manager is a fossil energy producer, and during the project it will gradually become the manager of a Smart Grid, able to absorb, smooth, store and redistribute the energy generated by innovative and renewable electricity production plants.

THE 3 STEPS FOR SMART ISLAND

- 1) Reduction of electricity demand
- 2) Production of 50% electricity from RES
- 3) Production of 100% electricity from RES

LAMPEDUSA: ENERGY CONSUMPTION

ΥΠΗΛΟΘΑΞΙΣ

SEASONALITY

Red line: February 1st
Blue line: August 15th

STEP 1 - REDUCTION OF ELECTRICITY DEMAND

Measure	Type of intervention	State of the art	New available technology	Energy saving	Barriers	Public incentives
Domestic electricity	LED lighting	Standard	LED lighting	10%	Cost	Yes
	Smart meters	Standard	Smart meters	5%	Cost	Yes
	Energy audits	Standard	Energy audits	5%	Cost	Yes
	Smart meters	Standard	Smart meters	5%	Cost	Yes
Public lighting	LED lighting	Standard	LED lighting	10%	Cost	Yes
	Smart meters	Standard	Smart meters	5%	Cost	Yes
Industry	Energy audits	Standard	Energy audits	5%	Cost	Yes

Electricity reduction = 34%

STEP 2 - Production of 50% electricity from RES

RES	MW	MWh/year	Barriers	Public incentives
PV roof	3	3600	3600 € registered buildings authorisation;	Yes
PV soil	2.5	3500	3500 € landscape authorisation;	No
wind <200kW	1.5	3750	3750 € landscape authorisation	Yes
Tot	7	10850		

STEP 3 - 100% RES

RES	MW	MWh/year	Barriers	Public incentives
PV roof	4	5000	5000 € registered buildings authorisation;	Yes
PV soil	3	4200	4200 € landscape authorisation	No
Concentration PV	3	5100	5100 € landscape authorisation	No
Wind tower	3	3000	3000 € landscape authorisation	No
Wind <200kW	3.5	4750	4750 € landscape authorisation	Yes
Water storage	5	2500	2500 € national environmental authorisation	Yes
Tot	15.5	20350		

RES SITE IDENTIFICATION

CITIZENS INVOLVEMENT

CITIZENS INVOLVEMENT

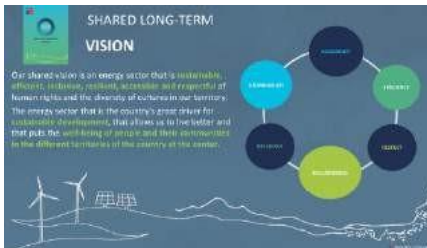
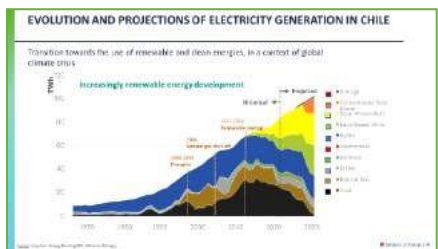
Thank You!

petracchia@ira.cnr.it

POLICY DIALOG – TOPIC 2

Agricultural waste management and bioenergy in the aboriginal area

Speaker 1: Mr. Francisco Merino, Head of the Dialogue Processes and Indigenous Consultation and Participation Unit of the Ministry of Energy, Chile.



- MAIN ASPECTS OF THE CHILEAN ENERGY POLICY**
1. Citizens participation is fundamental for the construction of public policy; it provides legitimacy and allows working with a long-term horizon.
 2. There is a need to balance the role of the state and the market; the State must play an active role, the private sector also has a role to play.
 3. Renewable energies and sustainable development represent an opportunity for a better quality of life for all in harmony with the environment.



GUIDELINE AND STANDARDS

Social Energy Challenge

SOCIAL BARRIERS

- "Liability Risk"
- Lack of knowledge about technology
- Lack of territorial planning
- Renewable Energy potential are in indigenous lands and rural sectors. Use territories and natural resources.
- Renewable Energy potential in areas of high biodiversity value
- Urban expansion in rural sectors
- Pronouncement of courts of justice for judicialization projects.

FOCUS

FOCUS

INITIATIVES TO REDUCE GAPS IN ENERGY WITH INDIGENOUS PEOPLES AND RURAL SECTORS

- Community Engagement
- Workshop about Energy in potential lands.
- Academic and Association support to communities.
- Guideline and standards with Human Right approach and Indigenous Peoples criteria

INITIATIVES TO REDUCE GAPS IN ENERGY WITH INDIGENOUS PEOPLES AND RURAL SECTORS

- Technical Assistance with:
 - World Bank
 - IDB
 - University of Maryland
 - Environmental Impact Assessment System
 - Technological tours

Technical Assistance

WHY ANALYZE THE RISKS AND SOCIOENVIRONMENTAL IMPACTS OF CLEAN ENERGY IN CHILE?

- Chile is an OECD country, with a multilateral vocation, an open economy.
- Scenario of commitment to decarbonization and energy transition.
- Geothermal, solar and wind energy essential for a renewable electrical matrix.
- Investment opportunity for renewable energy companies.

SOCIO-ENVIRONMENTAL GAPS IN GEOTHERMAL AND WIND ENERGY REPORT (WORLD BANK-GOVERNMENT OF CHILE)

- **Promote Profile Sharing:**
 - Ensure that geothermal concessions are awarded on lands without indigenous claims.
 - Decrease the extension of the request for concessions.
 - Avoid excessive economic cover areas at high ecological or cultural value.
- **Correct the regulations regarding water rights by geothermal energy.**
- **Use the concession decree to raise socio-environmental standards.**
- **Consult and cooperate with indigenous participation during the exploration-concession process.** Implement operational standards to improve participatory processes to identify impacts and community relations.
- **Early training of indigenous communities.**
- **Public consultation for:**
 - **Promote long-term social investment agreements.**
 - **Generate shared and transparent knowledge for socio-environmental assessment.**
 - **Improve the regulatory conditions for rights of use.**
 - **Improve or create complex systems.**
 - **Classify ecological impact lands.**
- **Integrate the area of community relations into the strategic dimension of the projects, having social impact, paying special attention to early and permanent relations with the communities.**

STRENGTHENING FINANCIAL INCLUSION, ESG & SUSTAINABLE FINANCE FOR WOMEN & INDIGENOUS GROUPS IN CHILE

"Chile's financial sector is dynamic and responsive to the need for accelerating financial inclusion in the country. Yet, women and indigenous groups still face significant barriers in gaining access to financial products and services. Challenges include the lack of credit histories, assets, incomes, and formal education among many others."

"Most crucially, banks can also consider how their sustainability/climate related activities can be diversified to meet national objectives of financial inclusion. Chile can learn from existing models from around the world on ways to strengthen financial inclusion, ESG and sustainable finance for its women and indigenous groups."

2ND NATIONAL PLAN BUSINESS AND HUMAN RIGHTS (2022 – 2025)

Objetivo	Medidas de acción	Plazo estimado de ejecución
Acción 1: Mejorar el acceso a servicios financieros para las mujeres y los grupos indígenas.	Implementar programas de inclusión financiera con enfoque de género e indígena.	2022
Acción 2: Promover el uso responsable de los recursos naturales.	Implementar programas de educación ambiental y conservación de recursos naturales.	2022
Acción 3: Promover el uso responsable de los recursos humanos.	Implementar programas de capacitación y desarrollo de habilidades.	2022

II. LOCAL ENERGY

LOCAL ENERGY

Goals and Purposes

Empower social organizations, communities and indigenous people in the area of energy development with regard to energy projects and their associated impacts, including their total or partial participation in their development.

GOAL

MINISTRY ROLE

WHAT IS LOCAL ENERGY?

This isn't	This is
• Concession / Mitigation	• Modelos de negocio de distribución energética
• Without participation	• Gestión y explotación energética
• 30%/70% model	• Impulsar el desarrollo
• Social financing	

SCOPE OF APPLICATION

Net Billing - Energy Community (Propiedad Conjunta)

The Net Billing - Energy Community - give a possibility develop energy systems with a **generation capacity no larger than 300 kW to supply power for multiple consumers**. Such energy communities will **enable users to co-ordinate a shared PV array with a single grid connection to inject surplus power back into the electricity network**. Also, this small systems to be connected at different locations from their consumer and outline an improved net billing payment system.

The **main challenge will be the governance to O&M** this small solar systems that include the option of creating energy communities.

Energy Benefits Partnership (Energía Asociativa)

Provide an opportunity to indigenous and rural communities (energy isolated) or another services, such as pumping of potable water and water for irrigation.

As Ministry we will **promote a link between communities and energy private companies through a MOU to use of locally available renewable energy resources** to development a rural energy system in location near to generation and transmission energy project.

Shared ownership Energy (Generación Comunitaria)

Shared ownership **gives community groups the chance to make an investment in a commercially owned renewable energy project with a private energy company**. Shared ownership is separate and additional to Community Benefits.

By participating in shared ownership of a renewable energy project, communities can share in a range of benefits including developing a sustainable income stream of which they have control, creating strong partnerships, and building resilience in their local area.

CONCLUSION

CHARACTERISTICS	NET BILLING - ENERGY COMMUNITIES	ENERGY BENEFITS PARTNERSHIPS	SHARED OWNERSHIP ENERGY
ENERGY SYSTEM	• On-grid	• Off-grid • On-grid	• Off-grid • On-grid
STAKEHOLDERS	• Multiple consumers (users)	• NGO (users) • Rural / Indigenous Communities (users for energy / sharing industries)	• Rural / Indigenous Communities with Energy private companies
BENEFITS	• Social	• Access	• Income
CHALLENGES	• Land • Technical • Energy knowledge	• Land • Technical • Energy knowledge • Governance • Social Aspects (Business)	• Land use • Technical • Energy knowledge • Governance • Social and Climate
INVESTMENT	• Public / Private	• Private	• Private



Francisco Merino
DIALOGUE PROCESS PARTNERSHIP
APEC-INDIGENOUS AFFAIRS
CARE UNIT
fmerino@ministerio.cl

Speaker 2: Assoc. Prof. Keng-Tung Wu, NCHU, Chinese Taipei.

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APEC Workshop of Empowering Indigenous Social Awareness on Renewable Energy and Increasing Inclusion Sustainability for Green Energy Applications in APEC Regions

Policy Dialog 2: Agricultural Waste Management and Bioenergy in the Aboriginal Area

An Innovative Small Biomass Gasification Power Generation System Integrated with the Portable Microgrid for Aboriginal Area

Keng-Tung Wu, PhD
Chung Hsing University, Chinese Taipei
wkt@chu.edu.tw

Splendor Hotel, Taichung, Chinese Taipei
22 March, 2023

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Keng-Tung Wu, PhD
PhD in Chemical Engng
University College London (UCL), UK (1997)



- Associate Professor, Department of Forestry, NCHU
- Leader, Bioenergy Research Core Laboratory, NCHU
- DEPDIR, General Center for Academia-Industry Collaboration, NCHU
- CEO, Office of Industrial Carbon Offset Promotions, NCHU
- Director, Industry Promotion Office for Southeast Asia (IPOSA)
- Secretary, APEC New and Renewable Energy Technologies Expert Group (APEC EGNRET)

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Outline

1. Where We Are & Who We Are
2. Biomass Gasification Tech
3. Net-zero Carbon Emission Community
4. Concluding Remarks
5. Acknowledgement



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SUSTAINABLE DEVELOPMENT GOALS

Who We Are & Where We Are

An Innovative Small Biomass Gasification Power Generation System Integrated with the Portable Microgrid for Aboriginal Area

國立東華大學·生物能源研究中心實驗室
Bioenergy Research Core Laboratory
Chung Hsing University, CHINESE TAIPEI

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An Innovative Small Biomass Gasification Power Generation System Integrated with the Portable Microgrid for Aboriginal Area

Where We are?



Chung Hsing University (NCHU)

Chung Hsing University (WCHU)

Source: By Wikidata - Own work, CC BY-SA 4.0, https://commons.wikimedia.org/w/index.php?curid=3910037

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An Innovative Small Biomass Gasification Power Generation System Integrated with the Portable Microgrid for Aboriginal Area

Who We are?

NCHU Bioenergy Research Core Laboratory (2007)
Educational Laboratory of Ambient Experience for Bioenergy (2011)



Fully Biomass Thermochemical Process Practice Lab
The First and Only One in Chinese Taipei

國立東華大學·生物能源研究中心實驗室
Bioenergy Research Core Laboratory
Chung Hsing University, CHINESE TAIPEI

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SUSTAINABLE DEVELOPMENT GOALS

Biomass Gasification Tech

An Innovative Small Biomass Gasification Power Generation System Integrated with the Portable Microgrid for Aboriginal Area

國立東華大學·生物能源研究中心實驗室
Bioenergy Research Core Laboratory
Chung Hsing University, CHINESE TAIPEI

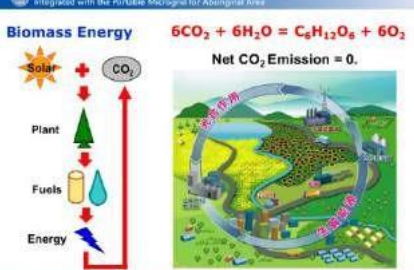
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An Innovative Small Biomass Gasification Power Generation System Integrated with the Portable Microgrid for Aboriginal Area

Biomass Energy

$$6CO_2 + 6H_2O = C_6H_{12}O_6 + 6O_2$$

Net CO₂ Emission = 0.




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An Innovative Small Biomass Gasification Power Generation System Integrated with the Portable Microgrid for Aboriginal Area

Definition of Biomass Energy in EU

European Union
Directive 2003/96/EC, 27-10-2003
Taxation of Energy Products & Electricity

Biomass shall mean the biodegradable fraction of products, waste and residues from agriculture (including vegetal and animal substances), forestry and related industries, as well as the **biodegradable fraction of industrial and municipal waste**.



What is Biomass Gasification?

➢ **Gasification:** conversion of carbonaceous feedstock, e.g. biomass, into gaseous fuel, i.e., combustible syngas, by partial oxidation at the elevated temperature.

➢ The syngas produced by gasification reaction mainly includes CO , H_2 , CH_4 , etc., and can be used as fuels for boilers or generators to supply the required heat or electricity.

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Advantages of Biomass Gasification

- Utilization of gaseous fuel converted from solid feedstock can avoid a large amount of $PM_{2.5}$ produced by direct combustion of solid fuel;
- The required air is less than that of direct combustion, so investment of dust removal devices is low;
- Emissions of NO_x and CO_2 are very low;
- Partial oxidation reaction leads lower residual oxygen content to avoid production of chlorophenol, the dioxin precursor.

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Advantages of Biomass Gasification

Direct Combustion vs Gasification

Polluted Emission	Direct Combustion	Gasification
$PM_{2.5}$	Necessary to install a bag filter, wet scrubber, etc. at the exit to remove dust such as $PM_{2.5}$. Waste water will be generated.	The amount of air required is less than that of direct combustion. If synthesis gas is directly utilized for heat utilization, almost no need to install dust removal device.
NO_x	Easy to generate fuel NO_x . Often necessary to install a selective catalytic reduction (SCR) device.	The amount of air required is less and no excess oxygen for fuel nitrogen to produce fuel NO_x . Most of syngas contains a large amount of nitrogen, so is not easy to produce thermal NO_x at the back-end utilization.
SO_x	Sulfur-containing feedstock will produce sulfur oxides (SO_x) during the combustion. Desulfurization device is need to be installed at exhaust.	Sulfur-containing feedstock are prone to produce H_2S and CO_2 acid gases during gasification, resulting in slight corrosion of pipelines.

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Advantages of Biomass Gasification

Direct Combustion vs Gasification

Polluted Emission	Direct Combustion	Gasification
Dioxin	A lot of residual oxygen can lead to produce chlorophenols easily, the precursors of dioxin. Afterwards the dioxin is generated.	Remaining oxygen is very small, which can avoid the production of chlorophenols, the precursor of dioxin. Chlorine combines with hydrogen to form hydrochloric acid (HCl), causing slight corrosion in the pipeline.
Ash	Not easy to burn completely, and a large amount of ash will be produced.	Bottom ash is much less than direct combustion. Part of residue is biochar which can be returned to farms, if the feedstock is woody biomass.

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Gasification Can Avoid Production of Dioxin

(Cl = Chlorine)

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Barriers of Small-scale Biomass Gasifiers

- Small gas cleaning system: Tar cracker + compact spray tower + electric tar catcher
- Internal combustion engine for power generation
- Tar: a viscous liquid below 350°C, formation during gasification
- Tar 100 mg/m^3 for gas engine (best value 50 mg/m^3)
- The gas cleaning system removes tar to ensure clean syngas ($+60^\circ\text{C}$) enters the generator, but tar is not easy to remove.
- Small gasifiers cannot set up expensive gas cleaning systems causing generators to be malfunction frequently and failure in power generation
- Employing wet scrubbers to remove tar produce waste water and the operation cost is increased

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NCHU OTWG Small-scale Agro Waste Gasification Power Generation System

- Zero tar and zero waste water
- Easy to operate
- Max. treatment capacity: 1,800 kg/hr agro waste
- Power output: 25-750 kWh electricity
- Can be integrated with microgrids system

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OTWG Biomass Gasifier

25-750 kW Small-scale Zero Tar Biomass Gasification based Power Generation System

Zero Tar and Zero Waste Water

Tar

Zero Tar

Traditional Biomass Gasifier OTWG Biomass Gasifier

OTWG Technology was transferred and licensed to Star Unite Enterprise Co., Ltd. (星聯實業有限公司)

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Net-zero Carbon Emission Community

An Innovative Small Biomass Gasification Power Generation System Integrated with the Portable Microgrid for Aboriginal Area

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生質物氣化微電網示意圖 Sketch of Biomass Gasification Microgrid

- Simple system
- Scalability
- Easy to operate
- Easy to maintain
- Reduce investment in power lines

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Agriculture Circular Economy

Small-scale Biomass Gasification-based Power Generation Integrated Microgrid System

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NCHU Bio-Energy Demo Site

NCHU 100 kW Agro Waste Gasification Power Generation System Integrated Microgrids

Commenced on 12 Nov 2019

100 kW Downdraft Gasifier

5 kW Microgrid

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新創農業廢物氣化發電結合可攜式微電網系統流程圖 Flowchart of Innovative Agricultural Waste Gasification Power Generation Integrated Portable Microgrids System

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可攜式電池充電區 Hot Swappable Battery

Safely removed and inserted the battery into a microgrid system without powering down the machine itself.

Source: MIRA-000 Co., Ltd.

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Microgrid System 中興電工 小型微電網裝置

700 x 300 x 1,200 mm Indoor

750 x 570 x 1,500 mm Outdoor

Microgrid System

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An Innovative Small Biomass Gasification Power Generation System Integrated with the Portable Microgrid for Aboriginal Area

Schematic Diagram of NCHU 100 kW Agro Waste Gasification Power Generator Integrated 20 x 5 kW Portable Microgrid Systems

- Separate biomass power generation facility from microgrid system
- Enhance decentralized energy power applications both extensively and intensively

Net-zero Carbon Emission Community

100 kW OTWG Biomass Gasification Generator
Agro-waste Feedstock = 500 kg/d
5 kW Battery Bank
40 Street Lights
400 Households
Hot Storage Battery Charging Zone
20 x 5 kW

Biomass Gasifier 23

An Innovative Small Biomass Gasification Power Generation System Integrated with the Portable Microgrid for Aboriginal Area

The First Biomass Energy Distributed Energy Systems (DES) in Chinese Taipei

Biomass Gasification Power Generation with Microgrid System in Cuijiong Villa

Expansion: Heat Pump, Vehicle
Hot Water, Electricity, Battery
Cuijiong Villa
75 kW OTWG Biomass Gasification Power Generation System
Microgrid (Hot Storage Battery)
Battery
Vehicle
Forestry Surplus Materials
Crushing
Pelletizer
Return to the Forest
Biochar

Will be officially launched on 30 April, 2023

Biomass Gasifier 28

An Innovative Small Biomass Gasification Power Generation System Integrated with the Portable Microgrid for Aboriginal Area

The First Biomass Energy Distributed Energy Systems (DES) in Chinese Taipei

Biomass Gasification Power Generation with Microgrid System in Cuijiong Villa

Simulated Configuration Diagram (Case A)

75 kW OTWG Biomass Gasification Power Generation System
Microgrid (Hot Storage Battery)
Battery
Vehicle

Will be officially launched on 30 April, 2023

Biomass Gasifier 27

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SUSTAINABLE DEVELOPMENT GOALS

MSW Gasification

An Innovative Small Biomass Gasification Power Generation System Integrated with the Portable Microgrid for Aboriginal Area

MSW
Bag Opening
SRF
Pelletizer
Crushing
RDF-5
NCHU OTWG Gasification Power Set
Electricity (Self-use)
Electricity (Sell)
Grid
Shredding
Magnetic Separator
Ash (few)
Outsourcing
Winnowing
SRF/RDF-5 Process
Gasification Generation Process

Biomass Gasifier 20

An Innovative Small Biomass Gasification Power Generation System Integrated with the Portable Microgrid for Aboriginal Area

Layout of the Small Scale Municipal Solid Waste (MSW) Gasification Generation Power System (45 m x 90 m)

Biomass Gasifier 20

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SUSTAINABLE DEVELOPMENT GOALS

Concluding Remarks

An Innovative Small Biomass Gasification Power Generation System Integrated with the Portable Microgrid for Aboriginal Area

Biomass Gasifier 22

An Innovative Small Biomass Gasification Power Generation System Integrated with the Portable Microgrid for Aboriginal Area

Key of Capacity Building on Bioenergy for Rural Communities in the Time of Climate Change & COVID-19

- Biomass: Essential in the Energy Transition
- Bioenergy Resilience

77th EURCE, Lisbon (2019)
BIOMASS ESSENTIAL IN THE ENERGY TRANSITION

Biomass Gasifier 22

An Innovative Small Biomass Gasification Power Generation System Integrated with the Portable Microgrid for Aboriginal Area

Toward Success on Using Bioenergy

Cost
Supply
Quality
BioEnergy
A Thinking for Future RD&D Orientations

Biomass Gasifier 20

An Innovative Small Biomass Gasification Power Generation System Integrated with the Portable Microgrid for Aboriginal Area

Concluding Remarks

RETIs

Regulations
Economy
Technologies
Integration
Social Enterprise

Biomass Gasifier 24

An Innovative Small Biomass Gasification Power Generation System Integrated with the Portable Microgrid for Aboriginal Area

Promotion 10th International Greentech & Eco Products Exhibition & Conference Malaysia (IGEM2019)

9-11 Oct 2019

Biomass Gasifier 25

An Innovative Small Biomass Gasification Power Generation System Integrated with the Portable Microgrid for Aboriginal Area

Acknowledgement

The R&D of NCHU OTWG Small-scale Agro Waste Gasification Power Generation Integrated Microgrid System supported by Science and Technology Council (NSTC), Chinese Taipei (111-3116-F-008-002-: Advanced Intelligent Circular Economy with Combined Cooling, Heat & Power (CCHP) System) is acknowledged.

【智能化先進能源綜合區域循環經濟汽電冷共生系統】
Advanced Intelligent Circular Economy with Combined Cooling, Heat & Power (CCHP) System

ACEpower
Advanced Intelligent Circular Economy with Combined Cooling, Heat & Power System
nextDrive UTE Light/Torch

Biomass Gasifier 14

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SUSTAINABLE DEVELOPMENT GOALS

Ensure access to affordable, reliable, sustainable and modern energy for all.

Biomass Gasifier 27

An Innovative Small Biomass Gasification Power Generation System Integrated with the Portable Microgrid for Aboriginal Area

Thank you very much for your attention.

Contact: wikt@nchu.edu.tw (K-T WU)

Biomass Gasifier 18

POLICY DIALOG – TOPIC 3

Renewable energy technology and regulations in the aboriginal area - Green Architecture in Indonesia

Speaker 1: Prof. Dr. Sangkertadi, Vice Rector, Unsrat, Indonesia.



GENERAL BACKGROUND

Focus of discussion in term of building Energy includes:

- Renewable Energy
- Energy Efficiency

Renewable Energy for Building, depend on:

- Natural energy source around the building environment (sun, water, wind, geothermal, waste,...)
- Design, size, and the building technology

Energy Efficiency in buildings depend on:

- Equipment, Utility (low energy system)
- Behavior of the user
- Design.

Green Building

2019 Energy Source Breakdown:

- 28% Transport
- 35% Industry
- 5% Other
- 32% Residential
- 8% Power generation
- 22% Non-ferrous metal
- 5% Building construction

In 2021 the operation of buildings accounted for 30% of global final energy consumption (IEA)

- How many buildings that apply renewable energy?
- How many Percent of Renewable energy contribute to the total building energy?
- How many m2 of building spaces which are served by Renewable energy? etc... etc

Traditional Dwelling in Indonesia

Indigenous Architecture; example of sustainable architecture

270 millions population
195 ethnics
5 big islands

Characteristic of Traditional Dwelling

- Climatic Responsive Architecture
- Using local natural material (wood, stone, Leaf)
- Low cost energy
- Village environment (low density, green, agriculture)
- Low rise building

Common Style of Urban Architecture:

- High rise,
- High density environment,
- Urban Culture,
- Urban Pollution

Trad. Architecture
Sustainable Architecture
Green Architecture

Challenges & Goals of Adaptive Sustainable Architecture

- Respect to the Traditional Architecture
- Energy efficient
- Comfort and Safe
- Green Urban Culture
- Low Carbon
- Space for Contemporary Activities

Green Building & Green City Codes

Indonesia Act No 28, 2002 on Building Construction

Norm & Regulation

Government Sector

- Central Government Regulation No.36/2005, Concerning the Implementation of Act No. 28/2002
- Central Government Regulation No.16/2021, Concerning the Implementation of Act No. 28/2002 (Introducing Definition and Scope of Green Building)
- Minister of Public Work Regulation No.2/2015, Concerning the Green Building
- Minister of Public Work Regulation No.21/2021, Concerning the Assessment of Green Building Performance

Private Sector

- Green Building Council Indonesia (GBCI) – Established in 2009
- Member of World Green Building Council
- GBCI Launched GREENSHIP ver.1.0 in 2010 A rating tool for Assessment of the Level of Green Building Level in Indonesia
- GBCI organize a Certified Training to the Practitioners of Green Building:
 - Greenship Associate, GA Certificate (General Knowledge in Green Building), and Introduction of Greenship)
 - Greenship Professional, GP Certificate (Capacity in using Greenship tool to assess a Greenbuilding)

Minister of Public Work Regulation No 2/2015, Concerning the Green Building

Green Building Mandatory:

- Office,
- Apartment in mixbuilding
- Storage house, Warehouse, Parking building
- Commercial Center
- Laboratory, Industry, Factory, Workshop
- Public Building (Concert Hall, Hospital, Prayer Building)

to practice, it depen on:

- Capacity in Green Building Knowledge of The Designer, Engineer, Assessor, Government Staff/ Regulator.

Local Government Act on Green Building:

- Jakarta
- Semarang
- Bandung

Number of cities in Indonesia: 98 Cities

24 Buildings certified by Green Building Council Indonesia

No	Name of Building	Type	Location	Certificate	Year Valid
1	BGA Foresta	Office	Tangerang	Platinum	2021-2024
2	Plaza BP Jamsostek	Office	Jakarta	Gold	2020-2023
3	Emerald Tower Grand Kemala Lagoon	Office	Bekasi	Gold	2020-2023
4	Terminal Joyoboyo	Bus Station	Surabaya	Silver	2021-2024
5	HOI Hive Menteng	Office	Jakarta	Gold	2022-2025
6	Yogyakarta International Airport	Airport Terminal	Yogyakarta	Gold	2021-2024
7	BTPN Cisadant Complex	Office	Jakarta	Gold	2020-2023
8	The Energy	Office	Jakarta	Gold	2020-2023
9	Sopo del Office Tower B	Office	Jakarta	Platinum	2020-2023
10	Venidian Tower Grand Sengkono Lagoon Surabaya	Office	Surabaya	Gold	2020-2023
11	Head Office PT KPI RU IV Cilecep	Office	Cilecep	Platinum	2022-2025
12	G-ha Unilever	Office	Tangerang	Platinum	2020-2023

24 Buildings certified by Green Building Council Indonesia

No	Name of Building	Type	Location	Certificate	Year Valid
13	AIA Center	Office	Jakarta	Gold	2020-2023
14	ROTX Place	Office	Jakarta	Platinum	2021-2024
15	Pacific Century Place	Office	Jakarta	Platinum	2023-2026
16	Trinity Tower	Office	Jakarta	Gold	2021-2024
17	Bandar Udara Internasional Banyuwangi	Airport Terminal	Banyuwangi	Gold	2023-2026
18	Green Office ESPI PT Pan Brothers Tbk	Office	Boyalali, Central Java	Platinum	2020-2023
19	Sopo del Office Tower A	Office	Jakarta	Platinum	2020-2023
20	J8 Tower	Office	Jakarta	Platinum	2021-2024
21	Menara BNI	Office	Jakarta	Gold	2020-2023
22	Toto Building Wisma 81	Office	Jakarta	Platinum	2020-2023
23	HK Tower	Office	Jakarta	Platinum	2021-2024
24	Sudirman 7.8 Tahap 1	Office	Jakarta	Gold	2020-2023

BCA Foresta – Bank Office in Tangerang
PLATINUM Certificate 2021-2024, GBCI

- Maximize daylighting
- Envelope double glass, low E glass
- Building Automation
- Water recycled and rain water
- Solar panel
- Electric car charging station





Grha Unilever - PT. Unilever Indonesia, Tbk

The high-tech designed building applies sustainable principles with a comprehensive active design and passive design.

Maximize natural lighting enter the building (300 lux)
 Use double glass skylight
 A very low Overall Thermal Transmission Value (about 20 W/m2).
 Electric lighting automation
 Solar Panel







Passenger Terminal of International Airport Banyuwangi

- Energy efficient design
- Water recycled
- Solar power energy
- Green roof
- Low Carbon
- Control Micro Climate by Pond
- Natural Lighting






Bus Station, Surabaya

- Green Façade, greenery on facade
- Low Energy Equipment & Electricity
- Maximize natural lighting
- Water recycle, Rain water harvesting
- Waste management






Green Office ESPI
PT Pan Brothers Tbk

- Water recycle, rainwater harvesting
- Microclimate
- Natural lighting







Course on Green Building in University

- Lecturers or Professors who have GA/ GP/ LEED certificate or others in general are able to teach green building in Indonesia
- 20 Universities have signed an agreement of cooperation with IFC (International Finance Corporation, World Bank Group) to implement a course on Design for Greater Efficiency in Faculty of Engineering especially in Architecture Department. Use EDGE software as tool for simulation in the course. EDGE software is created by IFC

1. Universitas Gadjah Mada
2. Universitas Indonesia
3. Universitas Diponegoro
4. Institut Teknologi Bandung
5. Institut Teknologi Sepuluh Nopember
6. Universitas Tarumanegara
7. Universitas Negeri Sebelas Maret
8. Universitas Trisakti
9. Universitas Widya Kartika
10. Universitas Brawijaya
11. Universitas Atma Jaya Yogyakarta
12. Universitas Pembangunan Jaya
13. Universitas Lambung Mangkurat
14. Universitas Parahyangan
15. UIN Alauddin Makassar
16. **UNIVERSITAS SAM RATULANGI**
17. Universitas Multimedia Nusantara
18. Universitas Kristen Duta Wacana
19. Universitas PGRI Semarang
20. Universitas Bandar Lampung

Green Building Course

- Heat Transfer
- Physical Human Comfort
- Energy Consumption
- Carbon emission
- Water calculation
- Material and Waste
- Operating Cost and Investment



EDGE facilitate student to state whether their design is enough efficient or not.

Map of solar energy in Indonesia

Sumber: P3TKB/TKE

Legenda
 kWh/m2/hari
 4.21 - 4.40
 4.41 - 4.60
 4.61 - 4.80
 4.81 - 5.00

Map of solar energy in Indonesia kWh/m2/day




Energy Consumption of Commercial Building in Indonesia, 2019, Sector

Sector	Air Conditioning	Lighting & Plug In	IT & Elevator
Office	44.1%	22.0%	1.8%
Mall/ Supermarket	42.7%	21.4%	1.2%
Hospital	43.9%	27.8%	1.9%
Hotel	46.3%	23.7%	1.4%

Need a Good Building Design & Utility to Minimize Energy Consumption for Air Conditioning

Basic Form, Design & Material of Building Envelope, Building Automation, Equipment



THANK YOU

Speaker 2: Dr. William Yi-Yuan Su, Chief R&D Officer and Chief Legal Counsel Incigt Inc., Chinese Taipei.


RENEWABLE ENERGY TECHNOLOGY AND REGULATIONS IN THE ABORIGINAL AREA GREEN ARCHITECTURE IN INDONESIA

DR. I UAN I IAM SU S.J.D.
C.O., INCIGT INC.

INDIGENOUS ARCHITECTURE: ANCIENT WISDOMS

Elements of indigenous architecture in Indonesia

- Roots of woven reeds, paddy rice, coconut leaves
- Tall and stilt house
- Woods/bamboo structure from forest
- Breathing Walls
- Roof Domination
- Non-Rigid Structures
- Adopted the nature environment.
- Circulate nature materials.



WEAKNESS AND THREATS

- Resilience against nature disasters.
 - Wildfire
 - Earthquake.
 - Storm/typhoon.
 - Extreme weather events.
- Extra energies are needed.
 - Cooling
 - Cooking
 - Lighting
- Lacking infrastructure construction and power grids building.

ENERGY EFFICIENCY REGULATIONS OF THE BUILDING AND CONSTRUCTION SECTOR

- Law No. 28 of 2002 on Building ("Law of Building").
- Presidential Regulation No. 22 of 2017 concerning the General National Energy Plan.
- Minister of Energy and Mineral Resources Regulation No. 14 of 2012 concerning Energy Management.
- Regulation No. 70 of 2009.
- ESDM Regulation No. 13.
- ESDM Regulation No. 7.
- Governmental Regulation No.16/2021 on Buildings.
- Regulation No. 21/2021 on The Assessment of Green Building Performance.
- Minister of Energy and Mineral Resources Regulation No. 18 of 2014.
- Minister of Energy and Mineral Resources Regulation No. 57 of 2017.

LACKING OF REGULATIONS ON INDIGENOUS BUILDINGS

- The energy efficiency regulations are targeted on new buildings.
- The materials and technologies standards are targeting on new buildings.
 - Cement, iron, steel, aluminum, ceramics, glass, plastic and paints.
 - Zinc plates. **Metal corrugated roofing sheet are usually used.**
 - Not used by aboriginal tribes and houses.
- Wooden structure and material safety standards are needed.
- Traditional and aboriginal buildings are protected as historical heritage.

GHGS EMISSION REDUCTION TARGETS

- GHGs emissions: 1,543 MtCO_{2e} in 2021.
 - between 2010-2021, 37.7% increasing.
 - energy demand accounts for about 34% of the emissions.
 - buildings and construction are responsible for almost 26% of energy- and process-related emissions in 2020.
 - Building sector constitutes 4% of energy-related CO₂ emissions.
- NDC: 29% reduction against BAU by 2030 (2,869 Gt CO_{2e}).
- Buildings and construction need to implement renewable energy.
 - Traditional houses in aboriginal communities are included.

GREEN BUILDING COUNCIL INDONESIA (GBCI)

- Learning LEED system from USA.
 - Leadership in Energy and Environmental Design
 - Energy and Atmosphere.
- New Building projects.
- Traditional and indigenous buildings are included.
 - Need more standards.

MAJOR BARRIERS IN THE IMPLEMENTATION OF GHG REDUCING TECHNOLOGIES

- Lack of energy efficiency policies
- Lack of incentives for potential investors
 - FIT price is not high enough.
 - Solar PV: 25-30 CENT USD / kWh
- Lack of technical expertise
- Lack of capacity to plan and design energy-efficient construction projects and financial issues
- Lack of financing opportunities

SUGGESTIONS

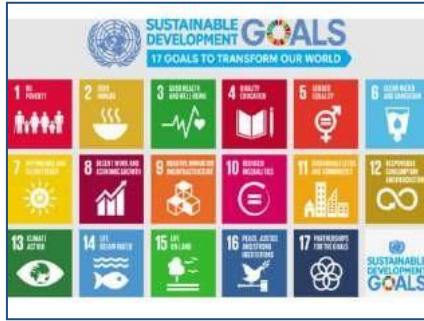
- Promote public participations on standard making process.
- Enhancing infrastructure construction and increasing capacities.
- Promoting and implementing adequate technologies.
 - Bottom-up approach:
 - Adequate technologies are suggested by the indigenous communities/tribes
 - Early on-site impact evaluation and assessment
- Education and promotions on renewable energy science and technologies.
- Raise FIT price in aboriginal area.
- Prior inform and consent.
- Benefit sharing with indigenous tribes.

Thanks for your attention
Q & A

VIRTUAL/PHYSICAL TRAINING COURSE

TOPIC 1: Introduction to SDGs

Speaker: Dr. Cindy Hsueh, s.School, Feng Chia University, Chinese Taipei.





Conclusions

1. Practicing recycle economy
2. Conserving & making the best use of natural resources
3. Working on SDGs in daily lives

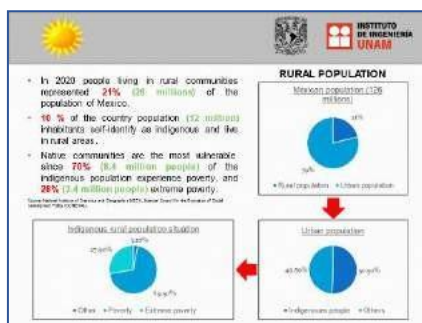
THANK YOU!

TOPIC 2: Introduction to renewable energy - GREEN ENERGY APPLICATIONS IN RURAL AREAS AND AWARENESS ON RENEWABLE ENERGY IN MEXICO

Speaker: Ms. Denise Yeazul Fernández Rojas, Urban Planning, UNAM, Mexico.

GREEN ENERGY APPLICATIONS IN RURAL AREAS AND AWARENESS ON RENEWABLE ENERGY IN MEXICO

Denise Yeazul Fernández Rojas(México)



GREEN ENERGY APPLICATIONS IN RURAL AREAS IN MEXICO

- Sun dryer
- Geothermal dehydrator
- Biomass

A problem is an opportunity

GENERATION



OBJECTIVE

- Go beyond manufacturing, cultivating, using and making use before throwing away.
- Getting on a circular culture where before it becomes residue, becomes raw material.

MAKING USE




HOMES



GREEN ENERGY APPLICATIONS IN RURAL AREAS IN MEXICO

- Sun dryer
- Geothermal dehydrator**
- Biomass



INDUSTRY


Deshidratador Geotérmico de Alimentos



1st industrial geothermal dehydrator installed and in operation in Latin America




Initially it starts with 20 jobs



Advantage, it works 24 hours a day, 365 days a year, and is not interrupted by factors such as cloud cover. (600 Kg/day)


Biomass



- About half of the world's population still depends on biomass as its main source of energy.
- The problem is that wood is being burned and forests are being destroyed at a faster rate than they are being recovered.


INSTITUTO DE INGENIERIA UNAM

- Raw material analysis is essential for the evaluation of combustion properties.
- The addition of woody raw materials increases the binding capacity of the mixtures (lignin).
- Additives or binders (limestone or kaolin) can be used to improve combustion.



- Solid fuel production
- Other uses of the pellets

Briquetas

- UNAM
- The Ministry of Agriculture, Livestock, Rural Development, Fisheries and Food (SAGARPA)
- Green to Energy company

Technology adapted for Mexico ready to be transferred to rural communities that require electricity and have numerous organic wastes from such as corn cob or wood from coffee plantations.

Mrs. Denise Yeazul Fernández Rojas

Instituto de Ingeniería, UNAM, Coordinadora de Ingeniería Ambiental, Pabellón 5, 5er Nivel, Circuito Exterior s/n, Ciudad Universitaria C.U., 04510 México, D.F., México
 T: 5623 41 41, 5623 41 42
 E: denisey@iia2007@iia.unam.mx

TOPIC 3: Indigenous cultural lifestyle

Speaker: Dr. Reiny Antonetha, Tumbol, Head of International office in Unsrat, Indonesia.

INDIGENOUS CULTURAL LIFESTYLE

WATER HYACINTH (EUCHORNIA CRASSIPES) OF LAKE TONDANO: WILD AT A HIDDEN TREASURE AS ALTERNATIVE ENERGY SOURCE

DR. REINY A. TUMBOL
FACULTY OF FISHERIES AND MARINE SCIENCE
SAM RATULANGI UNIVERSITY
MARANGI - INDONESIA

TONDANO LAKE

The Jewel of Sulawesi

Covering an area of 6000 ha in 1939, now only 2726 ha

Created in a cultural basin of 600m above sea level and surrounded by Minahasa, Tondano, Kowahe, Lembeh, Tompaso and Momoeru

In recent years there have been reports of decreasing water levels at Lake Tondano, from 3954 meters in 1939 to 18.25 (1994), 13m (2022)

Approximately 50 km from Manado city (the capital city of North Sulawesi Province, 600 meters above sea level)

THE LAKE AND ITS FUNCTIONS

- Fishing
- Agribusiness
- Tourism
- Hydroelectric power source
- Source of drinking water
- Source of hydropower

WATER HYACINTH PROBLEMS IN LAKE TONDANO

Water hyacinth is a characteristic of a species with low reproductive capacity and high adaptability.

Ecological function: water hyacinth is a natural and plant in aquatic ecosystem.

- Tourism
- Fishing
- Transportation
- Source of drinking water
- Source of hydropower

Water Hyacinth Eradication Program in Lake Tondano

Public method employed by directly burning, cutting, and removing the plant using herbicides or manual removal by hands and head tools.

The most significant in Lake Tondano (especially done by the Government, 2010) results are still not satisfying.

Chemical method using herbicides
Biological method introducing predators
Manual: Manpower (volunteers), it is laborious along with it. Manual (handmade) eradication system has been implemented in several cases, but the results are not ideal. It is understood that manual eradication is not a sustainable method. Control the population of this plant, to prevent biological destruction and keep it balanced with human needs. Balance is the key to sustainable consumption and production.

WATER HYACINTH: BENEFITS, USAGE, IMPACT TO ENVIRONMENT

Tremendous application in wastewater treatment: used to treat waste water from dyes, breweries, sugar factories, pulp and paper industries, palm oil mills, distilleries, etc. Effective in removing algae, fecal coliform bacteria, suspended particles, trace toxic metals, organics and many other dissolved impurities from wastewaters.

Potential for making textiles, paper, as fodder for animals, green manure, compost and for manufacturing fish traps.

It ferments rapidly due to its high water content and can supply stomachs for biogas production, considered as an alternative to fossil fuels as they are capable of converting their content into fuel energy at low cost and is recognized as an eco-friendly product.

Reduces water pollution effectively because it absorbs lots of phosphorus and nitrogen from water contaminated with toxic waste materials.

Has a high nutritional and is useful for human food, fibre source, animal food.

Hydrogel materials (a unique material that affordable to apply as a membrane layer) fabrication due to high cellulose content.

Water hyacinth for alternative energy source

- Water hyacinth is used as a natural energy source (as a biogas raw material).
- This plant can be processed as bioenergy, a fuel made from processing plants (biomass) to produce biogas that can be used for domestic fuel.
- This plant is processed into biogas since it contains large of methanogens (70%) and cellulose (7%).
- Cellulose in water hyacinth is hydrolyzed to reducing sugars. The hydrolysis process produces methane and carbon dioxide. It is also fermented with a high percentage of water contents (could up to 95%) and a chemical tissue structure produces gas.

Potential use and conversion of water hyacinth into value-added products – BIOFUEL

Water Hyacinth Biofuel Production Process:

- Water hyacinth collection
- Crop harvest
- Remove the water
- DMG (Dry Matter Gas)
- Water Hyacinth Biofuel
- Conversion from DMG to Biofuel
- Gasification
- Gasification
- Gasification

SMALL SCALE (HOUSEHOLD) USAGE OF WATER HYACINTH BIOGAS

Case study: Lake Victoria, Kenya

- Biogas for household use – cooking, hot water
- Liquid organic fertilizer (waste from digester)
- Insect repellent

SMALL SCALE (HOUSEHOLD) USAGE OF WATER HYACINTH BIOGAS

Implementation to Lake Tondano

- Requires big efforts of the government or NGO to start the project - requires incentives
- Community involvement, particularly women to carry out this new ideas - dealing with household need (cooking)
- To focus on farms and agricultural co-operatives to spread the concept of biogas use for domestic and collective purposes
- To ensure the short, medium and long-term economic, ecological and social benefits will contribute to the reduction of poverty

- Start the project from the domestic gas use
- Efforts to develop local markets - allow for the full-scale Lake Tondano
- Move to the lake-wide community

CONSTRAINTS

- Constant supply of water hyacinth (transportation shortage)
- The costs of building and purchasing of peripheral equipment for the start up of the project - requires strong commitment from the Government/NGO to ensure sustainable application
- Promoting biogas as a source of sustainable energy for small communities. Promoting the use of methane gas as biofuel to replace the use of fossil fuel or firewood to fight desertification and restore soil fertility continues
- The cost of the technology is still questionable to the community
- Reducing the risk of methane use as flammable substances – Educating the community

CONCLUSION

- Government involvement is the most important factor in the success of this project in promoting sustainable and low-cost energy production and employment opportunities in rural areas.
- Using the water hyacinth as a natural energy source for the production of biogas as a sustainable and low-cost energy source will promote a more sustainable and low-cost energy production.
- Government involvement in biogas production is the most important factor in the success of this project in promoting sustainable and low-cost energy production and employment opportunities in rural areas.

TOPIC 4: Increasing indigenous inclusions of renewable energy technology and regulations for green energy applications

Speaker: Dr. William Yi-Yuan Su, Chief R&D Officer and Chief Legal Counsel Incigt Inc., Chinese Taipei.

Increasing indigenous inclusion of renewable energy technology and regulations for green energy applications

DR. YIYUAN WILLIAM SU (S.J.D.)
CEO, INCIGT INC.

International law sources

- ▶ United Nations Declaration on the Rights of Indigenous People
 - ▶ Recognizing the rights to their lands, territories and resources (Article 26)
 - ▶ Article 8: Indigenous peoples and individuals have the right not to be subjected to forced assimilation or destruction of their culture.
 - ▶ Article 10: No relocation shall take place without the free, prior and informed consent of the indigenous peoples concerned and after agreement on just and fair compensation and, where possible, with the approval of states.
- ▶ UN Convention on Biological Diversity (UNCBD)
 - ▶ goals of the Convention: conservation, sustainable use, and equitable benefit sharing
 - ▶ Article 8(j): "to respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities... and promote their wider application with the approval and involvement of the holders of such knowledge, innovation and practices"
 - ▶ Nagoya Protocol, Article 6: Access to Genetic Resources.

Nature Resources

- ▶ Recognizing the rights to the resources.
 - ▶ Q: Who owns the nature resources in aboriginal living area?
 - ▶ Q: Is atmosphere a nature resource? Who has title?
 - ▶ State, user, car, shop, big tree, ...
- ▶ Waste or resources.
 - ▶ Decided by owner's decision or physical status?
 - ▶ Waiver, Indigenous Basic Act
 - ▶ Considering the traditional use and culture?
 - ▶ Creating economic concept.

Legislation on Renewable Energy Development

- ▶ Domestic renewable energy development goals.
- ▶ renewable energy power generation and energy storage facilities installed in indigenous areas, the central government shall provide reward for demonstration.
- ▶ Establishing aboriginal "cooperative association", or "citizen energy generation plan".
 - ▶ Participation of indigenous peoples.

Legislation on Renewable Energy Development

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 - ▶ Participation of indigenous peoples.




Implementation on prior informed consent principle

- ▶ Agreements
- ▶ Bad forms:
 - ▶ the renewable energy options are not chosen by the indigenous people.
 - ▶ free choice on using nature resources.
 - ▶ Only single/individual counter parties.
 - ▶ No return articles/clause.
 - ▶ Not earlier and prior notice on the proposal.
 - ▶ No public participation or hearings during proposal discussion.
 - ▶ Mutual consent or majority vote.
 - ▶ No due process.
 - ▶ No benefit sharing methods after using the nature sources.
 - ▶ No environment impacts evaluation or assessment methods/methods.

Thanks for your attention
Q & A

TOPIC 5: Agricultural waste management from indigenous cultural activities
Sustainability of building material: A study case of fiber banana reinforced concrete in Manado region.

Speaker: Dr. Ir. Ellen Joan Kumaat, Former Rector, Sam Ratulangi University, Indonesia.

<p>SUSTAINABILITY of BUILDING MATERIAL: A STUDY CASE of BANANA FIBER FERROCEMENT CONCRETE in MANADO REGION</p>	<p>PRESENTATION SYSTEMATICS</p> <ol style="list-style-type: none"> 1- INTRODUCTION 2- BANANA FIBER CHARACTERISTIC 3- FERROCEMENT FIBRE CONCRETE 4- COMPRESSIVE AND TENSILE STRENGTH RESULTS 5. CLOSSING REMARKS
<p>INTRODUCTION</p>	<p>Concern about environmental problems motivates researchers to develop <i>alternative</i> materials that are environmentally friendly to reduce the amount of CO₂ and other toxic gases released into the environment.</p>
 <p>Indonesia's banana production is in third place after India and China with 8 million metric tonnes or 9% of world production in 2020. (https://ekbis.sindonews.com)</p>	 <p>After taking the fruit, the banana stem will rot and pollute the surrounding environment.</p> <p>The development of environmentally friendly materials, including natural fibers, is a challenge.</p>
	<p>BANANA FIBER CHARACTERISTIC</p>



MECHANICAL PROPERTIES of BANANA STEM FIBERS

Specific Gravity	0,29 g/cm ³
Density	1,35 g/cm ³
Cellulose Content	63 - 64 %
Hemicellulose Content	20 %
Lignin Content	5 - 31,5 %
Average Tensile Strength	600 MPa
Average Tensile Modulus	17,85 GPa
Long Gain	3,36 %
Banana Stem Fiber Diameter	5,8 μm

• Suroso, P. & Kurniasih, S. (1995). High-strength Concrete: mixture proportioning with processed cellulose fiber for durability. ACI Materials Journal, 1(5), 463-468.

• Sufriadi. (2004). Pengaruh Konsentrasi Lintasan dan Waktu Pemasakan terhadap Rendemen dan Sifat Fisik Pulp Batang Pisang Kapok (Musa sp.) Rancangan Skripsi. Yogyakarta: Fakultas Kehutanan Universitas Gadjah Mada.

• Sufriadi. (2004). Pengaruh Konsentrasi Lintasan dan Waktu Pemasakan terhadap Rendemen dan Sifat Fisik Pulp Batang Pisang Kapok (Musa sp.) Rancangan Skripsi. Yogyakarta: Fakultas Kehutanan Universitas Gadjah Mada.

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FERROCEMENT FIBER CONCRETE

ACI Committee 549:

"Ferrocement is a type of thin wall reinforced concrete commonly constructed of hydraulic cement mortar reinforced with closely spaced layers of continuous and relatively small size wire mesh. The mesh may be made of metallic or other suitable materials".

(ACI Code, 1997)

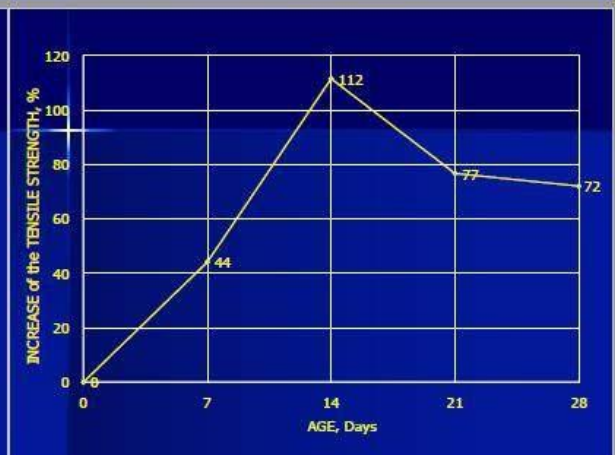
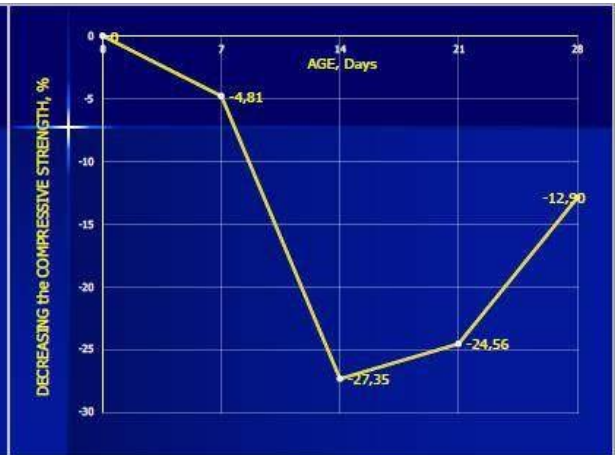
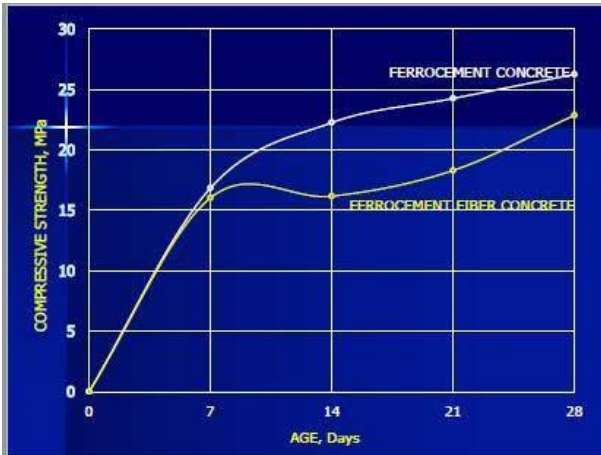
COMPOSITION of FERROCEMENT FIBER CONCRETE

MATERIALS	Kg/m ³
PORTLAND CEMENT (<i>Semen Tonasa, C</i>)	461.38
FINE AGGREGATE	1367.9
WATER (<i>Water Cement Ratio = 0.50</i>)	230.69
BANANA FIBER (<i>Musa Paradisiaca Forma Typica, 0.05% C</i>)	0.23



COMPRESSIVE AND TENSILE STRENGTH





CLOSSING REMARKS

Utilization of banana stem fiber in the composition of ferrocement concrete mixture showed:

1. At the age of 28 days ferrocement concrete,
 - Increase the tensile strength by 70%.
 - Decrease the compressive strength by 10%.
2. Could be used as a substitute for steel fiber in Ferro cement concrete.
3. Provide additional income for banana farmers while reducing CO₂ and environmental pollution.



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22-24 March 2024 | Hanoi, Vietnam | Online + Hybrid

Technology Dissemination

Research Scale Up Training/Education Skill

Goal

16

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AFFORDABLE SYMBIOENERGY SYSTEM FOR SMALL ISLANDS

- **Characteristics:** Low utilization, low-wastory, abundant available resources
- **Solution:** simple and affordable energy
- **Stakeholders:** government, university, community

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1. Manufacturing of Peasantry

2. Setting

18

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3. Distributing

4. Operating

5. Training

19

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BENEFITS

Region

Beneficiary

20

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QUALITY OF LIFE

Symbiosis Energy Model

SYNERGY

LOW-COST ENERGY

ENERGY EFFICIENCY

21

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The future of our children
the future of our planet
It's in OUR hands
That's why Energy Matters

Thank you!!

22

Workshop Day 2 – TOPIC 1: Bioenergy from Biomass for Rural Community.

BIOMAN Biogas Manado.

Speaker: Dr. Liny Tambajong, Manado Eco Green Community & Circular Economy, Indonesia.

The image displays a grid of 12 presentation slides, arranged in 3 rows and 4 columns. The slides are numbered 1 through 12 in the bottom-left corner of each slide.

- Slide 1:** Title slide for "BIOMAN BIOGASTER MANADO" featuring a woman's portrait and a map of Indonesia.
- Slide 2:** Map of Indonesia highlighting the location of Manado City.
- Slide 3:** A blank white slide.
- Slide 4:** "BIOMAN BIOGASTER MANADO" slide with a list of bullet points and a photo of a blue and red biogas tank.
- Slide 5:** "THE SIMPLE INSTALLATION OF BIOMAN" slide with diagrams showing the components and steps of the biogas system.
- Slide 6:** "FILTER BIOMAN" slide with a diagram of a vertical filter unit.
- Slide 7:** "BIOGAS PROCESS" slide with a diagram of a biogas digester and a "SAMPAH ORGANIK" (Organic Waste) input.
- Slide 8:** "BIOMAN Liquid organic fertilizer Usage in my garden" slide with photos of plants and a fertilizer application diagram.
- Slide 9:** "CIRCULAR ECONOMY" slide with a circular flow diagram showing the integration of biogas and organic waste.
- Slide 10:** "CARBON FOOTPRINT LPG" slide with a diagram comparing the carbon footprint of LPG from Singapore versus local biogas production in Manado.
- Slide 11:** "BIOMAN Biogas Distribution Map in Manado City" slide with a map showing distribution points across the city.
- Slide 12:** "INITIATOR MANADO ECO GREEN COMMUNITY & CIRCULAR ECONOMY" slide with a "BANK SAMPAH" (Waste Bank) logo and a "THANK YOU" message.

Workshop Day 2 – TOPIC 2 : *Green Cultural Life.*

Speaker 1: Prof. Dr. Hanilyn Aguilar Hidalgo, Professor, College of Economics and Management, Central Bicol State University of Agriculture, Philippines.

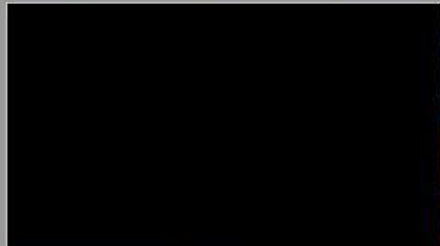
The image displays a grid of 23 presentation slides, numbered 1 through 23. The slides are organized into four rows:

- Row 1 (Slides 1-4):**
 - Slide 1: Title slide for 'Green Tourism Towards Community Development' by Hanilyn Aguilar Hidalgo, Professor at Central Bicol State University of Agriculture.
 - Slide 2: 'Tourism: man's basic need' featuring a pyramid diagram with levels: Self-actualization, Esteem, Safety, Belongingness, and Love.
 - Slide 3: 'Contents' slide listing: Tourism pros and cons, Sustainable/Green tourism, Bicol, Philippines green tourism initiatives, and Policy challenges.
 - Slide 4: A table comparing 'MCTE's Initiatives' and 'MCTE's Agri-tourism Initiatives'.
- Row 2 (Slides 5-8):**
 - Slide 5: 'Tourism industry accounts for 10.4% of the world's GDP, making it one of the largest economic sectors worldwide'.
 - Slide 6: 'Downside of tourism' listing: major source of global greenhouse gas emissions (GHG), puts pressures on natural resources through over-consumption, and exploitation of local culture.
 - Slide 7: 'Bicolary Island (Bicol) and other the Ilocos Region Program of the Philippine Government' with a scenic beach image.
 - Slide 8: 'Sustainable tourism!' with an image of a person in a forest.
- Row 3 (Slides 9-12):**
 - Slide 9: 'SUSTAINABLE TOURISM' listing: Ecotourism, Nature-based tourism, Rural tourism, Agritourism, and Community tourism.
 - Slide 10: 'Pillars of Sustainable Tourism' listing: Social justice, Economic development, and Environmental integrity.
 - Slide 11: 'Sustainable Tourism' infographic showing a circular flow of economic, social, and environmental benefits.
 - Slide 12: 'Hope for greener forms of growth' with an image of a person standing on a hill.
- Row 4 (Slides 13-16):**
 - Slide 13: 'Greening the tourism industry' diagram showing 'Green Hospitality', 'Green Food and Beverage', 'Sustainable Energy Systems', 'Digital Marketing Systems', and 'Green Transportation'.
 - Slide 14: 'Greening the tourism experience: the case of Bicol Region, Philippines'.
 - Slide 15: 'Conscious tourists' defining a completely different way of seeing, being and doing; small scale tourism which involves visiting natural areas while minimizing environmental impacts.
 - Slide 16: 'Role of enablers in farm transformations' listing: Farms as learning sites of agriculture and Farm schools as agri-tourism models.
- Row 5 (Slides 17-20):**
 - Slide 17: 'Pandemic aftermath: investing in wellness' with images of people in a natural setting.
 - Slide 18: 'al fresco dining' with an image of people dining outdoors.
 - Slide 19: 'Bikers hub' with an image of people on bicycles.
 - Slide 20: 'What tourists need' (Attraction, Food, Activities) vs 'What people have' (Natural resources, Farm, Culture).
- Row 6 (Slides 21-23):**
 - Slide 21: 'Tourism Value Chain - Parties directly involved' flowchart.
 - Slide 22: 'Policy challenges towards green tourism' listing: Incentives and rewards, Trade-offs from conventional tourism, and Call for more enablers towards green tourism.
 - Slide 23: 'Nature has its way of putting things into perspective.' with a river image.

Speaker 2: Mr. Yuan-Horng, NA, Manager, Jin-Du Restaurant, Chinese Taipei.







Speaker 3: Mr. Yosifu Kacaw, Chinese Taipei Indigenous Amis tribe Contemporary Artist, Chinese Taipei.

			<p>Can't speak 說不出</p>
			<p>Now is your time 現在是你的時候</p>
			<p>I hear myself 我聽到自己的聲音</p>
			<p>Flying Fish offering 送魚祭</p>



what are you laughing at?
你在笑什麼?



The sun is coming out 太陽出來了



Blue tears 蓝色的眼泪



Somewhere over the rainbow
彩虹的第一端

Mark and glory
印记与荣耀



The last three 最後一瞬間



Proud of who I am
骄傲就是傲



The sound of the sea 海洋的聲音



Happy hour
歡樂時光



Purple tears
紫色的眼泪



Listen to your heart 傾心



Daughter of the Pacific
太平洋的姑娘



Green tears
绿色的眼泪



Embrace your true colors
拥抱你的真实色彩



Flying seeds
飞翔的种子



Harvest
收获



Waterfall
瀑布



Hear the sound of harvest
聆听收获的声音



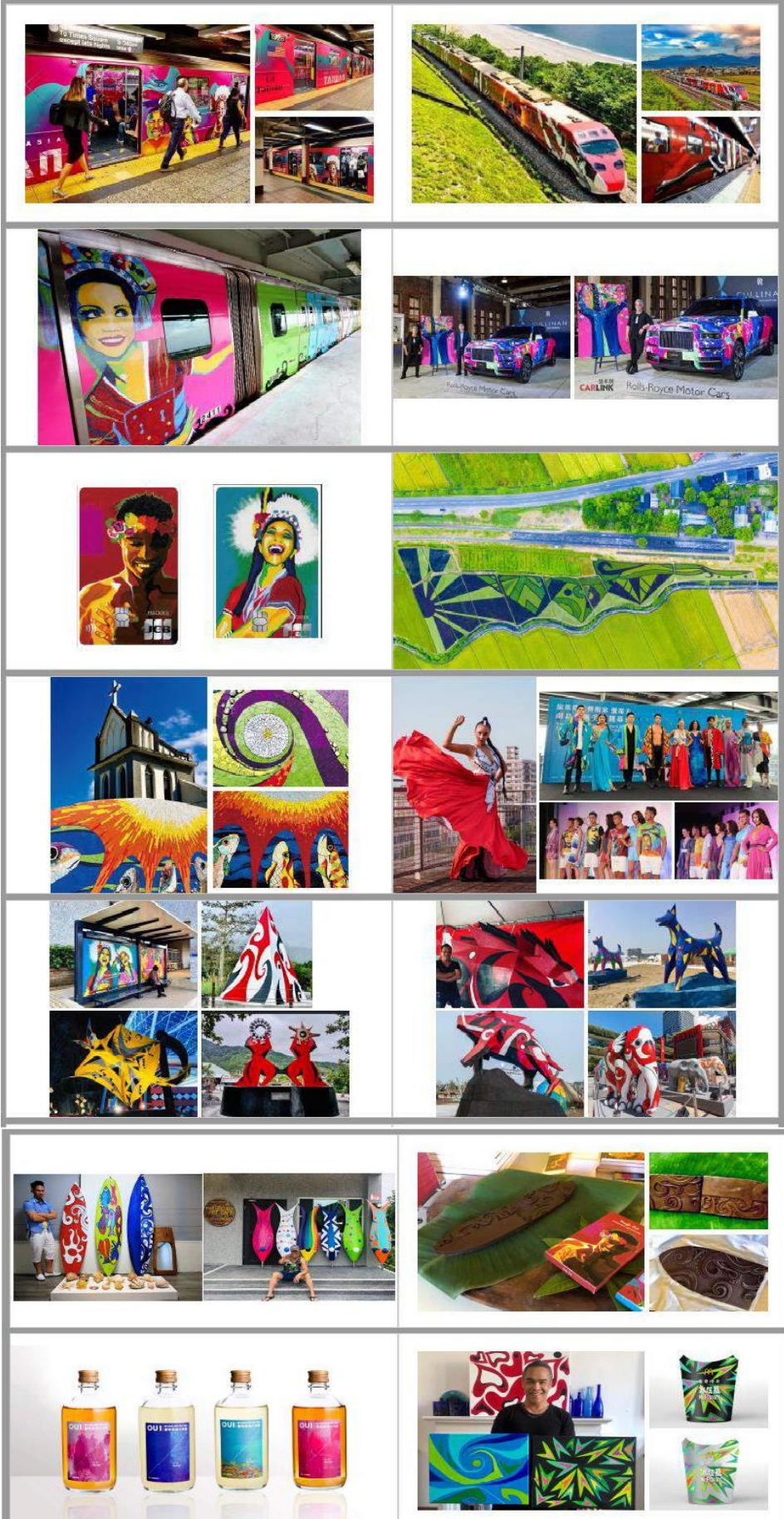
Hear the wing singing
聆听翅膀的声音



Hear the sound of flowers blooming
聆听花儿绽放的声音



The Love Fairy Story of Peacock Pearl
孔雀之珠的爱情神话故事



Workshop Day 2 – TOPIC 3 : Sustainable Renewable Energy for Indigenous People.

Speaker: Dr. Cristhian Chicaiza-Ortiz, Assistant Professor at the Universidad Regional Amazónica IKIAM (Amazon Regional University IKIAM), Ecuador.

Academic Offer

Veterinary Medicine and Quality Management	Electromechanics and Renewable Energies	Ecossytem Engineering	Agroecology Engineering	Biocommerce
Hydrology Engineering	Nanotechnology Engineering	Education in Experimental Sciences	Geoenvironment Engineering	Sustainable Architecture

GENERAL OBJECTIVE

To develop the knowledge and technologies necessary to provide sustainable and accessible solutions to society in the field of biomass valorization for energy, physicochemical, biological, agricultural and environmental use, with a focus on the sustainable development of the Amazon region of Ecuador.

LINES OF RESEARCH

- Potential Usable biomass
- Biomass utilization solutions
- Biomass pre-treatment processes for its utilization
- Post-treatment processes of products generated from biomass valorization
- Use of products generated in biomass valorization

Contents

01 The global energy matrix	02 Waste management in developing countries	03 From organic waste to energy transition	04 Biomass as a bioenergy alternative
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Part 1: Currently world energy matrix

Environmental impacts

The world's energy matrix depends on of fossil fuels, which are responsible for disastrous impacts.

- One of the most relevant is the uncontrolled emission of CO₂, which leads to the intensification of global climate change.
- The contributions to the environmental impact occur in all cases in the early stages of waste disposal and the rate of decomposition together with the distribution of the impact over time increase in warm regions.
- Proper waste management is essential in these regions to control and minimize its possible impacts.

Isolated systems, the Amazon

Reference: Renewable Energy based on biomass in Amazonian communities



Only a small percentage of the country's energy production capacity is outside the electricity system, in small isolated systems, mainly in the Amazon region.

Many of these isolated systems have precarious access to energy due, in part, to efforts to keep the forest well preserved.

Medeiros et al., 2019; Ziegler et al., 2019

Part 2: Waste management in developing countries



Developed countries vs. Developing countries

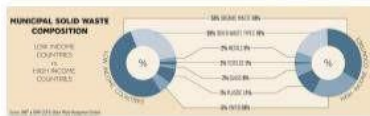
There are huge differences in terms of the generation, composition and management of waste between the two groups.

• With a better level of income, a higher generation of waste.

• The trend is to seek more integrated and sustainable waste management systems.

• The struggle continues to move from the disposal of waste in open-air dumps to controlled sanitary landfills.

• It is important to clarify that the European case studies may not be representative of the LCA scenario due to their technological and geomorphic conditions.



Diegel et al., 2018

Impact in the Amazon region

The generation and composition of waste vary depending on some conditions:

- Socioeconomy
- Climate
- Geography
- Cultural conditions
- Waste planning systems
- Eating habits

Sanitary landfills located in areas with hot, tropical climates and high organic matter content will have:

- Higher LFG generation
- Higher leachate generation

Temperature directly affects the anaerobic decomposition rates of waste.

Diegel et al., 2018; Ziegler et al., 2019



Part 3: From organic waste to energy transition



Current energy characteristics in the Amazon region

01

Oil dominates national energy, representing 80% of energy consumption, followed by hydroelectricity (16.6%), natural gas (3%) and renewable energies (0.7%).



Reference: Renewable Energy based on biomass in Amazonian communities

02

Part of the conservation argument is based on environmental protection, which is closely related to the negative record of the oil sector in the Amazon.



03

Almost 70% of municipal solid waste is deposited in the open air and only 15% is used as an organic compound for agriculture. Leaving a high percentage that can be used as biowaste.



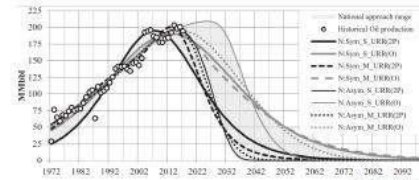
Medeiros et al., 2019; Ziegler et al., 2019

World oil reserves



Schwarz et al., 2010

Impacts of oil in Ecuador



Barbosa et al., 2018



Current energy characteristics in the Amazon region



Reference: Renewable Energy based on biomass in Amazonian communities

A unique feature of the Amazon region is its many isolated, riverine communities.

- 1 A reduced and decentralized consumer market, in which kilometers of cables are needed to supply a single home, due to the vast territorial dispersion.
- 2 Difficult access, which is done predominantly by boat or plane, generating costs based on the transport of fossil fuel by river.



Sacchano, 2010; Medeiros et al., 2019

Current energy characteristics in the Amazon region



Reference: Renewable Energy based on biomass in Amazonian communities

A unique feature of the Amazon region is its many isolated, riverine communities.

- 3 The prohibition of passing on various operating costs, due to the low level of income in local communities.
- 4 Lack of technical background generates loss in the generation and distribution systems, leading to significant financial losses.



Sacchano, 2010; Medeiros et al., 2019

Overview of the MSWM in Ecuador

Research Article

Evaluation of municipal solid waste management system of Quito - Ecuador through life cycle assessment approach

Avaliação do sistema de gestão de resíduos sólidos urbanos de Quito - Ecuador através de análise de ciclo de vida

Evaluación del sistema de gestión de residuos sólidos urbanos de Quito - Ecuador mediante análisis de ciclo de vida

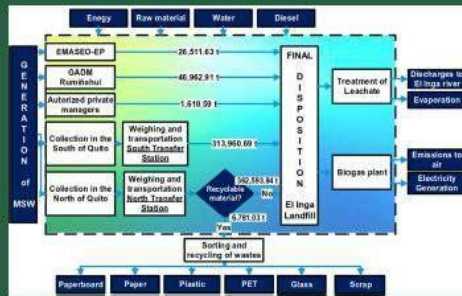
Christian David Chacón Ortiz^{1*}
 Vanessa Patricia Bascuñán Vilal²
 Christian Orlando Camacho López³
 Angel Fabian Chacón Ortiz⁴

Quito

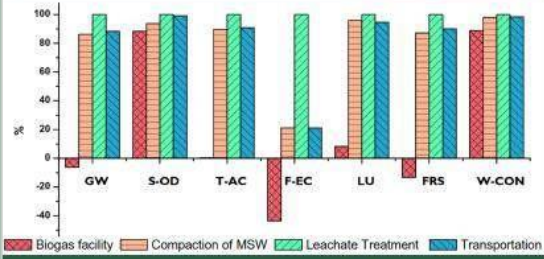
CAPITAL OF ECUADOR

- The largest city in terms of national GDP and headquarters of the main companies.
- Approx. 2000 tons/day of MSW are collected, ending in the landfill El Inga.

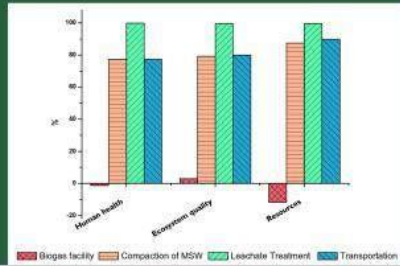
Objective: Evaluate the MSWM of Metropolitan District of Quito through an approach of LCA



Midpoint approach

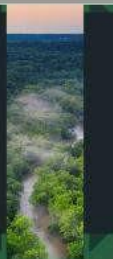


Damage approach



ASHKA PAGRACHU YUPAICHANI

E-mail: cristhianchacaiza@hotmail.com



Workshop Day 2 – TOPIC 4: SME Entrepreneurship.

Speaker 1: Dr Eros Manzo, Responsible for international cooperation of CNR-IIA, Italy.

The presentation consists of 30 slides, numbered 1 through 30, covering the following topics:

- Slide 1:** Institute of Atmospheric Pollution Research CNR-IAA, ICMR. ENERGY JUSTICE – Key Concepts - Metrics and THE EUROPEAN PERSPECTIVES.
- Slide 2:** Introduction to energy justice, mentioning the 2018 report by Sustainable Development.
- Slide 3:** DEFINITION AND CONCEPTS. It is essential to the extent to which energy justice, for countries, regions and citizens of energy and power use issues, concerning environmental, economic, and socio-demographic issues.
- Slide 4:** DEFINITION AND CONCEPTS. It is also related to effective environmental, energy and climate justice, with justice and being related to energy issues (Baker, 2016), and Justice (2016) and Justice (2016) (Carter, 2016).
- Slide 5:** DEFINITION AND CONCEPTS. The Western perspective of energy justice is based on a notion of distributive justice and distributive, not on the idea of procedural justice and procedural justice. The Western perspective of energy justice is based on a notion of distributive justice and distributive, not on the idea of procedural justice and procedural justice.
- Slide 6:** Energy justice. It is broader than distributive justice, procedural justice and procedural justice. It is broader than distributive justice, procedural justice and procedural justice.
- Slide 7:** Energy justice. It is broader than distributive justice, procedural justice and procedural justice. It is broader than distributive justice, procedural justice and procedural justice.
- Slide 8:** The overall national approach to energy distribution has shifted in an effective and efficient way. It is broader than distributive justice, procedural justice and procedural justice.
- Slide 9:** Distributional justice. It is broader than distributive justice, procedural justice and procedural justice. It is broader than distributive justice, procedural justice and procedural justice.
- Slide 10:** Procedural justice. It is broader than distributive justice, procedural justice and procedural justice. It is broader than distributive justice, procedural justice and procedural justice.
- Slide 11:** Introduction and Economic Justice. It is broader than distributive justice, procedural justice and procedural justice. It is broader than distributive justice, procedural justice and procedural justice.
- Slide 12:** Energy Justice Conceptual Framework. It is broader than distributive justice, procedural justice and procedural justice. It is broader than distributive justice, procedural justice and procedural justice.
- Slide 13:** Indigenous energy justice. It is broader than distributive justice, procedural justice and procedural justice. It is broader than distributive justice, procedural justice and procedural justice.
- Slide 14:** Indigenous energy justice. It is broader than distributive justice, procedural justice and procedural justice. It is broader than distributive justice, procedural justice and procedural justice.
- Slide 15:** Indigenous energy justice. It is broader than distributive justice, procedural justice and procedural justice. It is broader than distributive justice, procedural justice and procedural justice.
- Slide 16:** From Energy to Energy Justice. It is broader than distributive justice, procedural justice and procedural justice. It is broader than distributive justice, procedural justice and procedural justice.
- Slide 17:** From Energy to Energy Justice. It is broader than distributive justice, procedural justice and procedural justice. It is broader than distributive justice, procedural justice and procedural justice.
- Slide 18:** From Energy to Energy Justice. It is broader than distributive justice, procedural justice and procedural justice. It is broader than distributive justice, procedural justice and procedural justice.
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- Slide 20:** From Energy to Energy Justice. It is broader than distributive justice, procedural justice and procedural justice. It is broader than distributive justice, procedural justice and procedural justice.
- Slide 21:** From Energy to Energy Justice. It is broader than distributive justice, procedural justice and procedural justice. It is broader than distributive justice, procedural justice and procedural justice.
- Slide 22:** From Energy to Energy Justice. It is broader than distributive justice, procedural justice and procedural justice. It is broader than distributive justice, procedural justice and procedural justice.
- Slide 23:** From Energy to Energy Justice. It is broader than distributive justice, procedural justice and procedural justice. It is broader than distributive justice, procedural justice and procedural justice.
- Slide 24:** From Energy to Energy Justice. It is broader than distributive justice, procedural justice and procedural justice. It is broader than distributive justice, procedural justice and procedural justice.
- Slide 25:** From Energy to Energy Justice. It is broader than distributive justice, procedural justice and procedural justice. It is broader than distributive justice, procedural justice and procedural justice.
- Slide 26:** From Energy to Energy Justice. It is broader than distributive justice, procedural justice and procedural justice. It is broader than distributive justice, procedural justice and procedural justice.
- Slide 27:** From Energy to Energy Justice. It is broader than distributive justice, procedural justice and procedural justice. It is broader than distributive justice, procedural justice and procedural justice.
- Slide 28:** From Energy to Energy Justice. It is broader than distributive justice, procedural justice and procedural justice. It is broader than distributive justice, procedural justice and procedural justice.
- Slide 29:** From Energy to Energy Justice. It is broader than distributive justice, procedural justice and procedural justice. It is broader than distributive justice, procedural justice and procedural justice.
- Slide 30:** CONCLUSION. The aim of all the energy justice policies is to ensure that energy is distributed in a way that is fair and equitable. Thank You.

Speaker 2 (Indigenous Speaker):

Dr. Wei-Chieh Hua, General Manager, Splendid Marketing Ltd., Chinese Taipei.

The presentation consists of 30 slides, numbered 1 through 30. The content is as follows:

- Slide 1:** SME ENTREPRENEURSHIP. Splendid Marketing Ltd., 2023.03.23.
- Slide 2:** SPEAKER-JACK HUA. Bio: President, Splendid Marketing, Splendid Coffee Co., Ltd., Taiwan, China. Experience: 1st Consultant Taiwan Investment Office, Taiwan Trade Office in Taipei. Specialty: Organic, sustainable, healthy, clean, green, Regional Industry Development Consulting. Position: Founder of Splendid Co., Ltd. General Manager of Splendid Marketing Co., Ltd. Managing Director of Splendid Marketing Co., Ltd. Chairman of Splendid Marketing Co., Ltd. Chairman of Splendid Marketing Co., Ltd. Chairman of Splendid Marketing Co., Ltd.
- Slide 3:** IT'S ALL ABOUT A BOX OF COFFEE... (World map with coffee box icon)
- Slide 4:** A COFFEEHOLIC (Photo of two men drinking coffee)
- Slide 5:** Taiwan Coffee in Pingtung (Photo of coffee plantation)
- Slide 6:** A severe Typhoon(88号风灾) in Taiwan Tribe (Photos of typhoon damage)
- Slide 7:** Taiwan Tribe now... (Photo of a group of people)
- Slide 8:** Turn a crisis into an opportunity (Diagram showing Resilience, Innovation, Environmental Protection, and Talent Development)
- Slide 9:** Starting a Business (Photos of business meetings)
- Slide 10:** Indigenous Industry Structure of Developing (Diagram of a tree with branches for various products)
- Slide 11:** Brand Concept (Diagrams showing brand identity and value)
- Slide 12:** The Use of coffee whole tree (Diagram showing the use of coffee tree parts)
- Slide 13:** Industrial Selling Center (Photos of industrial centers)
- Slide 14:** A person works, a group of people work for. Promoting Coffee Industry and Training. [Open up Coffee Demonstration Farm] [Introduce Coffee Management Courses]
- Slide 15:** Promoting Coffee Industry and Training. [Develop Organic Coffee Planting Concept] [Connect Coffee Roasting Applied Courses]
- Slide 16:** Six-grade Industry Concept (Diagram showing six levels of industry development)
- Slide 17:** From the very beginning to the world! (Photos of coffee processing)
- Slide 18:** (Photo of a group of people)
- Slide 19:** (Photo of a group of people)
- Slide 20:** (Photo of a group of people)
- Slide 21:** (Photo of a group of people)
- Slide 22:** (Photo of a group of people)
- Slide 23:** (Photo of a group of people)
- Slide 24:** Branding (Photos of coffee products)
- Slide 25:** Products (Photos of coffee products)
- Slide 26:** Accomplishments (Photos of awards and certificates)
- Slide 27:** (Photos of coffee products)
- Slide 28:** The Future of Indigenous Industry (Diagram showing the future of indigenous industry)
- Slide 29:** GREEN ENERGY APPLICATION (Photos of green energy applications)
- Slide 30:** Thank you. Mali Mali Masalu.

Workshop Day 2 – TOPIC 5: Green Vehicles Application in Rural Areas (Online).

Speaker: Assoc. Prof. Dr. Ching-Ming Lai, NCHU, Chinese Taipei.


[EWG 14 2021A]
APEC Workshop of Empowering Indigenous Social Awareness on Renewable Energy and Increasing Inclusion Sustainability for Green Energy Applications in APEC Regions
Topic 5: Green Vehicles Application in Rural Areas
 Dr. Ching-Ming Lai, NCHU, Chinese Taipei
 pcm21@gmail.com
 22-24, March, 2021 (Taichung City, Chinese Taipei)

Outlines

- Abstract
- Brief Introduction of Green EVs
- Benefits using green vehicles in rural areas
- Potential Applications for EVs in Rural Areas
- How to Charge an EV with Solar Power
- NCHU Electric Mower
- Conclusions


Abstract

- Green vehicles offer a promising solution to the challenges of transportation in rural areas, and their application has the potential to revolutionize rural transportation by providing sustainable and eco-friendly options.
- Electric vehicles (EVs), hybrid EVs, plug-in EVs, and hydrogen fuel cell EVs are among the options that can help reduce carbon emissions, lower operating costs, and improve air quality in rural areas.




Abstract

- Furthermore, rural areas, with their sufficient renewable energy sources, are particularly well-suited for the use of green vehicles.
- In this talk, we will introduce the benefits and potential applications of using green vehicles in rural areas, and provide several examples to inspire colleagues to join us in promoting the adoption of green vehicles in rural communities.




Brief Introduction of Green EVs

- Green EVs that run on electric power rather than gasoline or diesel fuel.
- They are considered "green" because they produce little or no emissions, which helps to reduce air pollution and greenhouse gas emissions.
- Green electric vehicles are becoming increasingly popular due to their environmental benefits, lower operating costs, and advances in battery technology that have increased their driving range and reduced charging times. They are also helping to drive the transition to a cleaner, more sustainable transportation system.



Brief Introduction of Green EVs


- There are many different types of electric vehicles, including all-electric vehicles (EVs), plug-in hybrid electric vehicles (PHEVs), and hybrid electric vehicles (HEVs).
- All-electric vehicles run solely on battery power, while plug-in hybrid electric vehicles have both an electric motor and an internal combustion engine, and hybrid electric vehicles use a combination of electric power and gasoline.



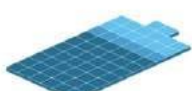
Brief Introduction of Green EVs

EVs are typically comprised of 4 main elements:

- An onboard charger that converts household AC power to DC
- Batteries that store the charged electricity
- An inverter for converting the flow of electricity from the battery to the motor
- Motors that convert the electricity into propulsion power




How to Charge an EV with Solar Power




How to Charge an EV with Solar Power


A charging station providing solar-powered bikes and bicycles to rural communities in Zimbabwe (ZiBike).



How to Charge an EV with Solar Power




How to Charge an EV with Solar Power



A typical setup for the PV-grid charging system.

Potential Applications for EVs in Rural Areas


- Agriculture
- Transportation
- Emergency services
- Recreation



Potential Applications for EVs in Rural Areas

Agriculture

- One example is the Monarch tractor, a 75-hp electric smart tractor manufactured in Livermore, California.
- A four-wheel drive version sells for about \$68,900.
- The tractor is built with DCB parts that are cobalt-free, and the battery can be recycled.
- Monarch sells a unit for recycling a spare battery.
- A charge is good for an average of 10 hours run time and provides about 60 amp-hr of peak energy for 40 hours. Speed is governed below 25 mph.




Potential Applications for EVs in Rural Areas

Transportation

- Rural Opportunities to Use Transportation for Economic Success (ROUTES) is an initiative to address disparities in rural transportation infrastructure by developing user-friendly tools and interventions, aggregating DOT resources, and providing technical assistance.


The Rural Transportation Network is Critical for USA Economy



Potential Applications for EVs in Rural Areas

Emergency services

- An ambulance of three-wheeler electric vehicle solves issues in rural areas.
- During covid-19, 3-wheeler EV has been very supportive in providing timely assistance to the patients from home to the hospital.




Wadi Bangal, India

Potential Applications for EVs in Rural Areas


Recreation

- Electric campers have become increasingly popular in recent years as we attempt to move towards more sustainable modes of transport.
- The previously believed myth that buying an electric camper to help the environment meant sacrificing performance is finally being debunked.




NCHU Electric Mower

- All Electric Power
- Wireless Charging
- Remote Control
- Solar Charge Station




Transformation from USA Gasoline Mower
 Electric Mower developed by Prof. C.M. Lai, NCHU

Demo Wireless charging



Wireless charging, possessing the AI technology of autonomous Extension


Demo Running on a sport lawn



Conclusions

- Green EVs in rural areas are gaining in popularity thanks to their many environmental benefits, including reduced carbon emissions and air pollution.
- To promote sustainable energy practices in rural areas, it's important to utilize solar power efficiently to charge EV batteries and harness total green electricity. By doing so, we can reduce our reliance on non-renewable energy sources and increase the use of clean energy in transportation.
- Recent advances in battery technology with solar charge have further improved their charging range and charging times, making them an even more practical option for daily use.
- As more people choose electric vehicles, they are helping to drive the transition towards a cleaner, more sustainable transportation system.

Dr. Ching-Ming Lai, NCHU, Chinese Taipei
 pcm21@gmail.com



Intelligent EV and Green Energy
 Driving a Smart and Clean City

Workshop Day 2 – TOPIC 6: *Microgrid applications in the rural area.*

Speaker: Mr. Kenny Tseng, CEO of Mobii Green Energy Co., Ltd., Chinese Taipei.

Taiwan's Secret Weapons for Accelerating Decarbonization

Kenny Tseng
CEO of Mobii Green Energy Co.

Kenny Tseng
CEO of Mobii Green Energy Co.

- Founder of Mobii Medical Technology
- Founder of Mobii Sustainable Travel Agency
- Founder of Mobii Green Logistics
- Advisor of Taiwan Outpost
- Board member of Taiwan System Technologies (TS)

Highlights of Mobii Green Energy Co

- Renewable Energy Electricity Sale
- Renewable Energy Construction
- Greenable Energy Storage
- Greenly Supply Network
- TV Channel Installation and Management
- Microgrid and Energy Management
- Carbon Footprint Assessment and Management
- Carbon Credit Trading

What Do We Need Now?

1. An one-stop shopping solution
2. More global collaborations
3. New ESG and digitalization mutual-benefit ecosystem

The most important sentence from Nvidia CEO, Jensen Huang, at the 2023 GTC.

The iPhone moment of AI has started.

Challenges in Developing Renewable Smart Grid Solutions.

- Funding challenges:** High upfront costs, Difficult to raise capital, Limited access to financing.
- Technical challenges:** Grid stability, Interconnection, Limited storage capacity.
- Regulatory challenges:** Complex in multiple areas, Lack of clear rules and incentives.
- Integration challenges:** Energy grid stability and programming, Lack of business model.
- Interconnecting challenges:** Interconnectivity issues with different components, Limited interconnectivity.
- Scalability challenges:** Difficult to replicate models in different regions, Lack of uniform regulations and incentives.
- Maintenance challenges:** Higher maintenance costs for renewable energy, Lack of government regulations, budget, and subsidies.

Mobii ESG Transformation Solution Cycle.

ESG (Environmental, Social, Governance) and Digitalization are integrated into a cycle that includes: ESG Strategy, ESG Reporting, ESG Risk Management, and ESG Performance.

Exploring The World Smart Energy Week at Tokyo and Beyond

World Smart Energy Week 2023 (Oct 16-18, 2023) in Tokyo, Japan.

Participants: Mobii Green Energy, Formosa Energy, and others.

Mobii Teamed up with Formosa Japan to Present Mobii Green Film and ESG GreenTech Solutions in Hotels.

Formosa Hotels (FOTEL) and Mobii Green Energy (MGE) have implemented Energy Storage Solutions.

Mobii Green Film
A Cutting-edge Material Formulation

Mobii Green Film is an innovative and advanced film material that utilizes cutting-edge material technology to enhance solar power generation efficiency.

Mobii Integrated ESG GreenTech Solutions to Achieve Sustainable Goals for All Venues

ESG GreenTech Solutions in Hotel Industry: Energy Efficiency, Water Conservation, Waste Management, and Carbon Footprint Reduction.

Go Green Empowering By AWS CarbonLake Tool

Carbon Lake is a cloud-based tool for carbon footprint management, offering features like data integration, reporting, and optimization.

Mobii ESG GreenTech Solution in Agricultural Industry

Integration of renewable energy and digitalized facility management. And carbon footprint management.

Two-stage BioHythane Power Generation System Turnkey Solution

Energy Recovery: 8-43%
Combustion Efficiency: 20-30%
Gas Generation: 82%

The Secret Weapons for Accelerating Plant Growth

1. Hyperspectral Absorber
2. High Efficiency Spectrum Shed Film
3. Dissolved Oxygen Nutrient Solution

TaiSugar Agricultural Circular Park

A Green Energy Circular Pig Farm. Daily productivity of 200 tons of pig manure and wastewater, generating 3.1 million kWh of electricity per year.

Mobii's Innovative 5 in 1 Integration Model

Integration of: Overseas Markets, Circular Economy, Microgrid, Agri-Tech Industry, and Renewable Energy Industry.

"The iPhone Moment of ESG Collaboration has Started."

Join Mobii ESG Alliances Now

Workshop Day 2 – TOPIC 7: Scale-up of solar PV in the rural area.

Speaker: Dr. Pi-Fuang Chen, CEO for Zolargus Co. Ltd., Chinese Taipei.

Green Energy From Seeds to Forests
- By Pi-Fuang Chen

Abstract
Green energy, specially Solar Energy, is getting more popular in developed countries now, however, it still hard for developing countries. The KEY steps to success are accumulated feedback lots of real cases. Here, we used our experience in Taiwan, as example, to do training class with national certificate for qualified manpower and crystal green energy policy with secured investment. Last, some successful green energy applications and stories will be introduced.

Now and Future
• Energy Seeds – in Education
- Education platform
- Certification System
People
↓
Money
↓
• Energy Forests – in Applications
- Solar Farms
- Solar Streetlight
- Solar utilities

Energy Seeds – in Education
• Educating people know and would like to utilize green energy.
• Training people to be the qualified manpower to introduce green energy.

Taiwan Certification System
There is a class of national solar certification in Taiwan.
Allowing the qualified people with solar certification can join solar energy development.
• Secure the installation quality
• Fully understand the maintenance
• Keep the solar energy system to work as long as you expected

Education Platform
HsiuPing University as an example

Real Case in HsiuPing University

No energy, No growth
• Energy is always an issue regarding to economic growth.
• Specially, Taiwan is an island country, Excepted green energy, Taiwan must import energy.

Real Solar Farm Cases

Taoyuan High School

The Biggest Bay Solar Farm In The World (I)
160MWp Sea Solar Farm

The Biggest Bay Solar Farm In The World (II)
Up And Down Based on Tidal

Real Solar Farms In Japan

Taiwan Solar Stories In Discovery Channel

Green energy needs money
• Where is the money?
• Can it be easy money?

Why People Invest Solar Farms In Taiwan?
• Clear policy
• Return Rate is more than 10%
• Sign 20 year contract with Taipower(TPC) is secured
• Verify results for more than 10 years and sync up with the investment plan.

Taipower (TPC) Buying Price for Green Energy

Types	Price (NTD)	Quantity (MW)	Capacity (MW)	Notes
Single-Phase	4,500	9,021	1,804	10-year contract
Three-Phase	4,200	9,021	1,804	10-year contract
Single-Phase	4,000	9,021	1,804	10-year contract
Three-Phase	3,800	9,021	1,804	10-year contract
Single-Phase	3,600	9,021	1,804	10-year contract
Three-Phase	3,400	9,021	1,804	10-year contract
Single-Phase	3,200	9,021	1,804	10-year contract
Three-Phase	3,000	9,021	1,804	10-year contract

As An Example

Green Energy Forests

Real Utilities

Real Solar Streetlight Case In Vietnam

Rural Area Solar House Power Independent

Solar Water Pumping

Flooding Shelter In Manado, Indonesia
About 30% each house without power. Solar energy can help.

Solar Power For Shelter houses

Power Box Spec

Water Power

More and more solar utilities
Just Do It!

Green Forests
Q&A

Workshop Day 2 – TOPIC 8: Scale-up Agricultural waste of bioenergy technology.

Speaker: Prof. Dr. Dwi Susilaningih, Senior Researcher at the BRIN, Indonesia.

The presentation consists of 21 slides, numbered 1 through 21. The content is organized as follows:

- Slide 1:** Title slide for the EWS 14 2021 APEC WORKSHOP, 'SCALE UP AGRICULTURAL WASTES OF BIOENERGY TECHNOLOGY IN INDONESIA', presented by Dwi Susilaningih from BRIN.
- Slide 2:** 'LAY OUT PRESENTATION' with an agenda: 1. INTRODUCTION AGRICULTURAL WASTE IN INDONESIA, 2. ELECTRICITY FROM PALM OIL WASTES CONVERSION, 3. BIODIESEL FROM PALM OIL WASTES, 4. FUEL FROM BIOMASSES CONVERSION, 5. EXPLORATION NEW RESOURCES FOR RNE, 6. CLOSING REMARKS.
- Slide 3:** 'Introduction' listing major Indonesian agriculture products (CROPP PLANTATION, PLANTATION/ESTATE, LIVESTOCK) and waste materials (SOLID WASTES, LIQUID WASTES, GSK).
- Slide 4:** 'ELECTRICITY FROM BIOMASSES CONVERSION IN INDONESIA'.
- Slide 5:** 'CROP PLANTATION WASTES' showing waste types like rice straw, coconut husk, sugarcane, and cassava stalks.
- Slide 6:** 'PALM OIL LIQUID WASTES' flowchart showing waste from mills and refineries.
- Slide 7:** 'Biogas from POME-Liquid Waste of PALM OIL INDUSTRIES' with a map of Indonesia and a bar chart.
- Slide 8:** 'SUGARCANE LIQUID WASTE' showing waste from mills and refineries.
- Slide 9:** 'SAGO LIQUID WASTE' showing waste from mills and refineries.
- Slide 10:** 'Pulp Factory and their wastes' showing waste from mills and refineries.
- Slide 11:** 'FUEL FROM BIOMASSES CONVERSION IN INDONESIA'.
- Slide 12:** 'BIODIESEL FROM PALM OIL' showing waste from mills and refineries.
- Slide 13:** 'BIOETHANOL FOR FUEL' showing waste from mills and refineries.
- Slide 14:** 'COOKING GAS FROM BIOMASSES CONVERSION IN INDONESIA'.
- Slide 15:** 'MANADO PROJECT CONCERNING THE CATTLES MANURES INTO COOKING GAS' showing a biogas process diagram.
- Slide 16:** 'EXPLORING NEW RESOURCES FOR RNE IN INDONESIA'.
- Slide 17:** 'Integrating Control Center' showing a control room.
- Slide 18:** 'BIOENERGI ALGA' showing algae production.
- Slide 19:** 'MANADO PROJECT CONCERNING THE CATTLES MANURES INTO COOKING GAS' showing a biogas process diagram.
- Slide 20:** 'CLOSING REMARKS' with two points: 1. Conversion of wastes biomasses in commercial scale in Indonesia in current state are really using coal, natural gas and distribution processing system to produce electric energy. 2. Appropriate technologies for collected biomasses also needed containing efficiency energies production.
- Slide 21:** 'THANK YOU FOR YOUR KIND ATTENTION' with contact information for BRIN.