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 CO_2 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 CO_2 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 pleasured 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 Splender Hotel, Chinese Taipei.

ANNEX 1: Agenda

Agenda

Asia-Pacific Economic Cooperation

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** • 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	**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, Supervsiing Sceince Research Specialist, Department of Energy, Renewable Energy Management Bureau, Philippines.
12:30 – 14:00	**Lunch**
Virtual/Physical Training Course	
14:00 – 14:20	**Topic 1:** Introduction to SDGs **Lecturer:** Dr. Cindy Hsueh, s.School, Feng Chia University, Chinese Taipei.
14:20 – 14:40	**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.
14:40 – 15:00	**Topic 3:** Indigenous cultural lifestyle **Lecturer:** Dr. Reiny Antonetha, TUMBOL, HEAD of International office in UnSRAT, Indonesia.
15:00 – 15:20	**Coffee Break**
15:20 – 15:40	**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
15:40 – 16:00	**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.
16:00 – 16:20	**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.
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	**Topic 1:** Bioenergy from Biomass for Rural Community- BIOMAN. Biogas Manado Dr. Liny Tambajong, Manado Eco Green Community & Circular Economy, Indonesia

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 Susilaningsih, 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

	(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 Indignious Peoples (UNDRIP). This Declaration, adopted by the UN General Assembly in 2007, recognizes and respect for" indigenous knowledge, culturesl 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 conosider 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 Artic, 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 Europe[1] 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 Union[3]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 activties and safeguard cultural heritage of European significance. The Article 167 of the Treaty on the functioning of the European Union[4] 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 Europe[5], the architectural heritage is defined as "permaner properties" including monuments[6], groups[7] of buildings and sites[8]. 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 mounments, groups of buildings and sites. Therefore, the traditional buildings or communities of the European indigenous people could be protected by this Convention.

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[2] Amsterdam Declaration, adopted at the Congress on the European Architectural Geritage. 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, eqrthquakes, typhoons, or other extreme weather events. These traditional houses also need extra energy for cooking, cooling, and lighting. Under the energy efficiency improvment 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 CO_2 emissions. The Indonesian government summitted its economy determinated contribution as 29% reduction against business-as-usual (BAU) by 2030, which is equal to 2,869 GttCO_{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://wipolex-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 desination, 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 recognization 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. Althouth 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 2005[15] to conserve and preserve domestic heritage buildingss. 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 Curtural 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 heritage[17]. 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 settting 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 inhibited 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, paragraph1. 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 Chutural Heritage. The regulation states the central competent authority shall proceed and conduct a comprehensive survey of Aboriginal traditional buildings that features ethno-cultural-cultural characteristics ad 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 CO_2 emission of the residential sector is 29.72MtCO_2 in 2020, accounting for 11.55% of the total emission of all sectors. The commercial sector is 26.64MtCO_2 in 2020, accounting for 10.35% of the total emission of all sectors. The government will require the residential sector to reduce 1.61MtCO_2, and the commercial sector will reduce 2.15MtCO_2 during 2021-2025[19]. 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 Secots. 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 usedthe 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 Department[21]. 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 centruies, and then gradually adopted by the government after their participation on the UNESCO conference for protection of tangible and intangible curtural heritage management during 2002[22]. 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, froup 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 centuries[23]. 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 maintainess 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 (CO_2) 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 CO_2 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.

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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 tis, 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 UNs' 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 havebeen 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 Abriginal 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.

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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
Ari Sutanto	Indonesia
Rima Yunica Tahir	Indonesia
Ahmad Suryono Wibowo	Indonesia
Hieryco Manalip	Indonesia
Grace Natalie Wicaksono	Indonesia
Khyrania Aldera	Indonesia
Ivy Latief Soehono	Indonesia
Rayhan Landep Wiastomo	Indonesia
Jayen Aris Kriswantoro	Indonesia
Ivana Marcia Florence	Indonesia
Tiziana Davanzo	Italy
Yoshiki KITANO	Japan
Takuma Suzuki	Japan
Dra. Neftali Rojas Valencia	Mexico
Peer Mohamed	Malaysia
Hanilyn A. Hidalgo	The Philippines
Keith Eduard S. Hidalgo	The Philippines
Rameshprabu Ramaraj	Thailand
Yuwalee Unpaprom	Thailand
Winitra Leelapattana	Thailand
Panate Manomaivibool	Thailand
Nuttapon Chanpichaigosol	Thailand
Prakaidao Pomdaeng	Thailand

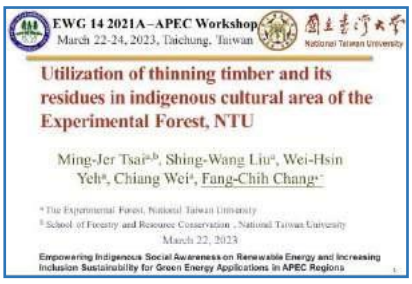
Kuan-Yin Pan	Chinese Taipei
Yu-Xuan Liu	Chinese Taipei
Tsung-Hsien Chen	Chinese Taipei
Raymond Chen	Chinese Taipei
Yu-Ting Song	Chinese Taipei
Chiung-Hao Tseng	Chinese Taipei
Cheng Han Michael Liu	Chinese Taipei
Hui Chen Renee Chiu	Chinese Taipei
Lin Yu Chun	Chinese Taipei
Ting-Wu, Ko	Chinese Taipei
Shih-Yun Chang	Chinese Taipei
Min-Chen, Pan	Chinese Taipei
Matías Lin	Chinese Taipei
Pin Chun Chen	Chinese Taipei
Tsai Wan Yu	Chinese Taipei
Joy	Chinese Taipei
Chang, Chi-Fang	Chinese Taipei
Chen Bo Jyun	Chinese Taipei
Wu-Han-Xuan	Chinese Taipei
Jenifer Kristanto	Chinese Taipei
Liao Yuan-Yin	Chinese Taipei
Lena Chang	Chinese Taipei
Yu-Shu,Chen	Chinese Taipei
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

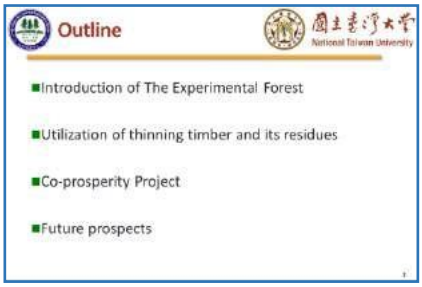
ANNEX 4 : Slides

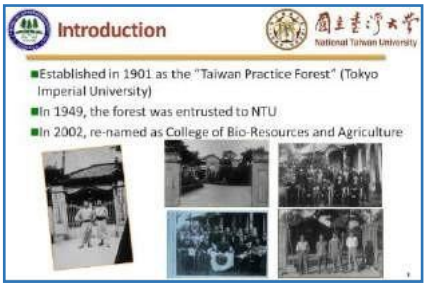
POLICY DIALOG – TOPIC 1

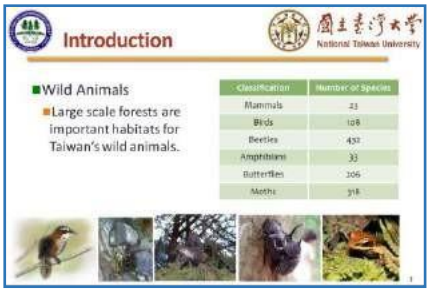
Aboriginal land planning and climate change Utilization of thinning timber and its residues in indigenous cultural area of the experimental forest

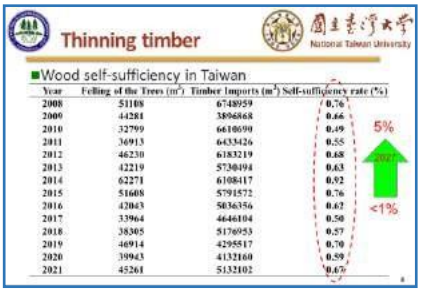
Speaker 1 : Dr. Fang-Chih Chang, Research Fellow, NTU, Chinese Taipei.

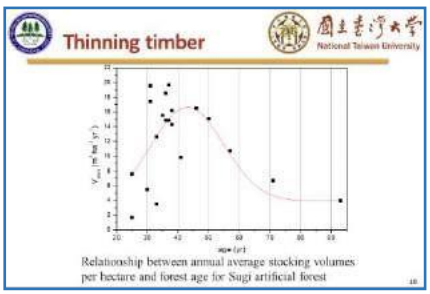


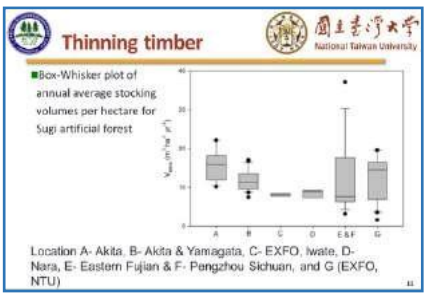


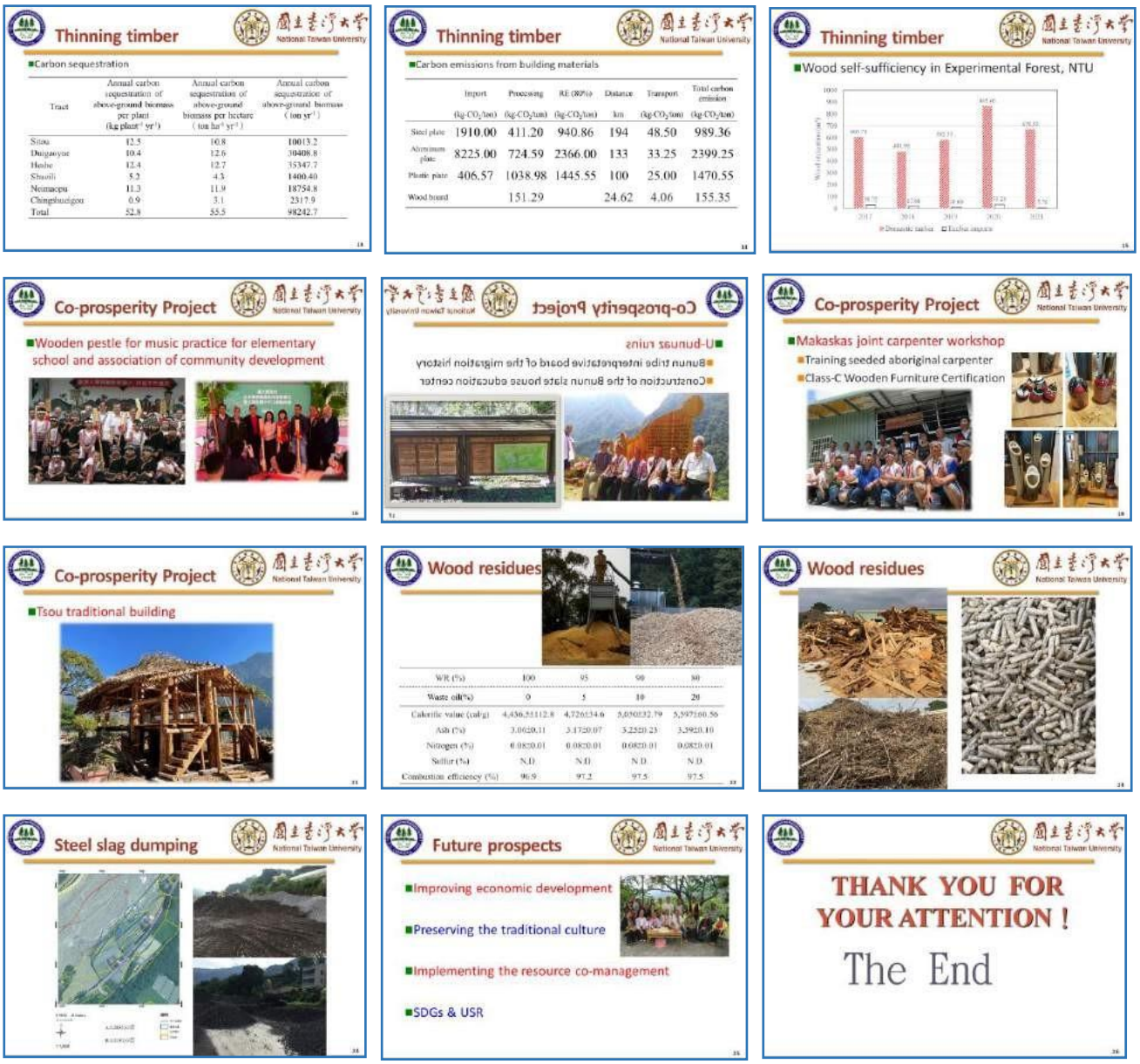












Speaker 2 : Dr. Francesco Petracchini, Director CNR - IIA, Italy.

Relevant thematic areas

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

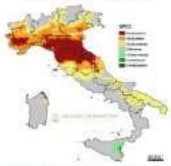
RESEARCH FIELDS

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

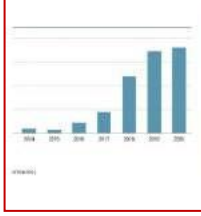
These describe and highlight the complexity of the Institute's national and international research and technological development activities to study, monitor and improve air quality, and to safeguard ecosystems and human health.

Climate Change: Glacier Melting

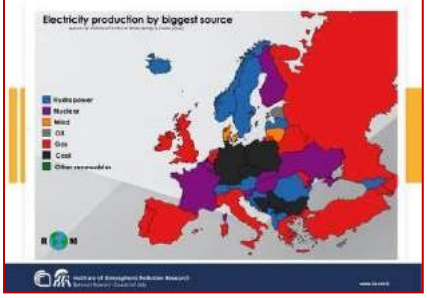
Climate Change Impacts: drought in Italy



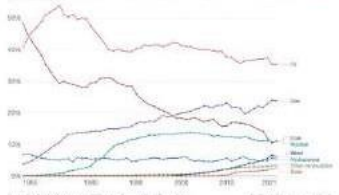
Climate Change effect: floods



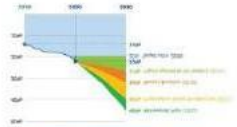
Electricity production by biggest source



Share of energy consumption by source, European Union (27)



EU Report



The Green Deal is a set of policy initiatives by the European Commission with the overarching aim of making Europe climate neutral in 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, biodiversity, 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 (Bertsch et al., 2016), 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 local 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:

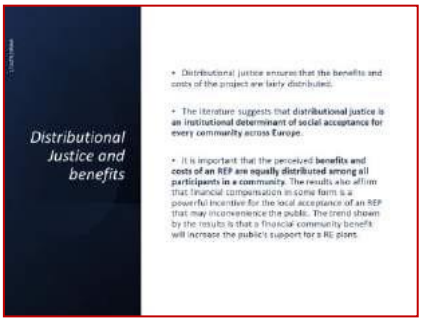
Trust
Siting and technology
Distributional Justice
effect socio-demographic factors on social acceptance

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.

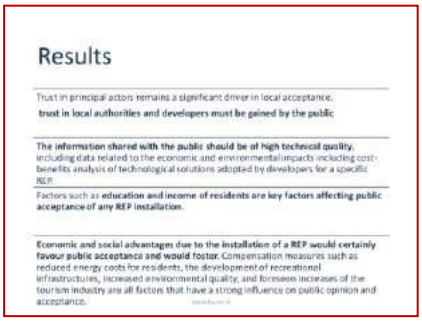
The studies indicate that **community participation helps alleviate the community's concerns and increase the level of mutual trust.** Disseminating information is crucial to correct any misconceptions about RES and REP. It is also important to mitigate the concerns about siting, environmental and human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


SITING


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 biased 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-benefits 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° European Biogas productor
More than 1550 plants
• Prejudices on:
• Health
• Pollution
• Smells
• Economic speculation
NO BIOGAS


ISAAC


SCHOOL TOUR:
7 REGIONS
1000+ STUDENTS


ABR PROTOTYPE INSTALLED ON TRUCK


BUCK BRADLEY
COMIC ADVENTURE (APP)


Benvenuto in Arborea ne parla


Benvenuto in Andria ne parla


ISOLE SOSTENIBILI
Energy, Circular Economy, Water, Mobility
Smart island projects in Italy


ITALIAN SMALL ISLANDS: PRESENT CONDITION
• Oversized power generation plants
• Low presence of renewable sources
• High presence of electricity in end uses
• Poor diffusion of energy efficiency solutions and of energy saving techniques
• Dependence on mainland for fuel, water, raw materials and waste disposal
• Need to increase 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 plants 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 requested by tourists

CNR-IIA and The Clean Energy for EU Islands Secretariat

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

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

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

- Dissemination
- Engagement platform
- Connection between the different levels of governance
- National Feedback (Islands 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 the energy generated by innovative and renewable electricity production plants.

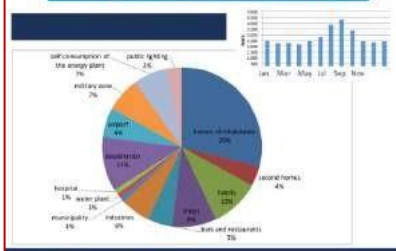
THE 3 STEPS FOR SMART ISLAND

1) Reduction of electricity demand

2) Production of 50% electricity from RES

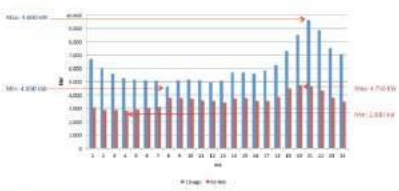
3) Production of 100% electricity from RES

LAMPEDUSA: ENERGY CONSUMPTION



SEASONALITY

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



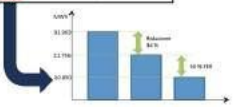
STEP 1 – REDUCTION OF ELECTRICITY DEMAND

Sector	Type of consumption	State of the art	New available technology	Energy saving	Barriers	Public incentives
Private houses	Hot water	Electric water heater	Thermal solar	15%	Public authorisation	Yes
	Lighting	80% CFL lamps	LED	5%	No	Yes
	Air conditioning	Heat pumps COP 1.5	Heat pumps COP >2.5	25%	Illegal houses	No
	Domestic devices	Low efficiency, no cut off	High efficiency, regulation and control	10%	No	Yes
Public services	Public lighting	Na and Hg lamps, no regulation and control	LED and control systems	5%	No	Yes
	Water	Low efficiency	High efficiency, monitoring		No	No
Mobility	Mobility	None	Bus, carsharing, car pooling		No	No

Electricity reduction = 34 %

STEP 2 - Production of 50% electricity from RES

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



STEP 3 - 100% RES

RES	MW	MWh/year	Barriers	Public incentives
PV roof	4	4800	authorisation; unregistered buildings	Yes
PV soil	3	4200	landscape authorisation	No
Concentration PV	1	1500	landscape authorisation	No
Wind tower	1	3000	landscape authorisation	No
wind <200kW	1.5	3750	landscape authorisation	Yes
wave energy	1	2900	national environmental authorisation	Yes
Tot	11.5	20850		

RES SITE IDENTIFICATION

CITIZENS INVOLVEMENT

CITIZENS INVOLVEMENT

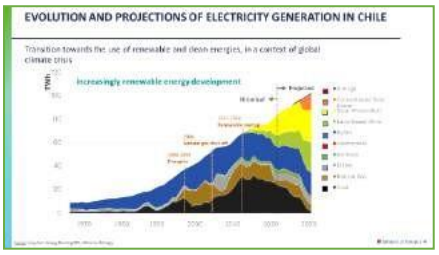
Thank You!

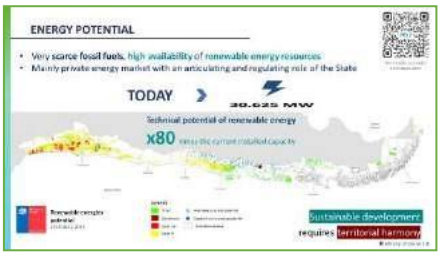
petracchini@iia.cnr.it

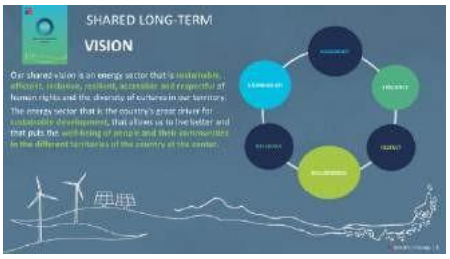
POLICY DIALOG – TOPIC 2

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.







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 apreach 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 Profit Sharing.**
- Ensure that geothermal concessions are awarded on lands without indigenous claims.
- Decrease the extension of the request for concessions.
- Avoid requesting concessions in areas of high ecological and/or cultural value.
- **Correct the regulations regarding water rights in geothermal energy.**
- **Use the concession decree to raise socio-environmental standards.**
- Consider ancestral indigenous participation during the exploration concession process. Implement international standards to improve participatory processes to identify impacts and community relations.
- Early training of indigenous communities.
- Public geothermal file.
- **Promote long-term social investment agreements.**
- Generate shared and transparent knowledge for environmental assessment.
- Improve the negotiation conditions for rights of way.
- **Improve or create complaint system.**
- Create ecological repair funds.
- **Integrate the area of community relations into the strategic divisions of the projects, having social experts, paying special attention to early and permanent relations with the communities.**

STRENGHTENING 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)

II. LOCAL ENERGY

LOCAL ENERGY

Goals and Purposes

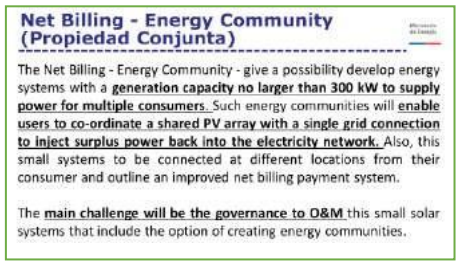
Empower social organizations, communities and indigenous people in the area of energy development with regard to energy projects and their associated impacts, including their total or partial participation in their development.

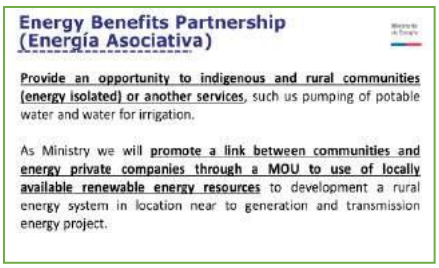
GOAL

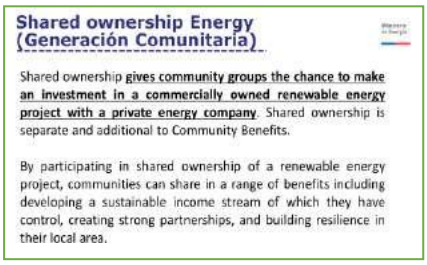
MINISTRY ROLE

WHAT IS LOCAL ENERGY?

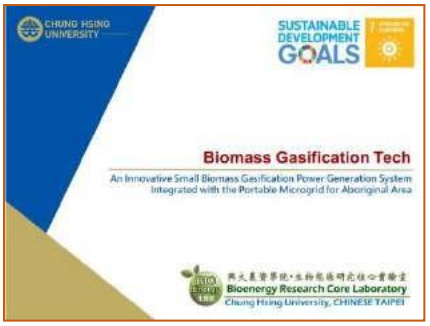
SCOPE OF APPLICATION

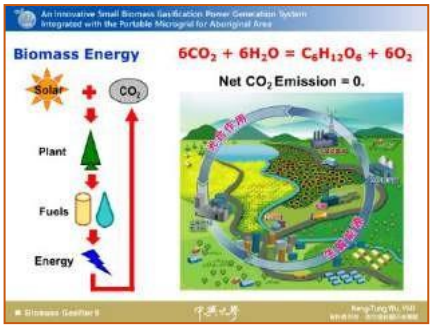


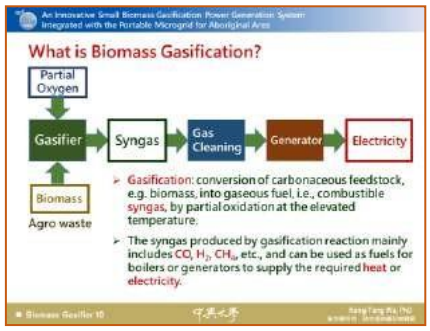


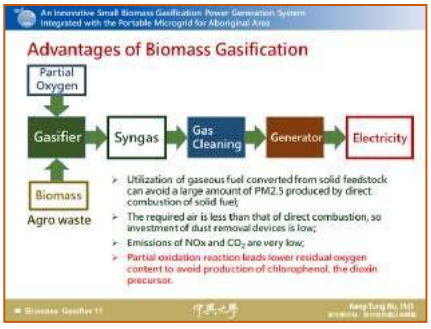


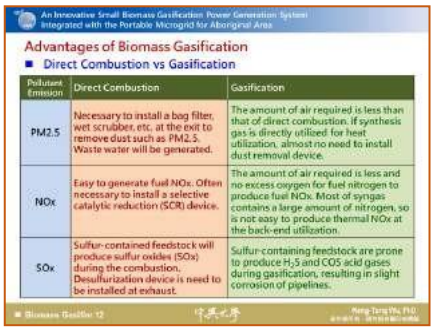
Speaker 2: Assoc. Prof. Keng-Tung Wu, NCHU, Chinese Taipei.

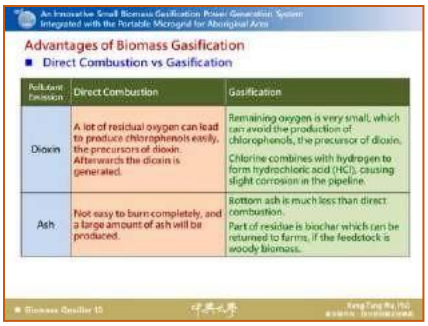


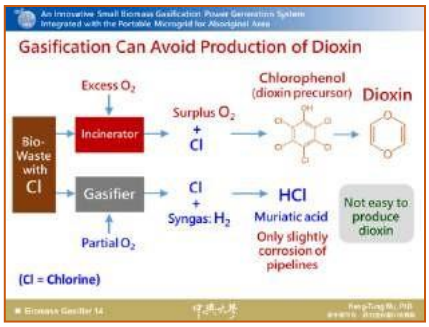


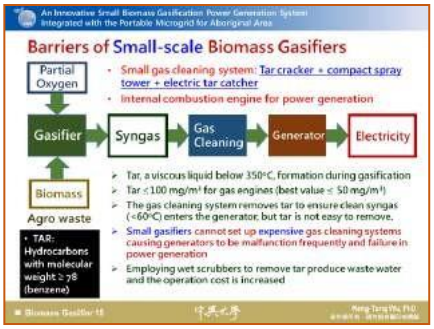

An Innovative Small Biomass Gasification Power Generation System Integrated with the Portable Microgrid for Aboriginal Area
What is Biomass Gasification?
Partial Oxygen
Gasifier
Syngas
Gas Cleaning
Generator
Electricity
Biomass
Agro waste
Gasification: conversion of carbonaceous feedstock, e.g. biomass, 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.

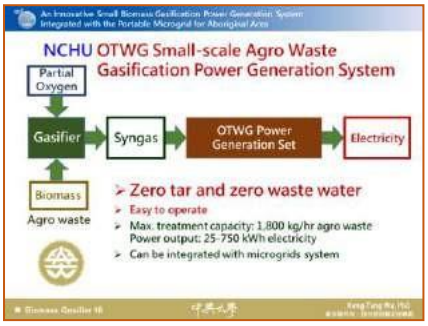

An Innovative Small Biomass Gasification Power Generation System Integrated with the Portable Microgrid for Aboriginal Area
Advantages of Biomass Gasification
Partial Oxygen
Gasifier
Syngas
Gas Cleaning
Generator
Electricity
Biomass
Agro waste
Utilization of gaseous fuel converted from solid feedstock can avoid a large amount of PM2.5 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 NOx and CO_2 are very low;
Partial oxidation reaction leads lower residual oxygen content to avoid production of chlorophenol, the dioxin precursor.


An Innovative Small Biomass Gasification Power Generation System Integrated with the Portable Microgrid for Aboriginal Area
Advantages of Biomass Gasification
Direct Combustion vs Gasification
Pollutant Emission | Direct Combustion | Gasification
PM2.5 | Necessary to install a bag filter, wet scrubber, etc. at the exit to remove dust such as PM2.5. 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.
NOx | Easy to generate fuel NOx. 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 NOx. Most of syngas contains a large amount of nitrogen, so is not easy to produce thermal NOx at the back-end utilization.
SOx | Sulfur-contained feedstock will produce sulfur oxides (SOx) during the combustion. Desulfurization device is need to be installed at exhaust. | Sulfur-containing feedstock are prone to produce H_2S and COS acid gases during gasification, resulting in slight corrosion of pipelines.

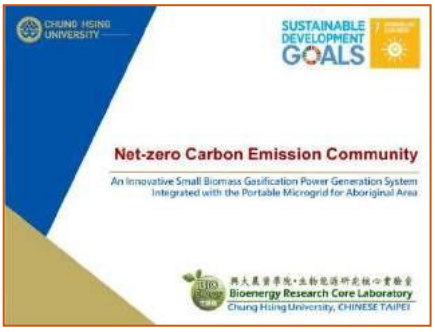

An Innovative Small Biomass Gasification Power Generation System Integrated with the Portable Microgrid for Aboriginal Area
Advantages of Biomass Gasification
Direct Combustion vs Gasification
Pollutant Emission | Direct Combustion | Gasification
Dioxin | A lot of residual oxygen can lead to produce 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 biocher which can be returned to farms, if the feedstock is woody biomass.


An Innovative Small Biomass Gasification Power Generation System Integrated with the Portable Microgrid for Aboriginal Area
Gasification Can Avoid Production of Dioxin
Excess O_2
Chlorophenol (dioxin precursor)
Dioxin
Bio-Waste with Cl
Incinerator
Surplus O_2 + Cl
Gasifier
Cl + Syngas: H_2
HCl
Muriatic acid
Only slightly corrosion of pipelines
Not easy to produce dioxin
Partial O_2
(Cl = Chlorine)

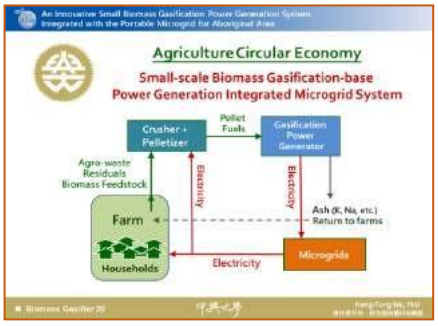

An Innovative Small Biomass Gasification Power Generation System Integrated with the Portable Microgrid for Aboriginal Area
Barriers of Small-scale Biomass Gasifiers
Partial Oxygen
Small gas cleaning system: Tar cracker + compact spray tower + electric tar catcher
Internal combustion engine for power generation
Gasifier
Syngas
Gas Cleaning
Generator
Electricity
Biomass
Agro waste
Tar, a viscous liquid below 350°C, formation during gasification
Tar ≤100 mg/m³ for gas engines (best value ≤ 50 mg/m³)
The gas cleaning system removes tar to ensure clean syngas (<60°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
TAR: Hydrocarbons with molecular weight > 78 (benzene)


An Innovative Small Biomass Gasification Power Generation System Integrated with the Portable Microgrid for Aboriginal Area
NCHU OTWG Small-scale Agro Waste Gasification Power Generation System
Partial Oxygen
Gasifier
Syngas
OTWG Power Generation Set
Electricity
Biomass
Agro waste
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


An Innovative Small Biomass Gasification Power Generation System Integrated with the Portable Microgrid for Aboriginal Area
OTWG Biomass Gasifier
25-750 kWe 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. (星宣實業有限公司)


CHUNG HSING UNIVERSITY
SUSTAINABLE DEVELOPMENT GOALS
Net-zero Carbon Emission Community
An Innovative Small Biomass Gasification Power Generation System Integrated with the Portable Microgrid for Aboriginal Area
Bioenergy Research Core Laboratory
Chung Hsing University, CHINESE TAIPEI


An Innovative Small Biomass Gasification Power Generation System Integrated with the Portable Microgrid for Aboriginal Area
生質物氣化微電網示意圖
Sketch of Biomass Gasification Microgrid
氣化發電 Gasification Power Generation
儲能系統 Energy Storage
《微電網系統》 Microgrid System
控制系統 Control System
農業廢棄物 (生質物) Agricultural Waste (Biomass)
辦公室、社區、農村 Offices, Communities, and Rural Villages
Simple system
Scalability
Easy to operate
Easy to maintain
Reduce investment in power lines

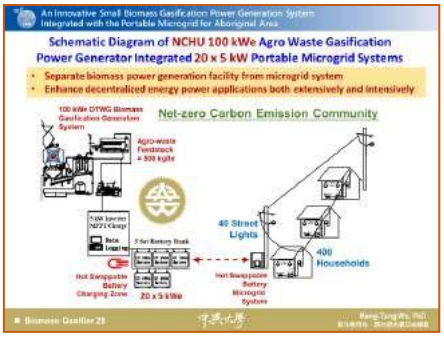

An Innovative Small Biomass Gasification Power Generation System Integrated with the Portable Microgrid for Aboriginal Area
Agriculture Circular Economy
Small-scale Biomass Gasification-base Power Generation Integrated Microgrid System
Crusher + Pelletizer
Pellet Fuels
Gasification Power Generator
Agro-waste Residuals Biomass Feedstock
Electricity
Farm
Ash (K, Na, etc.) Return to farms
Households
Electricity
Microgrids

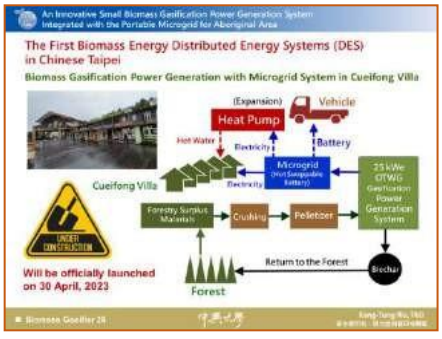

An Innovative Small Biomass Gasification Power Generation System Integrated with the Portable Microgrid for Aboriginal Area
NCHU BioEnergy Demo Site
NCHU 100 kWe Agro Waste Gasification Power Generation System Integrated Microgrids
Commenced on 12 Nov 2019
BioEnergy Demo Site
生質能源示範場域
5 kW Microgrid
1.2 m
100 kWe Downdraft Gasifier


An Innovative Small Biomass Gasification Power Generation System Integrated with the Portable Microgrid for Aboriginal Area
新型農業廢棄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
農田 Farmland
偏遠住家 Remote Residences
生質廢棄物 Bio-based Waste
氣化發電 Gasification Generation
無線智能電池充電區 Hot Swappable Batteries Charging Zone
微電網 Micro-grid
偏鄉社區住宅 Rural Residential Communities


An Innovative Small Biomass Gasification Power Generation System Integrated with the Portable Microgrid for Aboriginal Area
可攜式電池充電區 Portable Batteries Charging Zone
= Hot Swappable Battery
Safely removed and inserted the battery into a microgrid system without powering down the machine itself.
Source: MIMA LABO Co., Ltd.

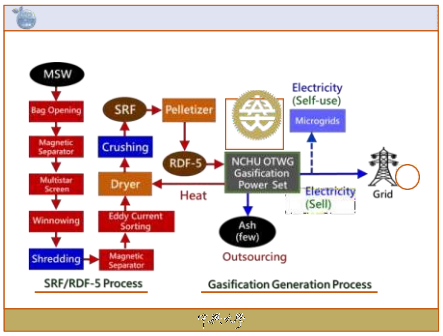

An Innovative Small Biomass Gasification Power Generation System Integrated with the Portable Microgrid for Aboriginal Area
Microgrid System
中興電工 小型微電網裝置
750 x 570 x 1,500 mm Outdoor
700 x 300 x1,200 mm Indoor
室內機
室外機
Microgrid System
Household


An Innovative Small Biomass Gasification Power Generation System Integrated with the Portable Microgrid for Aboriginal Area
Schematic Diagram of NCHU 100 kWe 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
40 Street Lights
400 Households
20 x 5 kWe


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 Cueifong Villa
Heat Pump
Vehicle
Battery
Microgrid
Cueifong Villa
Forestry Surplus Materials
Crushing
Pelletizer
25 kWe OTWG Gasification Power Generation System
Biochar
Return to the Forest
Forest
Will be officially launched on 30 April, 2023

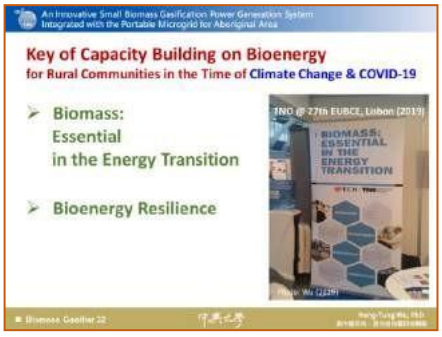

An Innovative Small Biomass Gasification Power Generation System Integrated with the Portable Microgrid for Aboriginal Area
The First Biomass Energy Distributed Energy Systems (DES) in Chinese Taipei
Biomass Gasification Power Generation with Microgrid System in Cueifong Villa
Simulated Configuration Diagram (Case A)
Will be officially launched on 30 April, 2023

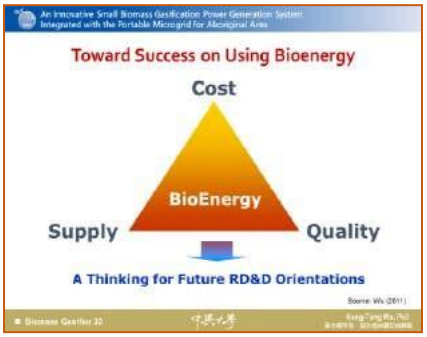

CHUNG HSING UNIVERSITY
SUSTAINABLE DEVELOPMENT GOALS
MSW Gasification
An Innovative Small Biomass Gasification Power Generation System Integrated with the Portable Microgrid for Aboriginal Area
Bioenergy Research Core Laboratory
Chung Hsing University, CHINESE TAIPEI


MSW
Bag Opening
Magnetic Separator
Multistar Screen
Winnowing
Shredding
SRF
Pelletizer
Crushing
Dryer
Eddy Current Sorting
Magnetic Separator
RDF-5
Heat
NCHU OTWG Gasification Power Set
Ash (few)
Outsourcing
Electricity (Self-use)
Microgrids
Electricity (Sell)
Grid
SRF/RDF-5 Process
Gasification Generation Process


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)


CHUNG HSING UNIVERSITY
SUSTAINABLE DEVELOPMENT GOALS
Concluding Remarks
An Innovative Small Biomass Gasification Power Generation System Integrated with the Portable Microgrid for Aboriginal Area
Bioenergy Research Core Laboratory
Chung Hsing University, CHINESE TAIPEI


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
TNO @ 27th EUBCE, Lisbon (2019)
BIOMASS: ESSENTIAL IN THE ENERGY TRANSITION


An Innovative Small Biomass Gasification Power Generation System Integrated with the Portable Microgrid for Aboriginal Area
Toward Success on Using Bioenergy
Cost
BioEnergy
Supply
Quality
A Thinking for Future RD&D Orientations


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


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


An Innovative Small Biomass Gasification Power Generation System Integrated with the Portable Microgrid for Aboriginal Area
Acknowledgement
SUSTAINABLE DEVELOPMENT GOALS
NSTC
【智能化先進能資源製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

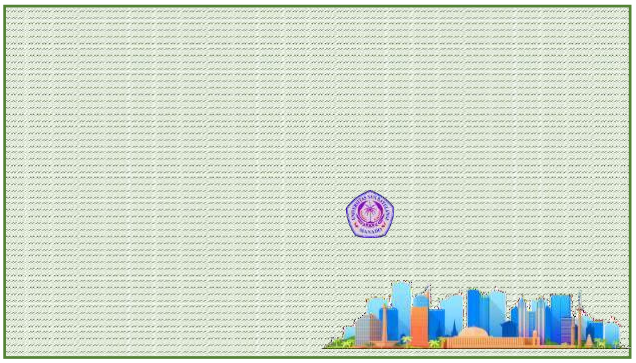

An Innovative Small Biomass Gasification Power Generation System Integrated with the Portable Microgrid for Aboriginal Area
SUSTAINABLE DEVELOPMENT GOALS
Ensure access to affordable, reliable, sustainable and modern energy for all.
BIO Energy
生質能
SUSTAINABLE DEVELOPMENT GOALS

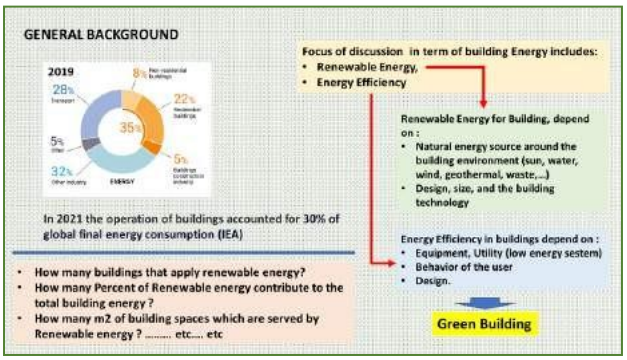

An Innovative Small Biomass Gasification Power Generation System Integrated with the Portable Microgrid for Aboriginal Area
NCHU since 1919
百年深耕 世紀躍升
Nurturing for a century, Flourishing in the centennial
Thank you very much for your attention.

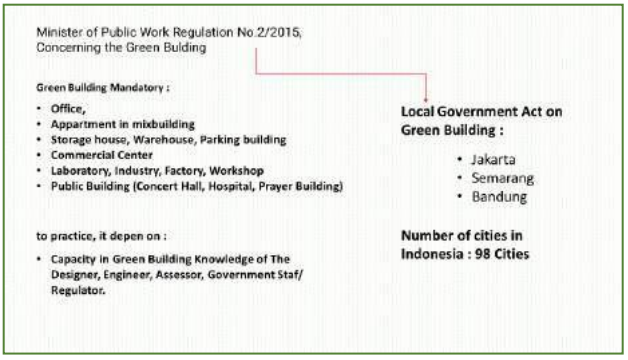
POLICY DIALOG – TOPIC 3

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

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







24 Buildings certified by Green Building Council Indonesia

No	Name of Building	Type	Location	Certificate	Year Valid
1	BCA Foresta	Office	Tangerang	Platinum	2021-2024
2	Plaza BP Jamsostek	Office	Jakarta	Gold	2020-2023
3	Emerald Tower Grand Kamala 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 Quadrant 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	Venetian Tower Grand Sungkono Lagoon Surabaya	Office	Surabaya	Gold	2020-2023
11	Head Office PT KPI RU IV Cilacap	Office	Cilacap	Platinum	2022-2025
12	Griha 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	RDTX 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	Boyolali, Central Java	Platinum	2020-2023
19	Sopo del Office Tower A	Office	Jakarta	Platinum	2020-2023
20	JB 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

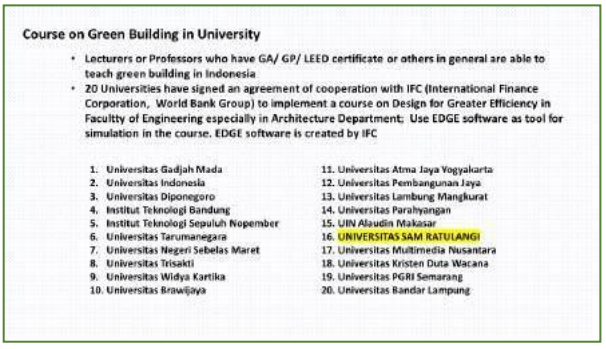

BCA Foresta –Bank Office in Tangerang
PLATINUM Certificate 2021-2024, GBCI
Maximize daylighting
Envelope double glass, low E glass
Building Automation
Water recycled and rain water
Solar panel
Electric car charging station

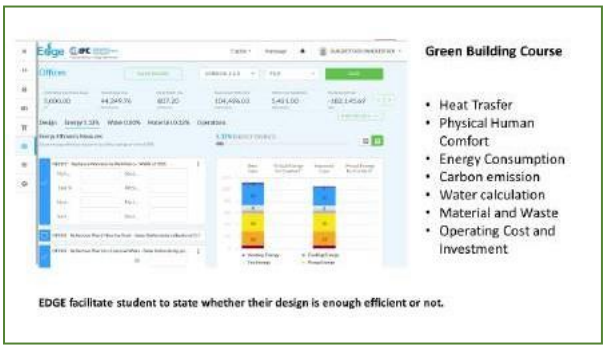

Grha Unilever - PT. Unilever Indonesia, Tbk
The high-tech designed building applies sustainable principles with a comprehensive active design and passive design.
Maximize natural lighting enter the building (300 lux)
Use double glass skylight
A very low Overall Thermal Transmision Value (about 20 W/m2).
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

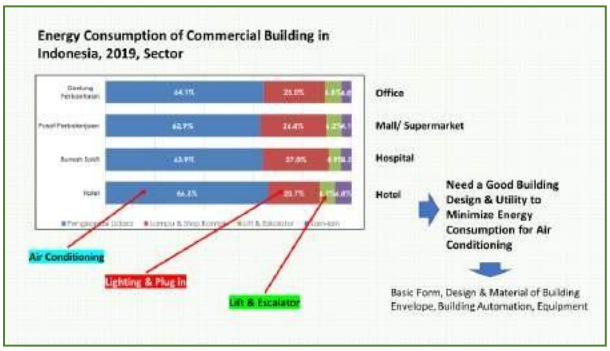

Bus Station, Surabaya
Green Façade, greenery on facade
Low Energy Equipment & Electricity
Maximize natural lighting
Water recycle, Rain water harvesting
Waste management
Bangunan Terminal Jojoboyo
Dibangun Dengan Konsep Green Building


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 Facultty 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 Alaudin Makasar
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 Trasfer
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.


Sumber: P3TKEBTKE
Legenda
Map of solar energy in Indonesia
kWh/m2/day


Energy Consumption of Commercial Building in Indonesia, 2019, Sector
Office
Mall/ Supermarket
Hospital
Hotel
Need a Good Building Design & Utility to Minimize Energy Consumption for Air Conditioning
Air Conditioning
Lighting & Plug In
Lift & Escalator
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 constitute 4% of energy-related CO_2 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

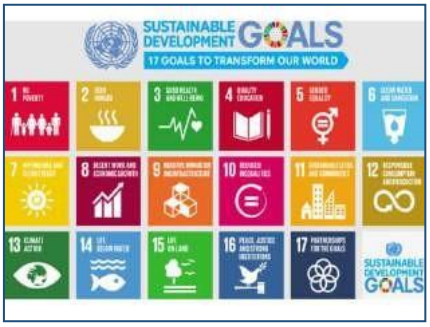
- Promote public participations on standard making process.
- Enhancing infrastructure construction and increasing capacities.
- Promoting and implementing adequate technologies.
  - Bottom-up approach:
    - Adequate technologies are suggested by the indigenous communities/tribes
    - Environment impact 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

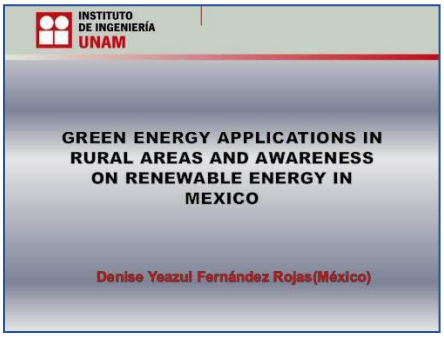
TOPIC 1: *Introduction to SDGs*

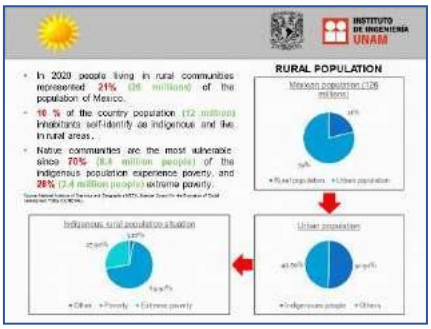
Speaker: Dr. Cindy Hsueh, s.School, Feng Chia University, Chinese Taipei.



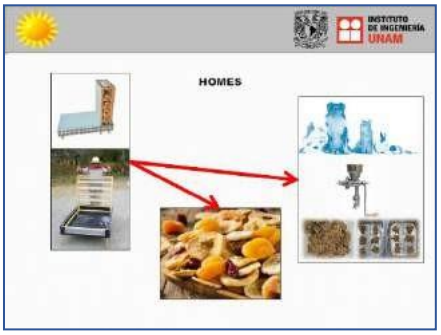
TOPIC 2: ***Introduction to renewable energy - GREEN ENERGY APPLICATIONS IN RURAL AREAS AND AWARENESS ON RENEWABLE ENERGY IN MEXICO***

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






INSTITUTO DE INGENIERIA UNAM
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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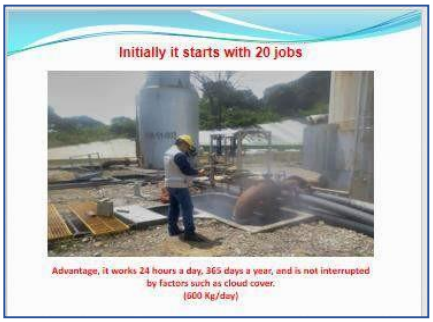
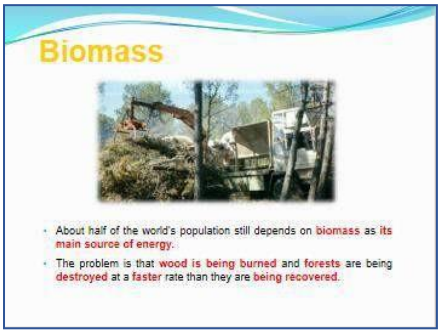
HOMES

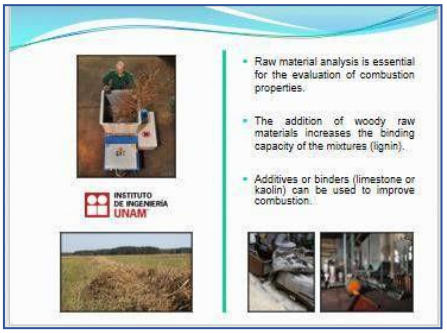

GREEN ENERGY APPLICATIONS IN RURAL AREAS IN MEXICO
• Sun dryer
• Geothermal dehydrator
• Biomass


INDUSTRY
Deshidratador GeoMímico de Alimentos
IDEA

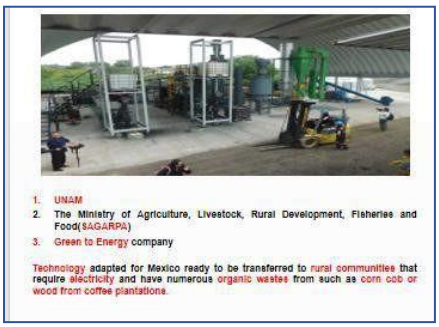

1st industrial geothermal dehydrator installed and in operation in Latin America


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


1. UNAM
2. The Ministry of Agriculture, Livestock, Rural Development, Fisheries and Food(SAGARPA)
3. 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.

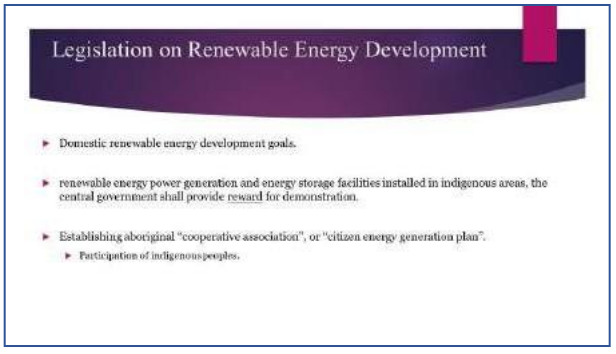

Thank you for your attention
Mra. Denise Yeazul Fernández Rojas

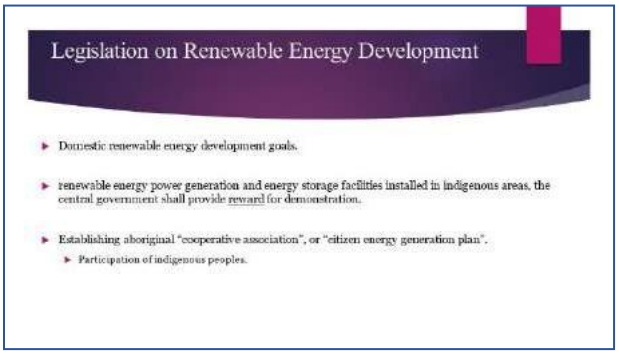
TOPIC 3: *Indigenous cultural lifestyle*

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

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

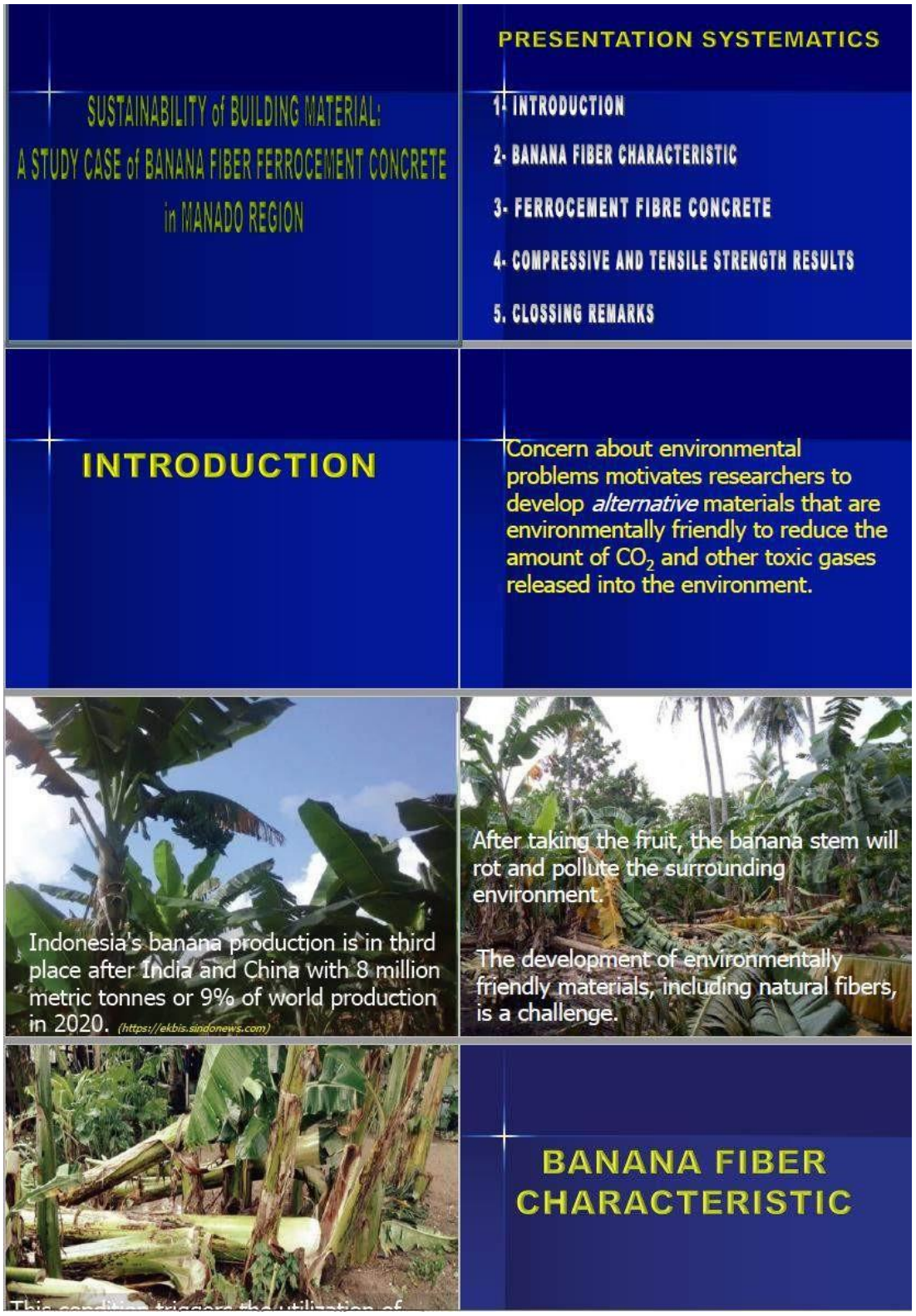
Speaker: Dr. William Yi-Yuan Su, Chief R&D Officer and Chief Legal Counsel Incigt Inc., Chinese Taipei.





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.



MECHANICAL PROPERTIES of BANANA STEM FIBERS

Specific Gravity	0,29 g/cm³
Density	1,35 g/cm³
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

- Soroushian,P.&Ravanbakhsh,S.1998,High-early Strength Concrete :mixture proportioning with processed cellulose fiber for durability , ACI Materials Journals,V.96.NO.5.September-October, 533-600.
- Syafrudin. 2004. Pengaruh Konsentrasi Larutan dan Waktu Pemasakan terhadap Rendemen dan Sifat Fisik Pulp Batang Pisang Kipok (Musa sp.) Pascapanen.Skripsi. Yogyakarta: Fakultas Kehutanan Universitas Gadjah Mada.
- Syafiq,A. Pemanfaatan Serat Batang Pohon Pisang. Dalam :Sintesa Material Hibrida Berbasis Geopolimer Abu Layang Batubara, Skripsi, UNES Semarang.

FERROCEMENT FIBER CONCRETE

ACI Committee 549:

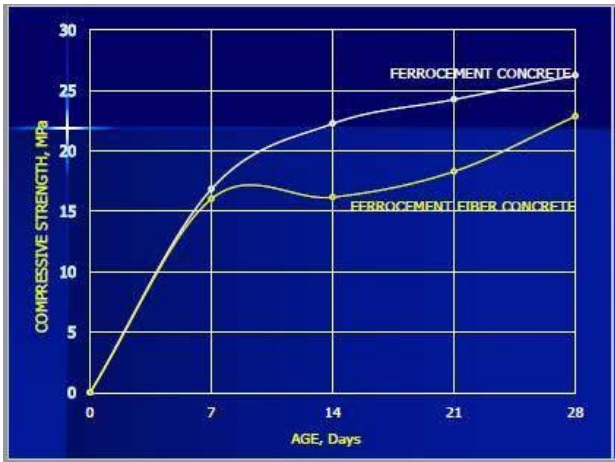
" Ferrocement is a type of thin wall reinforced concrete commonly constructed of hydraulic cement mortar reinforced with closely spaced layers of continuous and relatively small size wire mesh. The mesh may be made of metallic or other suitable materials *".*

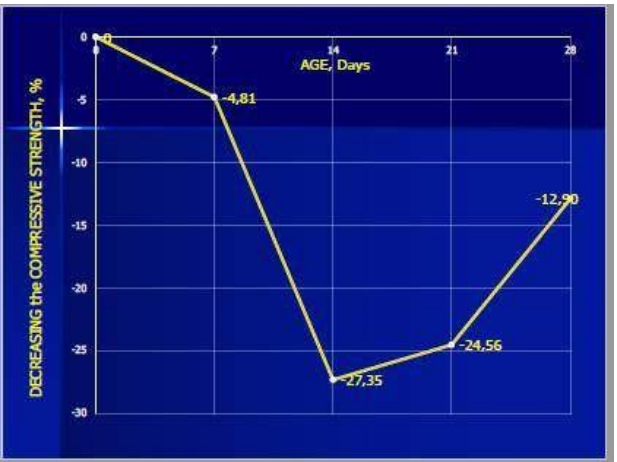
(ACI Code, 1997)

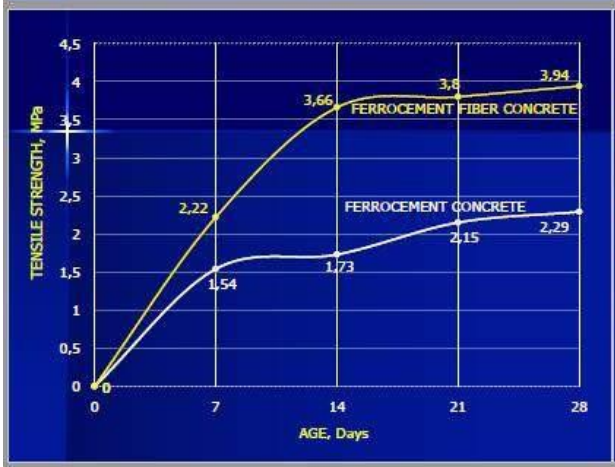
COMPOSITION of FERROCEMENT FIBER CONCRETE

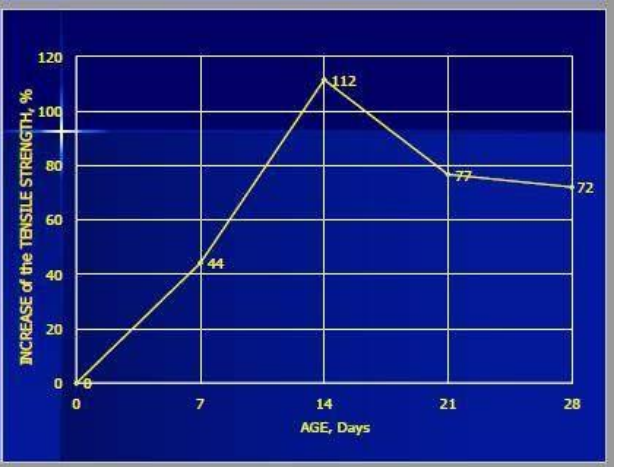
MATERIALS	Kg/m³
PORTLAND CEMENT *(Semen Tonasa, C)*	461.38
FINE AGGREGATE	1367.9
WATER *(Water Cement Ratio = 0.50)*	230.69
BANANA FIBER *(Musa Paradisiaca Forma Typica, 0.05% C)*	0.23

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 CO_2 and environmental pollution.

TOPIC 6: ***Symbiosis energy model in the rural area*****.**

Speaker: Ir. Alicia Sinsuw, MT, Ph.D(cand), Assistant Professor, Electrical Engineering Dept., Universitas Sam Ratulangi, Indonesia.

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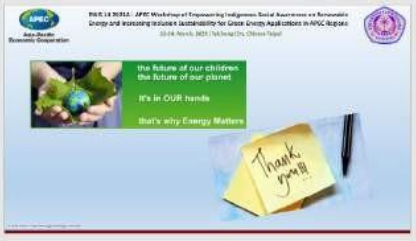

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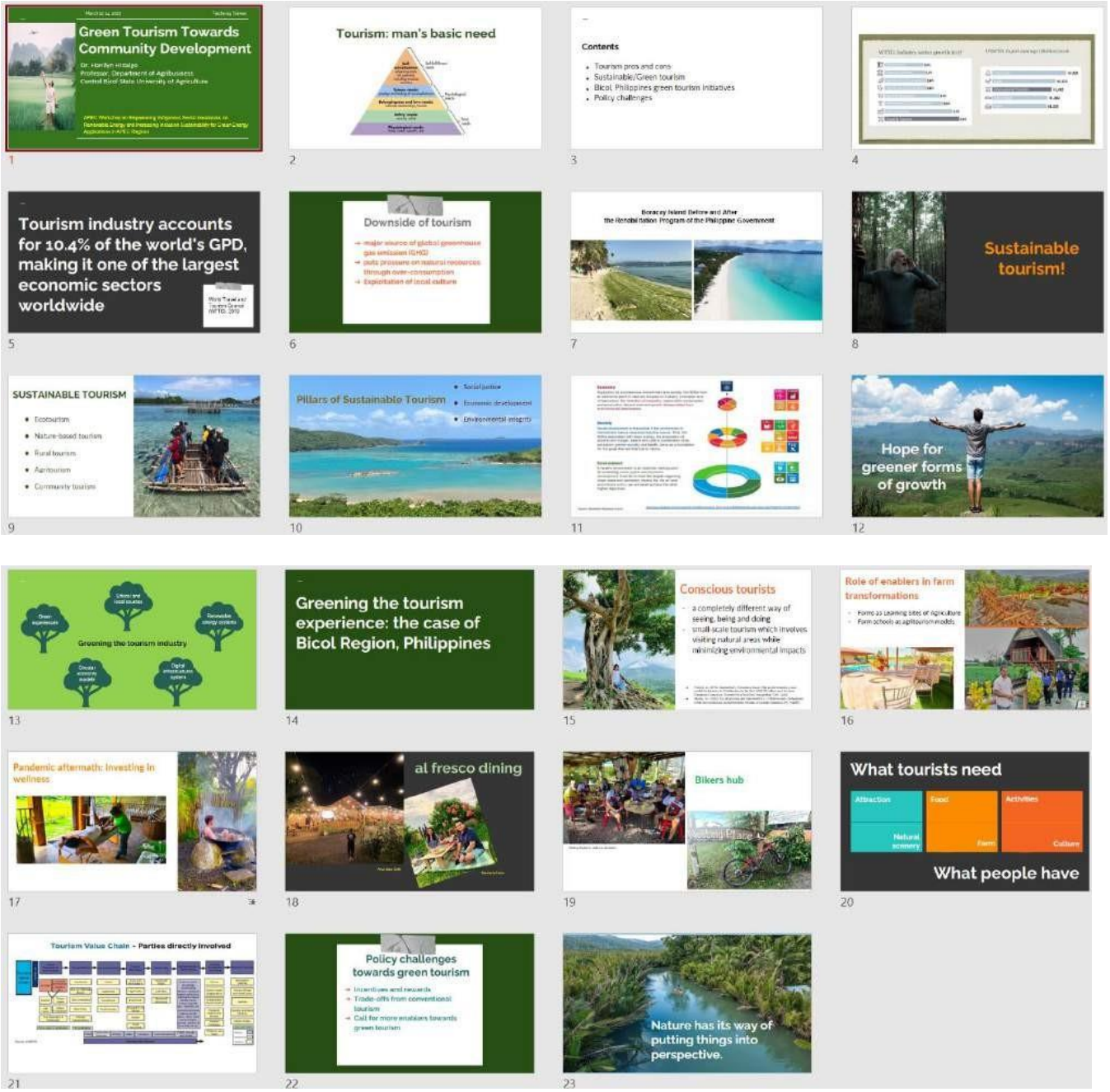
Workshop Day 2 – TOPIC 1: *Bioenergy from Biomass for Rural Community.*
BIOMAN Biogas Manado.

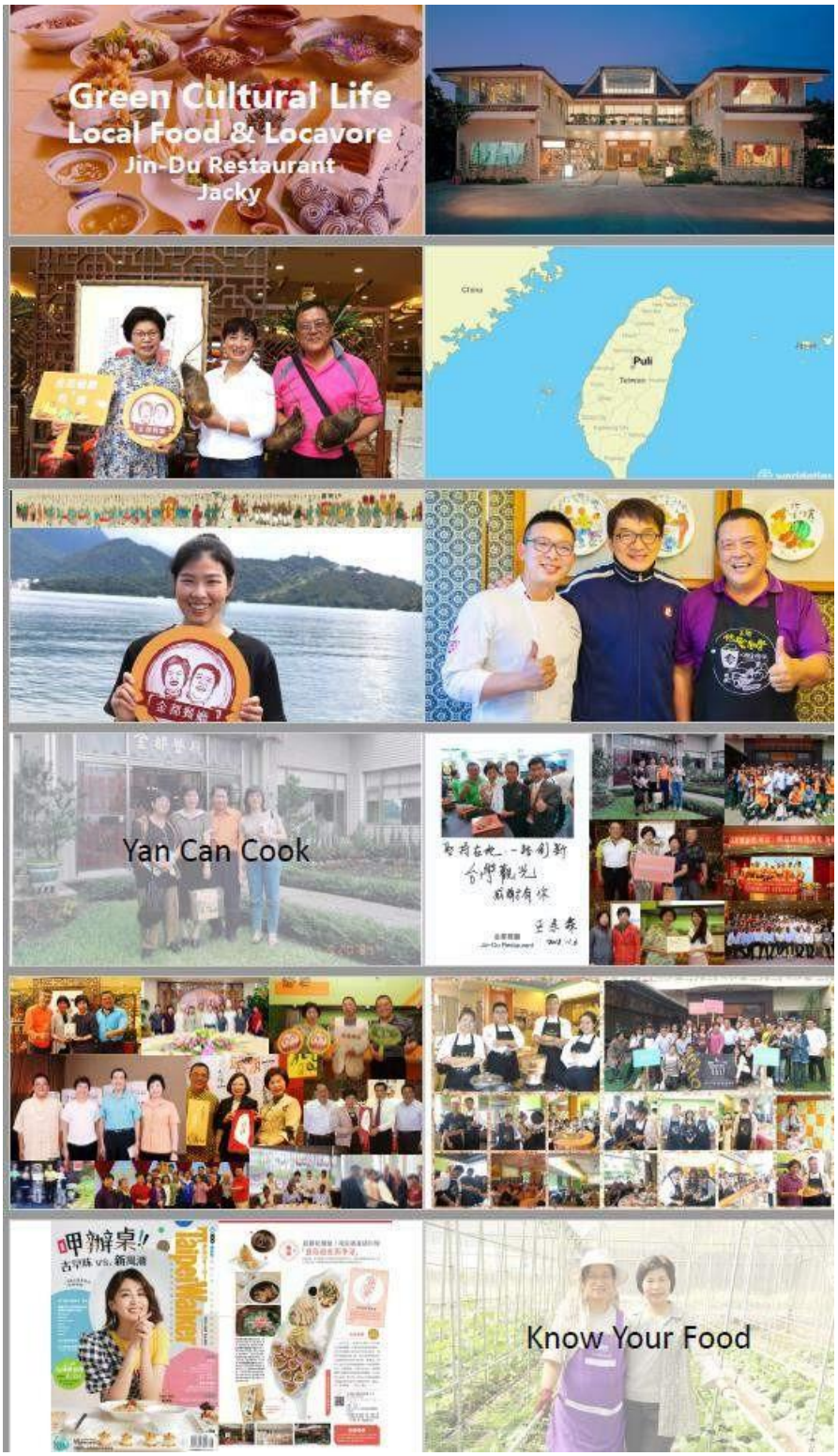
Speaker: Dr. Liny Tambajong, Manado Eco Green Community & Circular Economy, Indonesia.

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.

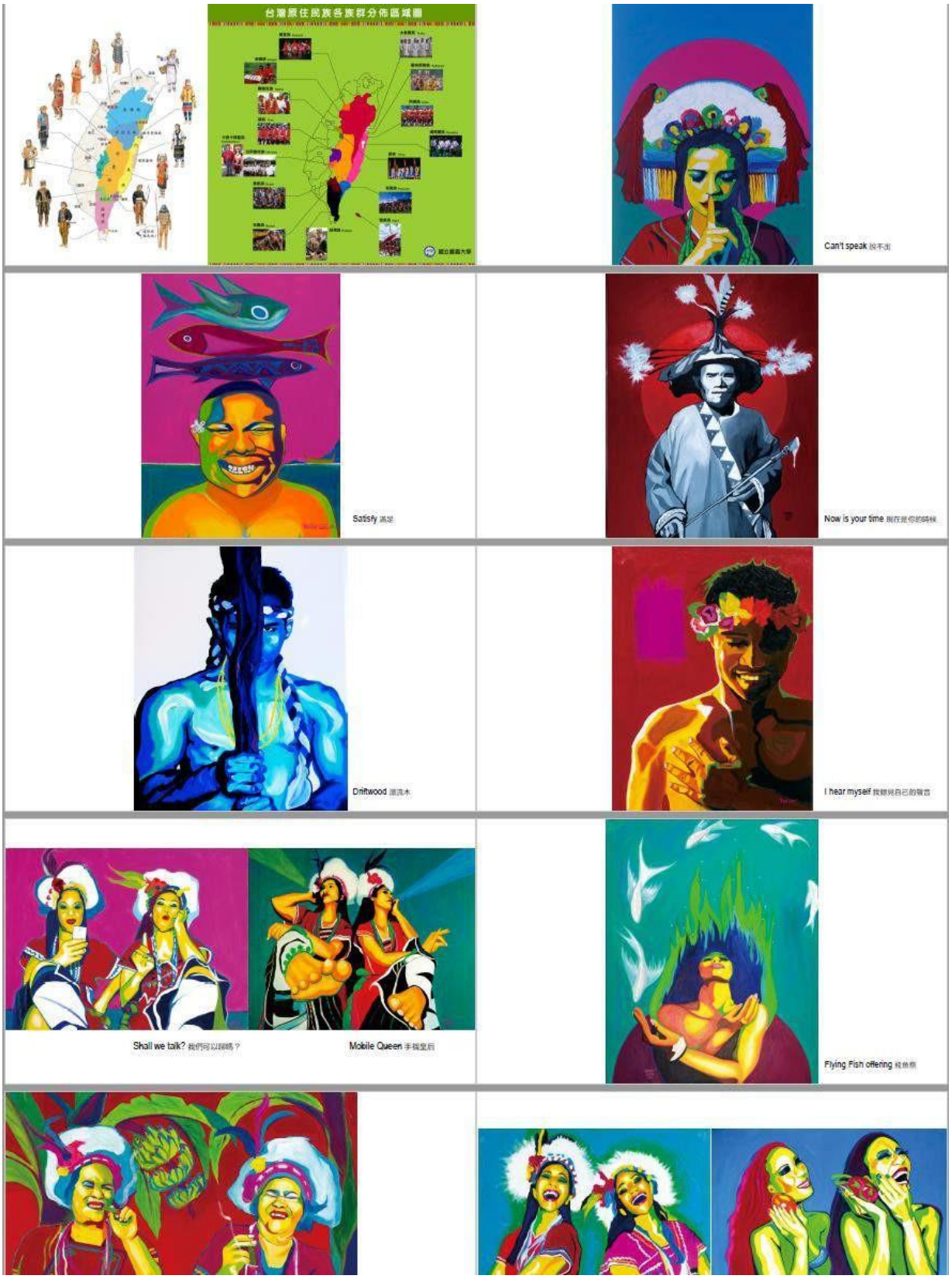


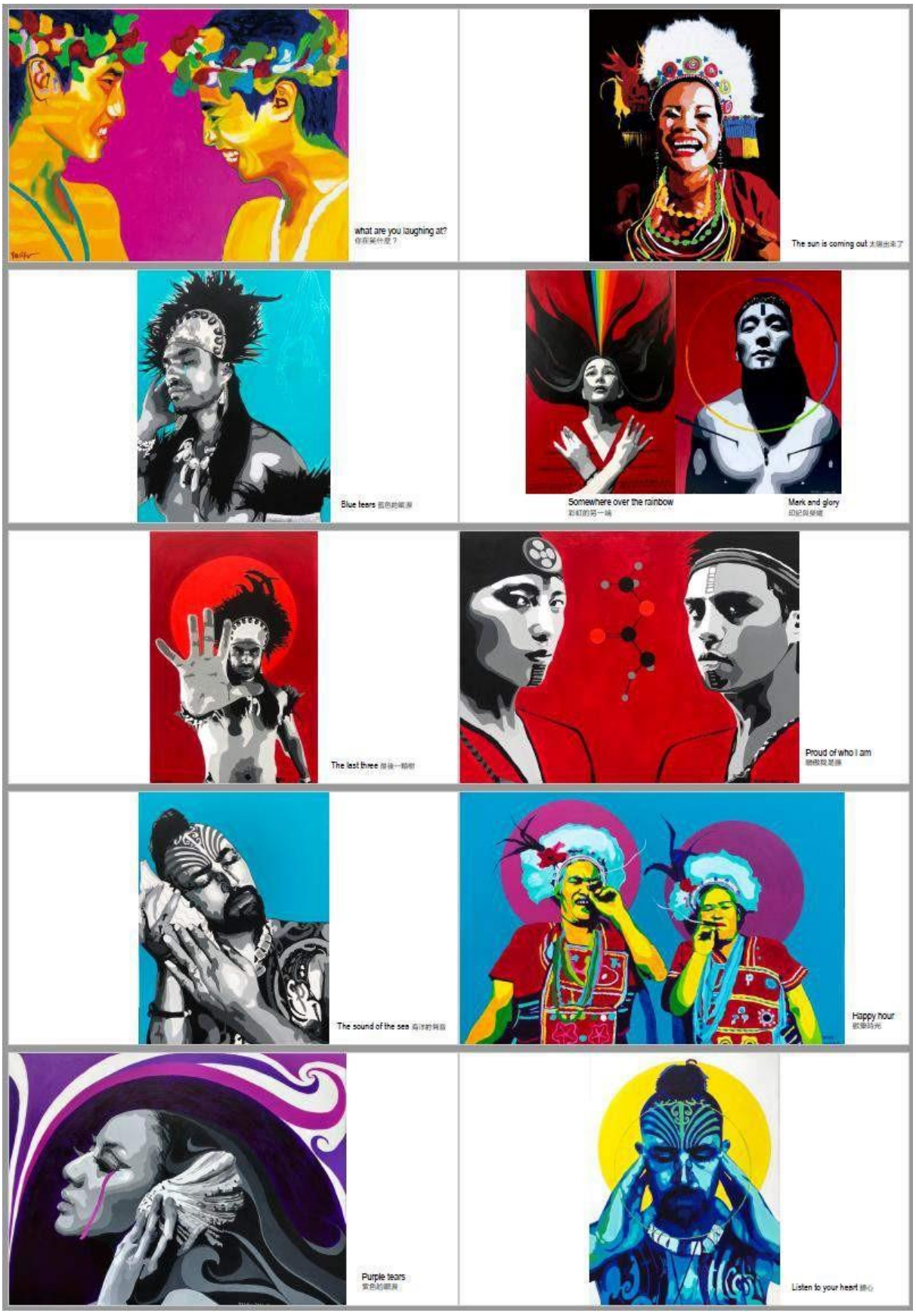
Speaker 2: Mr. Yuan-Horng, NA, Manager, Jin-Du Restaurant, Chinese Taipei.




Locavore & Local Culture
Tsao Mi Fun
(Taiwanese Fried Rice Noodles)
LINE Official Account
@jindurestaurant

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




what are you laughing at?
The sun is coming out
Blue tears
Somewhere over the rainbow
Mark and glory
The last three
Proud of who I am
The sound of the sea
Happy hour
Purple tears
Listen to your heart

Daughter of the pacific
太平洋的女兒

Green tears 綠色的眼淚

Embrace your true colors
擁抱你的真實色彩

Flying seeds
會飛的種子

Harvest 豐收

Waterfall 瀑布

Hear the sound of harvest
聽見豐收的聲音

Hear the wing singing
聽見鳴的聲音

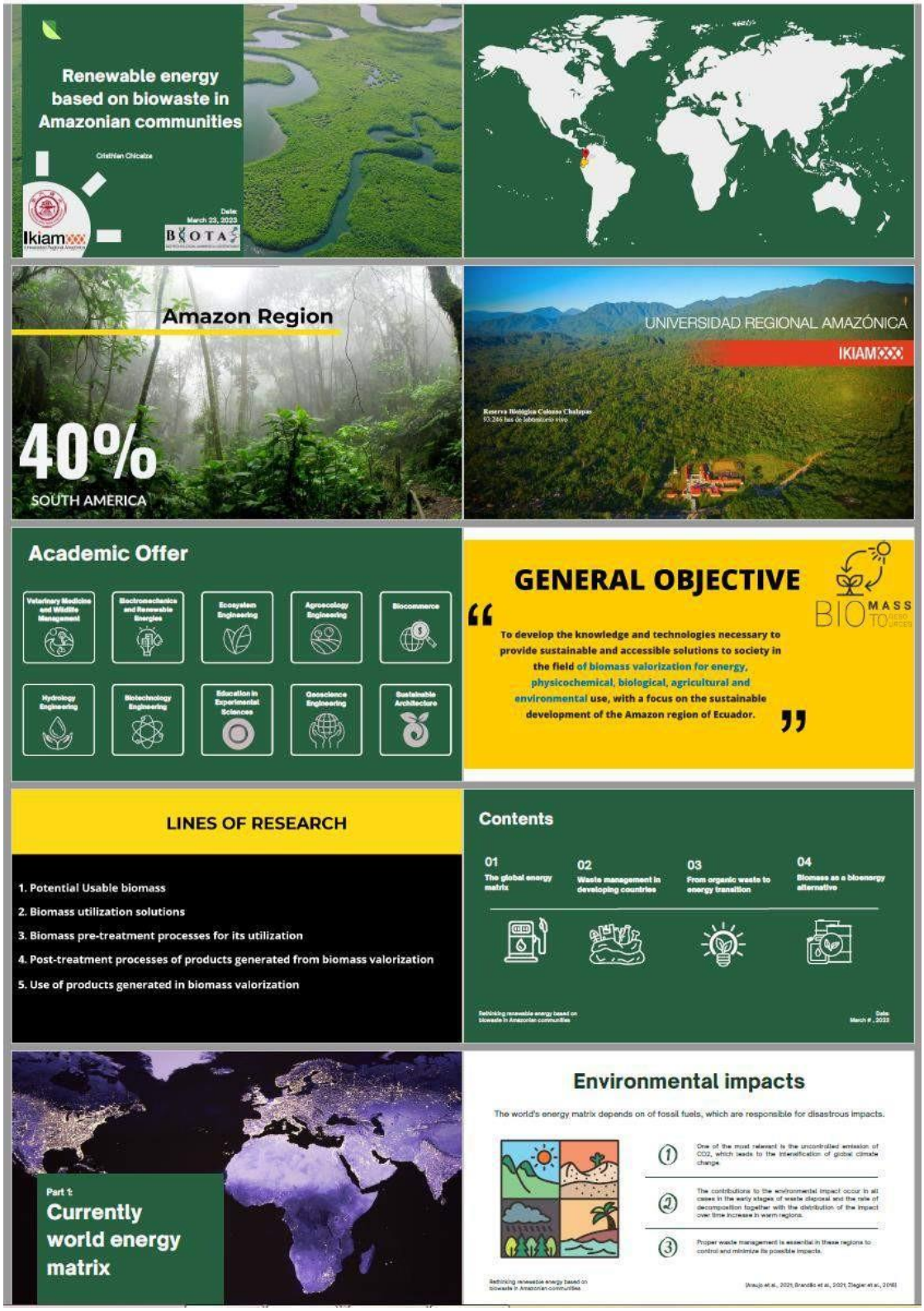
Hear the sound
of flowers blooming
聽見花開的聲音

The Love Fairy Story of Peacock Pearl
孔雀之珠的愛情神話故事


Rolls-Royce Motor Cars
CARLINK
Rolls-Royce Motor Cars

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.



Isolated systems, the Amazon

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.

Rethinking renewable energy based on biowaste in Amazonian communities

(Mendes 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 representatives of the LCA scenario due to their technological and geoclimatic conditions.

(Ziegler et al., 2019)

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
- higer leachate generation

Temperature directly affects the anaerobic decomposition rates of waste.

(Ziegler et al., 2019; 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%).

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 1.5% is used as an organic compound for agriculture, leaving a high percentage that can be used as bioenergy.

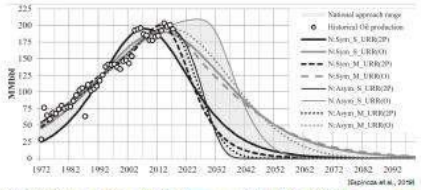
Rethinking renewable energy based on biowaste in Amazonian communities

(Mendes et al., 2019; Ziegler et al., 2019)

World oil reserves

(Schenk et al., 2012)

Impacts of oil in Ecuador



(Espinoza et al., 2019)

Current energy characteristics in the Amazon region

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.

Rethinking renewable energy based on biowaste in Amazonian communities

(Escribano, 2013; Mendes et al., 2019)

Current energy characteristics in the Amazon region

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

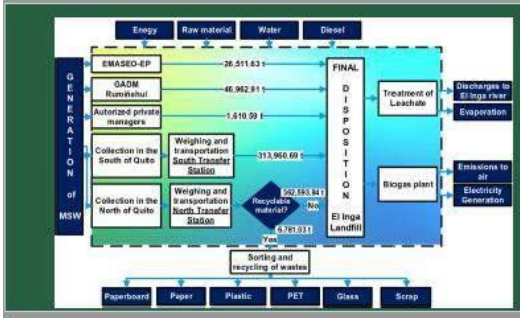
3. The prohibition of passing on various operating costs, due to the low level of income in local communities.
4. Lack of technical backgrounds generate loss in the generation and distribution systems, leading to significant financial losses.

Rethinking renewable energy based on biowaste in Amazonian communities

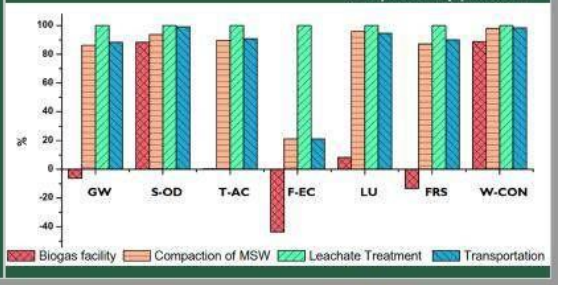
(Escribano, 2013; Mendes et al., 2019)

Overview of the MSWM in Ecuador

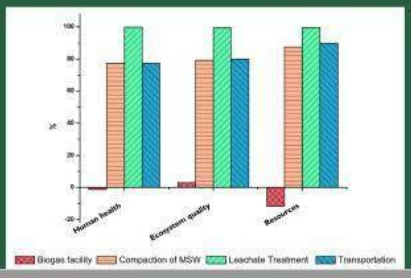
Quito



Midpoint approach



Damage approach



ASHKA PAGRACHU YUPAICHANI

E-mail: cristhianchicaiza@hotmail.com

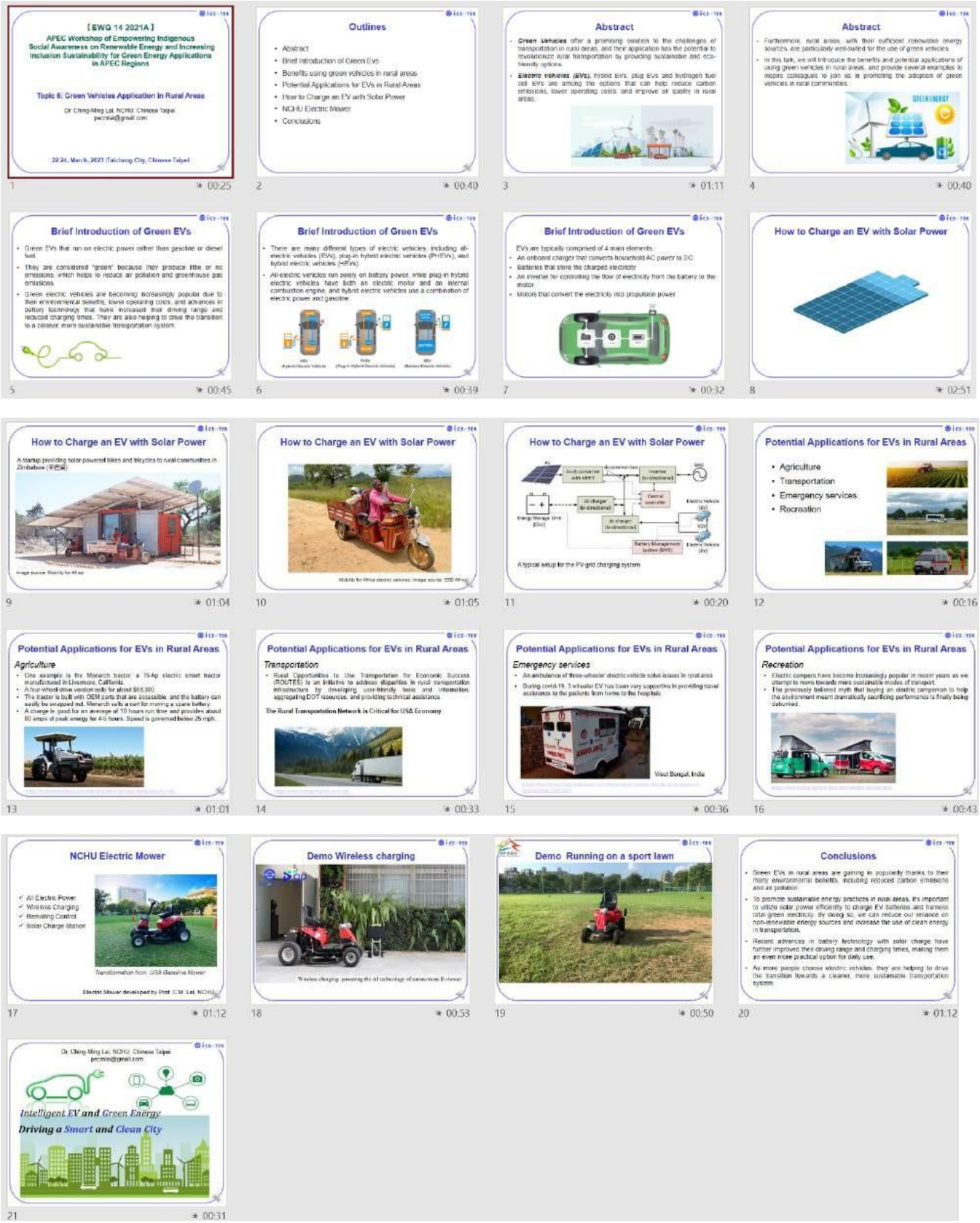
Workshop Day 2 – TOPIC 4: *SME Entrepreneurship.*

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

Speaker 2 (Indigenous Speaker):
Dr. Wei-Chieh Hua, General Manager, Splendid Marketing LtD., Chinese Taipei.

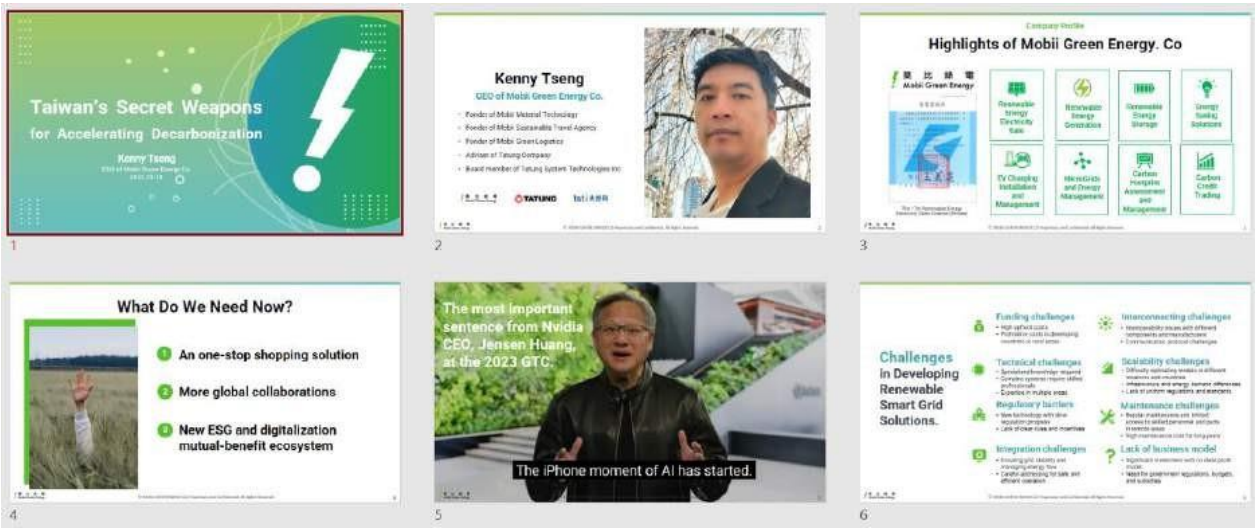
Workshop Day 2 – TOPIC 5: *Green Vehicles Application in Rural Areas (Online).*

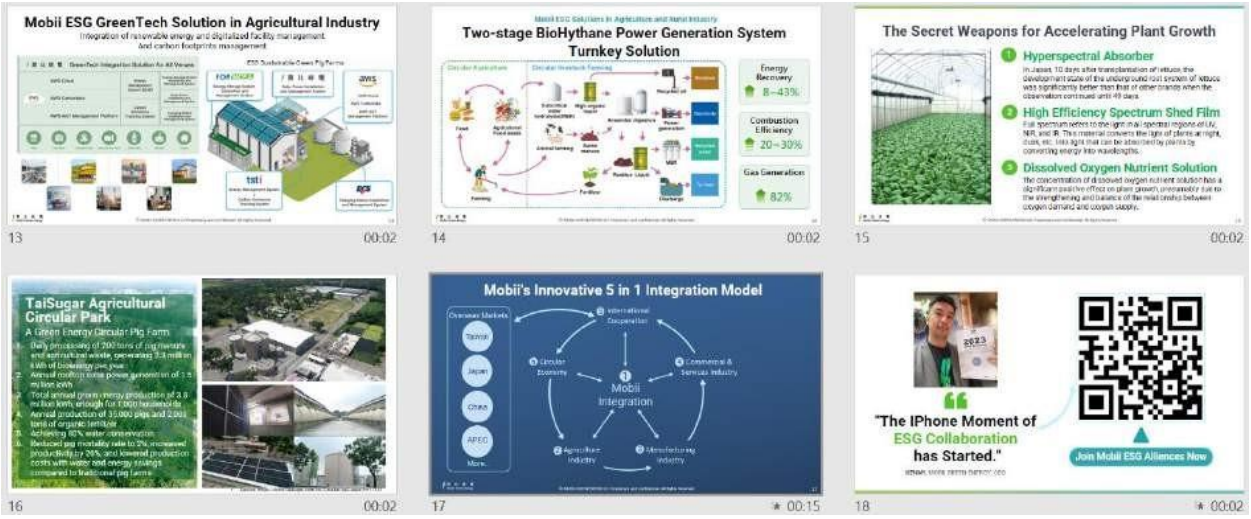
Speaker: Assoc. Prof. Dr. Ching-Ming Lai, NCHU, Chinese Taipei.



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

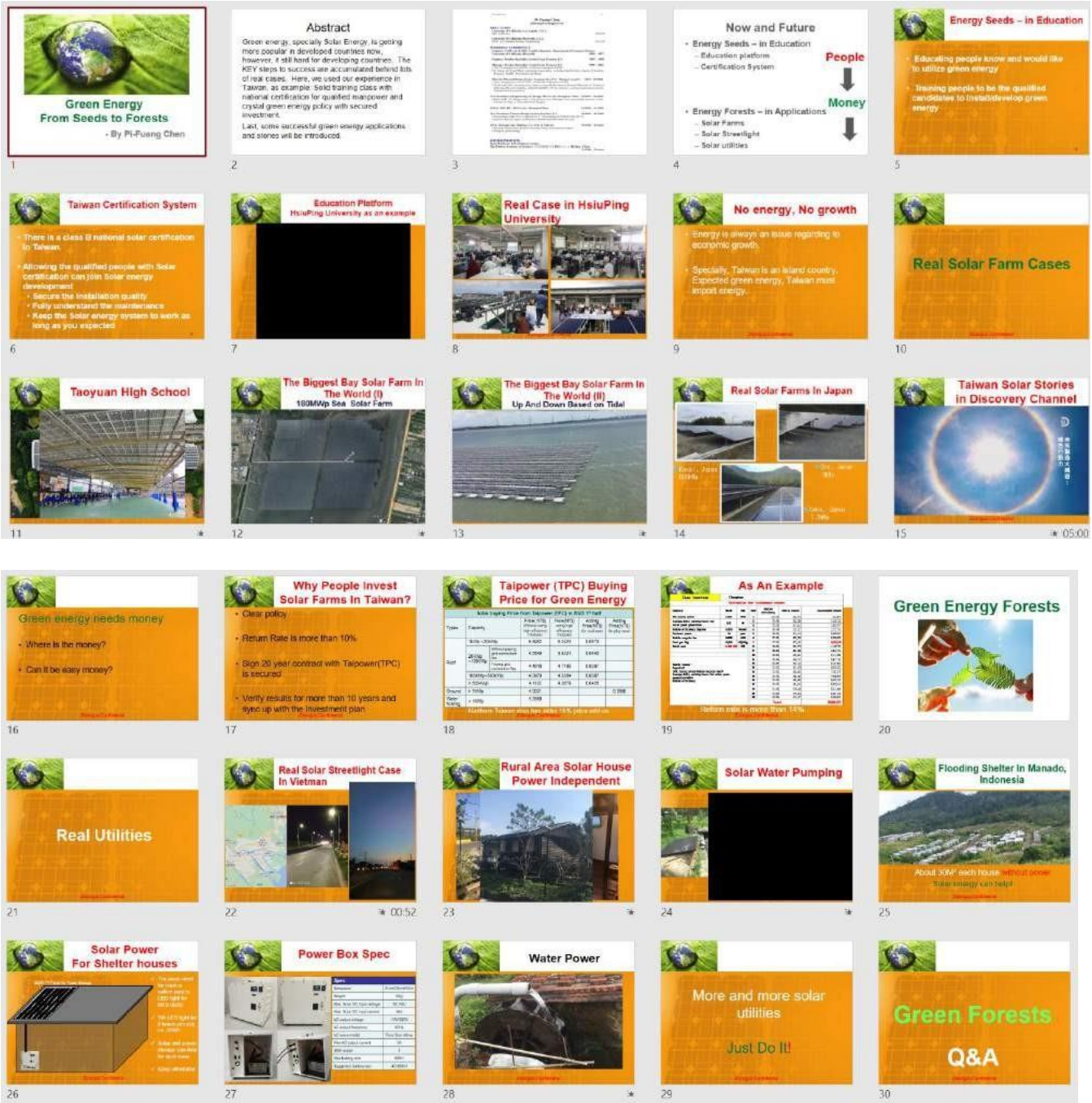
Speaker: Mr. Kenny Tseng, CEO of Mobii Green Energy Co., Ltd., Chinese Taipei.





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.



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

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