SUSTAINABILITY & RESILIENCE 6TH WORKSHOP

REPORT

2021 // PREPARED BY SUSTAINABILITY & RESILIENCE (SU-RE.CO)

Executive Summary

To deliver a sustainable solution in reducing climate change impacts in Indonesia, Su-re.co has synergised think-do-be tank activities in active collaboration with the government, private sectors, and European Commission partners. The ongoing projects are LANDMARC, IKI Small Grant Project: Biogas Initiative, and TIPPING+. The 6th Sustainability and Resilience workshop aimed to deliver current progress on the projects and unlock further possibilities for carbon emission reduction from the energy and land-use sector. The workshop also intended to contribute to national policymaking, such as Nationally Determined Contribution (NDC), addressing the climate crisis in Indonesia.

On Thursday, 28 October 2021, 122 delegates from local and national Governments, policymakers, NGOs, national and international academic researchers virtually gathered. In the beginning, current progress in each ongoing project was delivered. Updated activities in LANDMARC were presented, including determination of the scope of studies, recent stakeholder engagements, desk research to identify regional and national Land-based Mitigation Technology (LMT) portfolios, and appointed three case studies. As part of the Biogas Initiative IKI Small Grant Project, gas meter installation was successfully performed in Flores, East Nusa Tenggara. A technical roadmap is in the development stage to fit the existing platforms for selling carbon offset. TIPPING+ has started with two case studies in Banten and Bali to explore transformation towards clean energy. These locations will be used as main references to be upscaled at the national level and contribute to policymaking.

Focus Group Discussion (FGD) was carried out to pursue narratives in NDC in energy and land-use mitigation. Each project was brought into a different group of stakeholders to discover the challenges and opportunities of LMTs, the best blockchain option in selling carbon offset, and validate future alternatives in the energy sector from agents' point of view.

The workshop also maintained an interactive panel discussion to understand tipping phenomena in the energy and land-use sector. Indonesia has committed to achieving zero carbon by 2060. From the stakeholders' perspective, the commitment should also be accompanied by phasing out coal consistently and developing various renewables simultaneously. In the land-use sector, the tipping phenomenon is still facing barriers. The verification of the data related to forest cover area is lacking at the institutional level. Thus, the mitigation potential of LMTs has not yet been fully determined.

In the end, important takeaways were noted: achieving high penetration of clean energy usage essentially requires diverse energy sources, financing, and various schemes to accelerate the positive tipping point. Land-use modelling and successful blockchain development in carbon trade will also demand comprehensive and reliable data. Significantly, the co-production of knowledge between stakeholders is necessary to support integrative policy packages in renewable energy and land-based technologies.

Contents

Abbreviation List

1. Introduction and Project Updates

1.1 Introducing Su-re.co's Activities to Address Climate Change Issues

By Takeshi Takama (Su-re.co)

The Paris Agreement aims to limit global warming to well below 2°C, preferably to 1.5°C, compared to pre-industrial levels. However, based on a recent report published by Working Group I to the IPCC Sixth Assessment Report [1], limiting global warming to 1.5°C by 2100 requires strong, rapid, and sustained reductions in global greenhouse gas emissions, including reducing global carbon dioxide emissions by 45% by 2030 relative to the 2010 level and net-zero around mid-century. The updated NDC Synthesis Report [2] confirms that for all available NDCs of all 192 Parties taken together, a sizable increase of around 16% in global GHG emissions in 2030 compared to 2010 is anticipated. Unless changed quickly, an increase may lead to a temperature rise of about 2.7°C by the end of the century. These findings may indicate that the 1.5 - 2°C target is in jeopardy.

Looking at the power sector, while the trend of coal usage globally (e.g., China, India, South Africa) has very high shares, Indonesia is the only country to increase coal share due to development needs. Indonesia's power generations were dominated by coal between 2005 and 2019. The Government added 25 GW of coal-fired power plants, a 260% increase during the last fourteen years. Following Decision 1/CP.26 draft in COP26, countries are accelerating the phasing out of coal and subsidies for fossil fuels, which means that Indonesia should consider the phase-out of fossil fuel. A strategy to foster GHG emissions reduction is through cutting methane emissions due to its larger Global Warming Potential (GWP) compared to CO_2 (based on the AR5 report [3], the GWP ratio is 28:1, respectively). This strategy is supported by UNEP and CCAC report on A Global Methane Assessment (2021), which state human-caused methane emissions can be reduced by up to 45% this decade[4]. Such reductions would avoid nearly 0.3°C of global warming by 2045. They would be consistent with keeping the goal of the Paris Agreement to limit global temperature rise to 1.5˚C within reach.

A recent UN report shows a 1.1-degree increase due to CO_2 and CH_4 gases. So, these are two of the top greenhouse gas due to human activity. To reduce carbon and CO_2, humans have to give up energy use. However, methane gas is different, and it can be more used depending on how it is calculated. On a different side note, methane is between 20 and 100 times stronger than CO_2 as a greenhouse gas. To put it simply, using methane gas is a great way to reduce GHG emissions. Another alternative solution is to utilise decarbonisation technology. Figure 1-1 shows that Su-re.co integrates think-do-be tank activities within several ongoing projects. As part of Think-tank activities, Su-re.co is currently working on a land-use

[1] IPCC, 'Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate' (Cambridge: IPCC, 2021).

[2] UNFCCC, 'Updated NDC Synthesis Report: Worrying Trends Confirmed' (UNFCCC, 2021) <https://unfccc.int/news/updated-ndc-synthesis-report-worrying-trends-confirmed>.

[3] IPCC, 'Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (Eds.)]' (IPCC, Geneva, Switzerland, 2014).

[4] UNEP and CCAC, 'Global Methane Assessment: Benefits and Costs of Mitigating Methane Emissions' (Nairobi: UNEP, 2021).

decarbonisation project in Indonesia through LANDMARC (2020 – 2024). While, under IKI Small Grant, the Do-tank, Su-re.co will install the biogas digester for farmers to reduce methane gas. European Commission and GIZ, respectively, support these two activities. Through blockchain, Su-re.co will link the biogas and decarbonisation into the carbon market. Lastly, in the Be-tank, under the TIPPING+ project (2020 – 2023), Su-re.co identifies alternatives to achieve decarbonisation in the energy sector to contribute to policymaking.

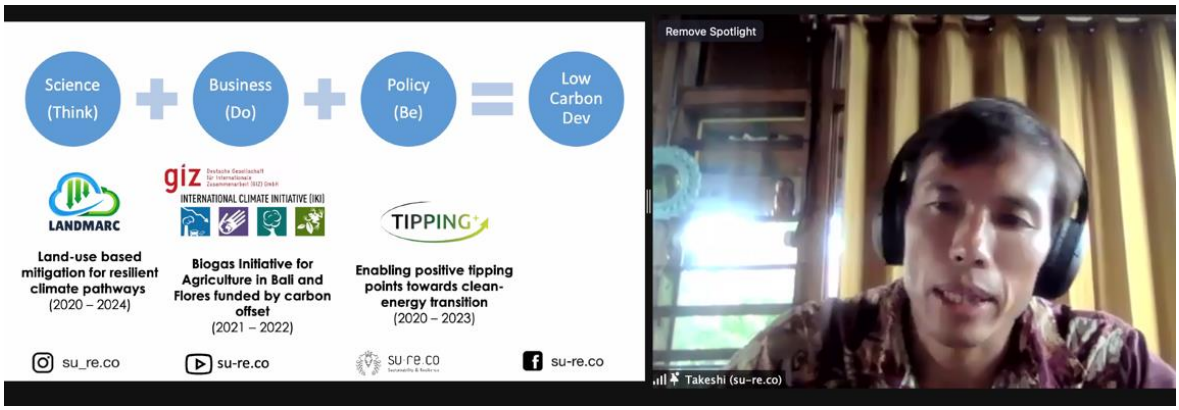


Figure 1-1. Current active project collaboration between su-re.co and partners

1.2 Progress of LANDMARC, IKI Small Grants, and TIPPING+ in Indonesia

1.2.1 LANDMARC: Decarbonisation from Compost including Biogas

By Siti Indriani (Su-re.co)

The leaders at COP26 highlighted the crucial role of forests, biodiversity, and sustainable land-use interdependency in enabling the world meeting sustainable development goals. Each position helps balance anthropogenic greenhouse gas emissions, remove through sinks, and maintain ecosystem services. These land-use practices should adopt sustainable production and consumption, infrastructure development, and investment. The actions will also support smallholders, indigenous people, and local communities – all of whom depend on forests for their livelihoods and have a key role in their stewardship.

The projects have been in the operational stage in Indonesia since around a year ago. Several milestones have been accomplished: engaging stakeholders at the national and regional level, scoping land-use mitigation technologies and practices (LMTs) and collecting narratives from desk research. Latter aims to identify a national and regional LMT portfolio. After achieving the milestones above, Indonesia has shortlisted several potential LMT scoping, including peat-/wetland management, forest land, and agroforestry.

To be considered for further analysis, LMT scoping results were elaborated into four main LMT narratives: forestry and peatland management, agroforestry, and soil carbon enhancement in agriculture. Indonesia's case study under the LANDMARC project focuses on agroforestry, compost, and biogas to identify decarbonisation potential from the land sector. Three study cases are chosen to represent those three areas, namely, biogas installation in coffee and cacao farms in Bali and Flores Island and compost in Gorontalo and North Sumatera (Figure 1-2).

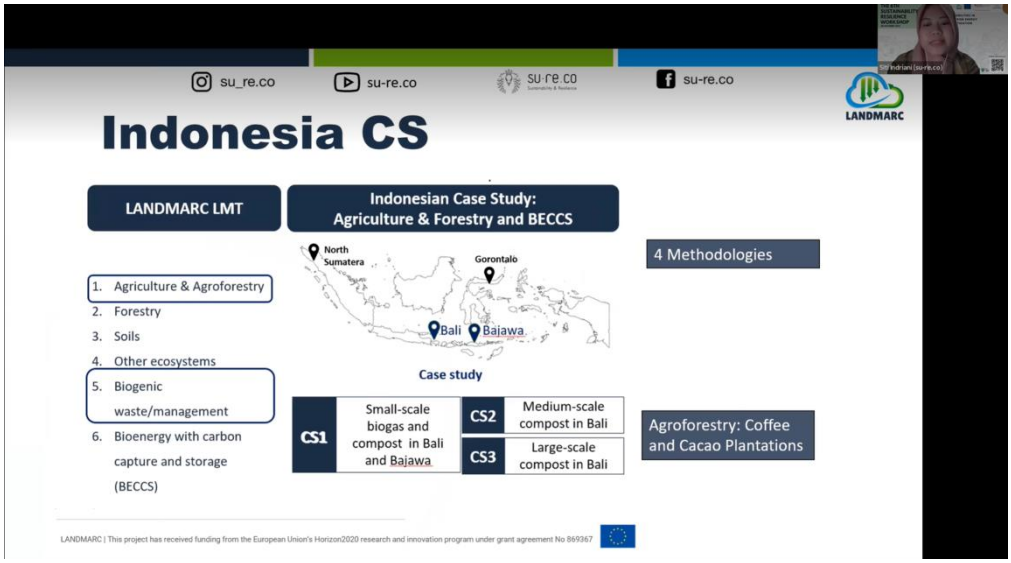


Figure 1-2. The scope of the LANDMARC Indonesia case study

The next milestone will mainly concentrate on modelling preparation. It contains in-situ monitoring and remote sensing to measure potential in fixing carbon. Therefore, collaboration with other parties is essential to collect figurative data. Then, further assessment concerning climate change risks and potential scaling up into the national, regional, and global levels will be conducted consecutively.

1.2.2 IKI Small Grant Project: Biogas Initiative for Agriculture in Bali and Flores funded by Carbon Offset

By Fabian Wiropranoto (Su-re.co)

Based on Article V of Decision 1/CP.26 draft, the Parties urge the operating entities of the Financial Mechanism, multilateral development banks, and other financial institutions to further scale-up investments in climate action and call for continued increase in the scale and effectiveness of climate finance from all sources globally. To do so, Su-re.co is developing a proof of concepts in scaling up the biogas technology with carbon offset (Figure 1-3).

Biogas has the potential to offset carbon on all four of the climate change drivers, i.e., nitrous oxide from synthetic fertiliser, methane from commoner animal manure, CO_2 from deforestation, and black carbon from firewood burning. The simple formula entails biogas-based carbon trading through a certification system to sell carbon offset. However, due to the high cost of the certification, the project changes the certification system into blockchain technology, which secures the data of the project's biogas without bearing the cost of a third party. Thus, creating a publication of its biogas to carbon offset will replace certification legitimacy.

Blockchain provides real-time data and cuts the high cost of certification and labour through a gas meter attached to each farmer's biogas digester. The project shares the income with farmers through real-time data as an additional incentive from this carbon offset system for maintaining sustainable operation and creating a transparent win-win situation for both sides. This setup will be used as a proof of concept.

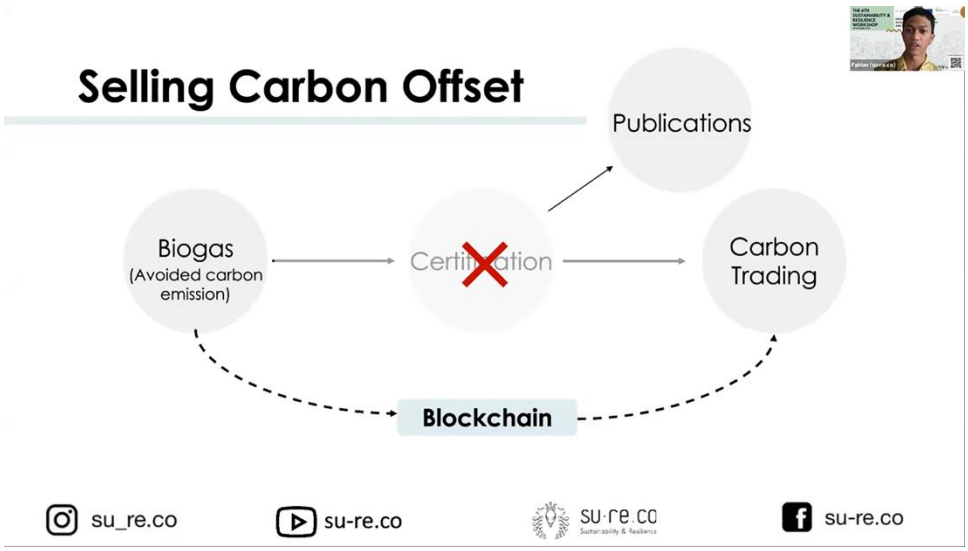


Figure 1-3. Biogas Initiative project update

This proof of concept to scale up biogas installation includes testing five gas meters and collecting and analysing the data to identify blockchain options to connect the carbon link. Currently, Su-re.co has currently installed gas meters in Flores, East Nusa Tenggara and has been creating a technical roadmap to look into ways to collaborate with existing platforms to sell carbon offset. The next step is to evaluate options for selling carbon offset, including the marketing aspect, a blockchain platform, and monetising channel for farmers to make a self-sustaining system.

1.3 TIPPING+: Enabling Positive Tipping Points towards Clean Energy

By Cynthia J. Ismail (Su.re-co)

A just transition to clean energy and the rapid coal phase-out at the COP26 aim to minimise temperature rises in line with the Paris Agreement. At least 23 nations pledged to phase out coal usage, including Indonesia, Vietnam, Poland, South Korea, Egypt, Spain, Nepal, Singapore, Chile and Ukraine. The developed nations have committed new support to help developing countries transition to clean energy. Aligning with this trend, the objective of the TIPPING+ project is to enact positive tipping points towards clean energy in coal-carbon intensive regions, including Indonesia. The high dependency on firewood in rural areas and coal stoppage is the focus of the Indonesia case study under TIPPING+. Most importantly, it aims to identify how the coal and carbon-intensive activities can be transformed towards clean energy from the agency perspective.

The TIPPING+ Indonesia case study started with two coal and carbon-intensive regions, namely Banten and Bali. While Banten province has the highest number of installed coal power plants, Bali is well-recognised as a province with projected rapid economic growth compared to other regions due to its tourism sector. TIPPING+ explores these regions transformation towards clean energy, which will be a reference for upscaling at the national level to contribute to the policymaking. One of the requirements is having the transformative vision to navigate the desirable energy transformation towards clean energy.

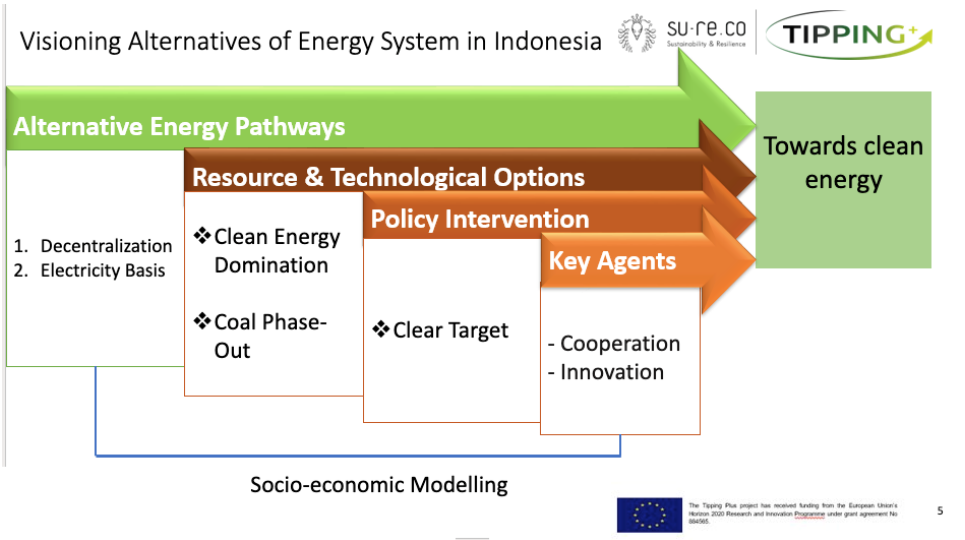


Figure 1-4. Visioning Alternatives of Energy System in Indonesia

Two themes emerge from the transformative vision from the stakeholder engagements, as shown in Figure 1-4. Firstly, the system will be decentralised or more flexible to manage all types of clean energy. Secondly, all of our social, industrial, economic activities will be electricity-based. Based on the visioning, there are mainly driven by three key drivers (1) resources availability and technological options (clean energy dominated and coal phase-out), (2)policy intervention that will support clear target, and (3) key agents interaction that will lead to a multilevel innovation driving our current situation towards clean energy.

2 Collecting Narratives in achieving NDC from energy and land-use mitigation through Focus Group Discussion

2.1 LANDMARC Discussion on Land-Use Mitigation Technologies and Practices

Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis is a framework to evaluate a project and develop strategic planning based on internal and external factors and current and future potentials. SWOT analysis was utilised in this FGD to discuss the key challenges and opportunities of implementing LMTs in Indonesia. The FGD also aimed to synergise planning and seek potential collaboration from all stakeholders. The LMTs discussion was split into agroforestry and biogas/compost sectors.

The discussion inferred that agroforestry implementation, particularly for storing carbon in Indonesia, could benefit the surrounded environment (Table 2-1). Agroforestry delivers carbon sequestrations that improve biodiversity, soil fertility, and water quality. However, trade-offs are raised as the main challenge. Farmers must divide their land smartly to designate areas for trees and others for crops, and thus, they can still achieve maximum profit and save carbon simultaneously.

Table 2-1. SWOT Analysis for Agroforestry

Strength	**Weakness**
- **Improve ecosystem services: carbon sequestration, biodiversity, water regulation, the soil fertile.** - **A potential voluntary market can be used for carbon offset.** - **Agroforestry (or mixed) systems typically have a good climate resilience (more drought resistance).** - **Carbon and biodiversity market.**	- **Long-term carbon stock due to small scale.** - **Agroforestry systems still have a relatively weak economic business case (often more labour intensive) and less focus on key cash crops.** - **A limited incentive for farmers to plant a tree.** - **Farmers are not interested due to trade-offs (not maximal economic value).** - **It can be difficult to ensure permanence (climate/social shock).** - **Huge initial investments. Payoff only comes years later.**
Opportunity	**Threat**
- **Carbon sequestration in the tree (maybe in soil) with potential additional income sources (e.g., fruit trees).** - **Multiple benefits: tangible and intangible for farmers.** - **Rewarding carbon benefits and other ecosystem services and other development goals may provide a better economic outlook.** - **Try to identify policies and incentive schemes that (still) promote monocultures and agricultural/forestry practices that are not 'climate change compatible'. For example, the actions are not climate-resilient, cause further soils/groundwater drainage, cause further deforestation, slash & burn). A 'first do not harm' policy principle for AF (afforestation), and other LMTs may help to conserve sinks.**	- Trades-off of agroforestry, for example, land management for corps. - Different opportunities from MoA and MoEF. - The agroforestry practice is costly in other provinces, such as Sumatra. - Social acceptance in the plantation areas. - Limited support from gov or others (private sectors, etc.)

Additionally, farmers currently do not have direct incentives to grow particular trees to support carbon sequestration. They also seem reluctant to apply the concept because agroforestry demands high cost and maintenance. The latter condition is observed while an international organisation based in Indonesia collaborates with Sriwijaya University, Palembang Environmental and Forestry Research and Development Center (Balitbang

Palembang), and MoEF tries to implement an integration model of agroforestry and fishery. This project is called agrosilvofishery and is located in South Sumatra for peatland restoration. Furthermore, farmers in South Sumatra prefer small-scale crop plantations, such as rubber or fruit, in the dry season. However, before the rainy season comes, they prepare the land by burning the peatland areas and starting paddy nurseries. This case is making the application of agrosilvofishery harder.

At the end of the discussion in the agroforestry sector, participants asserted the importance of cooperation with partners, such as Government to Government (G to G) and Business to Business (B to B). In addition to funding, Indonesia needs to have additional expertise, skill, and technology to close capacity gaps in implementing LMT. Alternatively, through cooperation with other countries or business companies.

In the biogas/compost sector, participants highlight a huge opportunity in organic waste management in the industrial sector for large-scale biogas or composting (Table 2-2).

Table 2-2. SWOT Analysis for Biogas/Compost

Strength	**Weakness**
- **Indonesia has a huge potential for organic waste for biogas and compost.** - **Cleaner energy than firewood/coal is very suitable if it replaces dirtier energy sources.** - **A common understanding of sequestration vs avoidance of fossil emissions is needed. If not coupled to BECCS, biogas can avoid dirtier energy but not sequester C.**	- **Resource competition with other uses of biomass. For example, plan material could be used as green manure for soil enhancement or livestock feed.** - **Biogas depends on plant input and needs much land. Useful for waste material, but can have very negative side effects if wrongly incentivised (e.g. maise> biogas in Germany)**
Opportunity	**Threat**
- **Organic waste from the agro-industry can be used for biogas, compost and biochar.** - **Biogas based on AD and compost is a highly circular technology that preserves soil carbon and nutrients and can be used in regenerative farming practices. Support for this option cannot only be on climate benefits, but co-benefits (nutrient recycling and limiting use of chemical fertilisers) have to be 'rewarded' or valued.**	- What about leakage of CH_4 from digestors? CH_4 is 21 times (AR2) stronger GWP value than CO_2.

Many potential co-products of waste management are produced. For example, a stakeholder managed a company that has successfully converted organic waste and wastewater in the sago and tapioca industry into biogas and animal feed. The latter product is made by maggot BSF, which processes organic waste into animal feed or dry organic fertiliser. This company also handled one hundred cows that fed on bioslurry-fertilised grass. However, it is required to optimise further implementation of current green technology and assess how it will

contribute to LMT. Further research collaboration between the company and other parties could be seen as a promising opportunity.

Due to limited time, the SWOT analysis of afforestation, peatland management, and other LMTs was not discussed further. The SWOT analysis of afforestation and peatland management are given below:

Table 2-3. SWOT Analysis for Afforestation

Strength	**Weakness**
- **40% potential emission reduction comes from the forestry sector**	- **Typically, the good practices are known. In this sector, it is often more a question of finance/funding that limits scaling up.**
Opportunity	**Threat**
- **REDD+ and forestry policies are relatively well developed in most areas. Continued and programmatic support and enforcement are needed. Avoid monocultures and optimise species selection.**	- *No input*

Table 2-4. SWOT Analysis for Peatland Management

Strength	**Weakness**
- **Rewetting Peatland to manage the water level can prevent peat fire**	- **A 'first do not harm' policy principle may be needed. Avoid any further destruction of peatlands. There is no additional drainage to enable expansion of other plantations and aim to avoid/combat peat fires. These more effective measures provide quicker results than 'regrow' peatlands.**
Opportunity	**Threat**
- **A 'first do not harm' policy principle may be needed. Avoid any further destruction of peatlands. There is no additional drainage to enable expansion of other plantations and aim to avoid/combat peat fires. These more effective measures provide quicker results than 'regrow' peatlands.**	- There is currently no (or a weak) business case for peatland conservation. - Companies/organisations/communities relying on peatland conversion for their income will have to be provided with a viable alternative.

2.2 IKI Biogas Initiative Discussion on Blockchain for Biogas Development

The FGD aims to understand how to upscale the carbon offset potential of biogas with blockchain technology by looking at three main questions: potential challenges of selling carbon offset, suitable blockchain platform options, and alternative pathways that farmers can monetise their income (Figure 2-1). Blockchain innovation guarantees the fidelity and security of a record of data. It generates trust without the need for a trusted third party—the data act as a currency for farmers in terms of carbon offset. However, the challenge is to find a suitable platform for farmers to receive financial income.

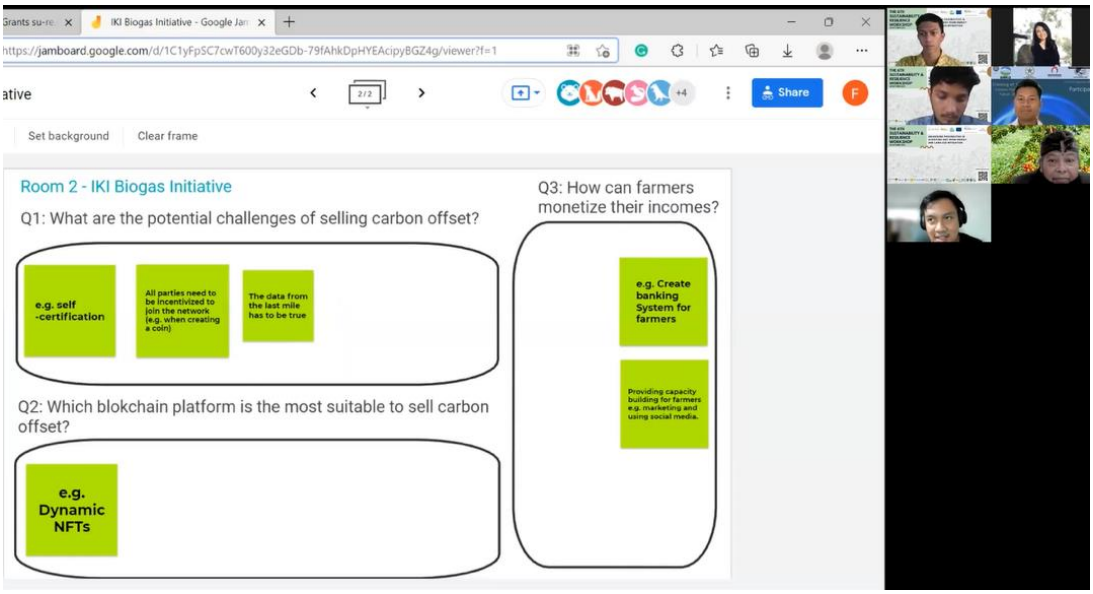


Figure 2-1. FGD on Biogas Initiative project

In exploring the best blockchain option, Su-re.co decides not to create its token but rather finds existing ones and sells them to the last mile. Once the blockchain system is created, the next step is to analyse the carbon market and identify advantages to incentivise people to join the community and sign up for this token. However, the more promising option is to create dynamic Non Fungible Tokens (NFTs), representing a nature-based solution beyond carbon offset. For example, as biogas production increases, the NFTs will change, and this option has less competition than the current carbon market.

NFTs are cryptographic assets on blockchain with unique identification codes and metadata that differentiate them from each other. It is different from cryptocurrency. NFTs cannot be traded, exchanged at equivalency, or used as a medium for commercial transactions. A participant agreed with the idea of NFTs, and it becomes another solution besides carbon trading. Instead of competing with the carbon credit market, NFT is a less established niche market that is more promising to connect farmers with the eco-conscious market.

In addition to blockchain configuration, the financial platform was highlighted as the main challenge of selling carbon offset. Su-re.co is in contact with AgUnity that creates a wallet for farmers without bank access. Almost all farmers in Indonesia, especially Bali, have

smartphones, but some do not have bank accounts, and some do not have family cards (KK) and ID card numbers (KTP). This initiative may inspire the project to create a monetisation system by integrating the bank account system into e-wallets built for farmers. Although blockchain is a revolutionary technology, it is not well-known yet because the Bank of Indonesia has not permitted it as a currency. Therefore, some steps require to be completed. It starts based on something currently implemented widely for farmers. It is noted that the project should introduce the blockchain and wallet separately at the bank. So, the e-wallet needs to be compatible with other banking systems, such as Bank Rakyat Indonesia (BRI) or Gopay by Gojek.

Regarding the alternative ways farmers can monetise their income, CARI!, a disaster management-based start-up, suggested capacity building for marketing and social media management, which is important nowadays. Through capacity building, the farmers will learn how to market their products using their social media. Su-re.co plans to hold an event for some farmers to educate them on using social media marketing and promoting agrotourism on their farms. The latter plan strives to add more value than just selling their products.

The solution to validate data in the last mile is still further explored with various stakeholders. Su-re.co's self-certification plan requires more additional research. In the end, any solution involving various technology has to be supported with capacity-building measures and connections to the banking system for farmers. Therefore, the implementation of blockchain of biogas can be sustained.

2.3 TIPPING+ Discussion on Clean Energy Transition in Indonesia

The objective of this FGD is to validate the future alternatives of the energy sector from agents' perspectives. The FGD focused on solar deployment as the most mentioned clean technology from stakeholder engagements. The interaction between key agents and resources access was explored during the discussion. The participants connected the key agents and resource/technological options with consideration of authority of power, how they interact, and the funding flow among stakeholders to other resources, followed by the data and information equally shared among the key agents. In this activity, key agents include national and local governments, private/business sectors, NGOs, academia/practitioners, financiers, intergovernmental agencies, and community/public.

The discussion started with no connection between the agent's options in the policy insight, focusing on solar energy. Noteworthy, each agent takes a different role at a different stage of the transformation process. In the case of solar energy, the national Government is considered the first key stakeholder in boosting the deployment of decentralised solar energy and financial support. This agent is perceived as an enforcing agent in the early stage of solar energy development (Figure 2-2). Once the market grows and becomes mature in the coming years, the non-governmental rules will be prominent. Besides the national Government, the local Government also plays an important role in implementing regional energy planning deriving from national energy planning. Both national and local Government would be more substantial today to a few years ahead. Another important stakeholder is the community or public who consume and sometimes provide their houses or lands as the location for solar panel installation.

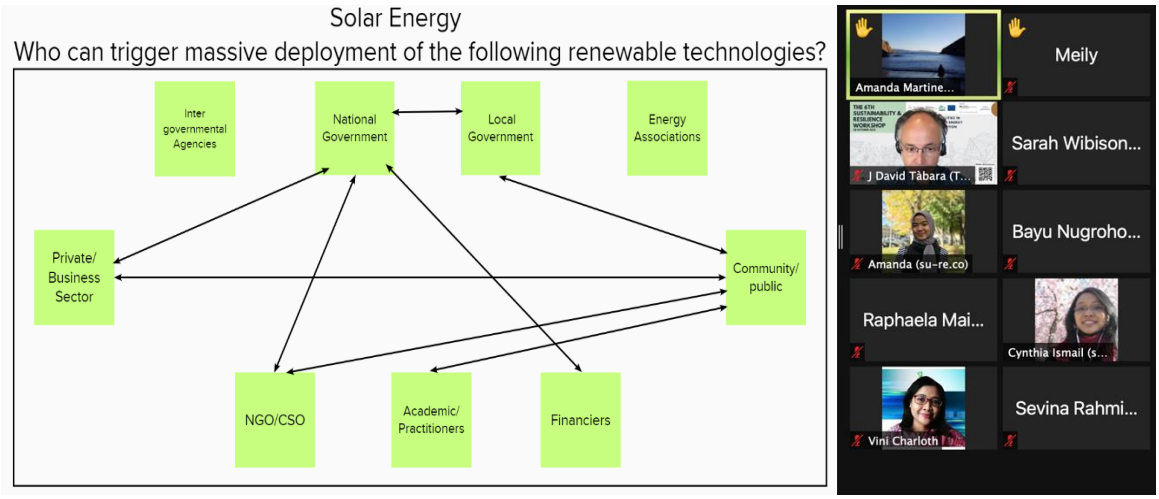


Figure 2-2. FGD for the TIPPING+ project

Participants underlined the significant contribution from NGOs and the private sector at the beginning of developing new renewable alternatives or new technologies. Emphasising renewable in other places will widen energy diversification and be a moment of tipping point. The tipping point is then particular for one technology moving from a single energy dependency to multiple energy sources. The diversification process will need different types of change agents, both from the private and public sectors.

A lesson learned from IESR that works on the sub-national level. It is important to engage the academic institutions. Since they often regarded sources of knowledge and legitimation of scientific evidence, they also have an important position in the communities. At the awareness-building stage, they will engage in many activities. Also, based on the necessities of each community at the village level or other regional boundaries, the public perspective on renewable energy is very important. It does not necessarily mean that they want to adopt renewable energy or solar energy directly, but the quality of energy access is one basic need they want to have. For example, people will ask for the quality of energy delivered by solar panels, whether it is good or better than what they have now from PLN or any other resources. So, it is always important to map different types of energy demands and availability access that the public would like to have, what kind of activity they want to pursue, and see how that area reacts to renewable energy use. These considerations are crucial because we have seen many of them aware of the climate crisis and want to act. However, there is still a lack of knowledge and implementation techniques on adapting to the climate action in their respective areas. The community in the IESR work also represents a huge group, such as women, indigenous community, etc. Therefore, it is essential to remark the opinions in each different group.

Lastly, PLN has launched the RUPTL 2021 – 2030 that has been called the greenest electricity business plan because PLN will establish more about 20 – 21 GW on renewable plans until 2030, which will be a massive movement of the renewables. However, PLN currently finds balancing the renewable supply and demand difficult. There is a decreasing trend in national electricity demand from 6% to 4% projections and the electricity trilemma of fulfilling the power demand and simultaneously reducing GHG emissions. On the other side, the progress of the 35 GW task force is still ongoing, with fossil fuel as the main fuel.

Overall, the highlights from the FGD conclude that all agents should have a different role depending on time and scale to operate and deploy the particular technology effectively. In order to ensure the deployment to the community, it involves various interactions. The national Government is crucial, followed by the local Government, to ensure top-down coordination. Moreover, wherever the renewable energy technology will be deployed, stakeholders should recognise the community's quality and their need to increase their learning capacity and social acceptance.

2.4 Progress and Status in Achieving NDC Target in Indonesia

By: Wayan Susi Dharmawan (Senior Researcher at the Center for Standardization of Sustainable Forest Management Instruments of MoEF)

There are four important points in Indonesia's Updated NDC to close out the second session. Firstly, while Indonesia's emission reduction NDC target remains the same – 29% or 40% with international support – the GHG emission level 2030 in the Updated NDC is slightly lower under conditional mitigation, particularly for the energy, waste, and Forest and Other Land Uses (FOLU) sector. Secondly, Indonesia has significant achievement in climate action vision regarding financial and institutional progress, especially RBP. Some of the key regulations include:

1. Government Regulation No.104/2015 on the changes of forest land use and function, which ban the conversion of forested land (productive production forest) in forest area for APL, except in the province where the non-forested lands in the production forest are not available;
2. Presidential Instruction No.5/2019 on Termination of New Permit and Improvement of Primary Natural Forest and Peatland Governance; and
3. Government Regulation No.46/2016 on strategic environmental assessments (SEAs) guide integrated, comprehensive, spatially detailed land-use planning at the national and sub-national level aiming at food, water, and energy security based on sound ecosystem management.

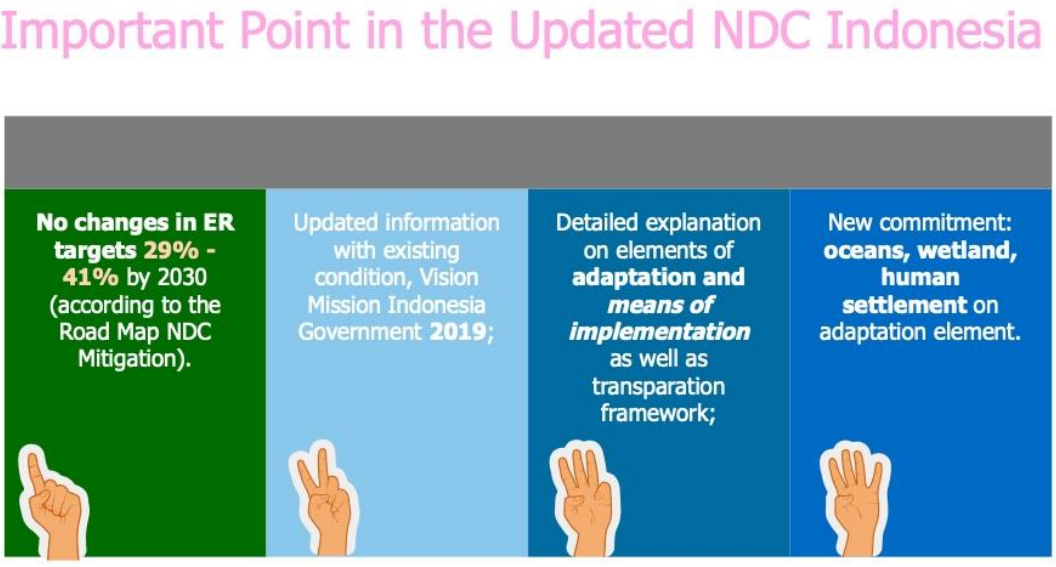


Figure 2-3. Four important points in the Updated NDC presented by I Wayan Susi Dharmawan

As a result, Indonesia significantly reduced deforestation by about 75%. Several programmes have been launched to accelerate the rehabilitation of the land, such as social forestry and land rehabilitation programmes and multi permit policies for forest concessions. Thirdly, policy, integrated development planning, implementation, and good governance are the lead drivers to complete the NDC and Low Carbon Development Plan. Lastly, with a new commitment to the ocean, wetland, and human settlement sector for the updated NDC adaptation elements, some challenges and opportunities are to be considered in the plan.

The raised population, decreasing forest coverage, threat of natural disaster, and approach to multi-stakeholder and multidisciplinary implementation are raised challenges. To end on a hopeful note, it is asserted that Indonesia has an opportunity for the green economy strategy and its incentive mechanism to be the key in implementing future climate change mitigation and adaptation action programs.

3 Interactive panel discussion to understand tipping phenomena in the energy and land-use sector

The tipping point indicates a change of a sector or a whole system. There are three moments at tipping points: (1) conditions that change, (2) tipping event or disruptive event, and (3) a new condition. The latter condition is based on the new attractors. Tipping points is a moment in which, due to deliberate interventions or disruptive event flips may cause a qualitative change in a social-ecological system towards:

a) A sustainable trajectory or structural changes. This phenomenon includes moving a sector from a particular trajectory to another, e.g., from a negative trajectory to a positive one. For example, tipping points towards clean energy transitions.
b) A sustainable new system's basin of attraction or systemic tipping points changing several systems. This system includes changing government regulations to modify the larger nature of systems. For example, tipping points toward full systems transformation.

Figure 3-1. Interactive panel discussion on the tipping phenomena in the energy and land sector

3.1 Tipping Phenomena in Energy Sectors: Towards Clean Energy

The interactive panel discussion started by describing tipping points in several countries. When a condition changes, referred to as the tipping point, the affected systems will change. For example, China's green policy pulls down inefficient coal power plants. Similarly, Germany decided to stop nuclear power after the Fukushima disaster in Japan. Meanwhile, in the case of Chile, there was a very small increase in public transport fees and created much social uprising that made the country change the whole constitution.

As a pledge to reduce climate change impact in Indonesia, PLN has already pitched to achieving zero carbon in 2060. This action requires to be accomplished simultaneously by uninstalling coal-fuelled power plants. It also represents the existing condition that Indonesia has a power oversupply. For example, Java-Bali interconnected grid is presently oversupplied, with 6 GW coming from the coal-fired power plants. The Government needs to fork out approximately 250 trillion rupiahs (USD 17.3 Billion) to compensate for the phasing out of

coal-fired power plants to address oversupply. This movement then will increase renewable installations in the existing electricity market. In order to successfully achieve a tipping point in the energy sector, it is important to consider the other determinants, for example, identifying alternatives to find the most suitable renewable resources to install and engaging collaboration among stakeholders. The Government has been approaching multilateral financial institutions to anticipate the issues of coal being phased out.

Nowadays, solar energy is perceived to have the potential to disrupt Indonesia's regime energy system. The Government has already rolled out several regulations promoting solar panel installations for individuals, commercials, and industries. The growth of solar energy installation has been emerging in the past three years. The main reasons are due to their practicality and declining cost. This moment could be considered a tipping point of the energy transition in Indonesia. At the end of the discussion, all panellists highlighted that stakeholders must understand the importance and urgency of low carbon development to enable a tipping point. After that, policy and financial schemes play a critical role in delivering smooth renewable installations.

3.2 Tipping Phenomena in The Land-Use Sector

Indonesia has a 190 million hectares terrestrial area, the third-largest tropical forest. Sumatra, Kalimantan, Sulawesi, and Papua have significant forest cover areas. Therefore, the forestry sector has an important role in reducing carbon emissions to the atmosphere. Indonesia has had a mechanism with international parties, referred to as REDD+, and has received RBPs since 2014. GCF funded USD 103.8 million, equivalent to 20.3 million tonnes CO_2eq, between 2014 and 2016. The newest one, FCPF Carbon Fund World Bank, has committed to distributing USD 110 million, equal to 22 million tonnes CO_2eq, within three different periods between 2021 – 2025 [5].

There was a question concerning monitoring and evaluation within the forestry sector during the panel session. Indonesia has a regulation to ban forest and peatland conversion, documented in Government Regulation No. 104/2015. Thus, to ensure that rule has been enforced successfully, MoEF has developed a high technology remote sensing system monitored by the local Government. The issue remains, it is because in remote sensing, scale matters. Data interpretation and model application could become challenging due to the scale issue. Thus, it has become one of the most important considerations to scale effectively the remotely sensed information at different scales[6]. This issue is in line with a statement mentioned by a panellist who noted that complete and reliable imagery is difficult to achieve due to a large forest area in Indonesia. On the other side, Ambienta, a private Spanish SME that leads earth observation in the LANDMARC, asserts that the capacities of validation and verification of the forest cover area are still lacking institutionally, including Government agencies.

[5] MOEF, 'Progres Result Based Payment REDD+', 2021 <http://ppid.menlhk.go.id/berita/siaran-pers/5816/progres-result-based-payment-redd>.

[6] Hua Wu and Zhao-Liang Li, 'Scale Issues in Remote Sensing: A Review on Analysis, Processing and Modeling', *Sensors*, 9.3 (2009), 1768–93 <https://doi.org/10.3390/s90301768>.

At the end of the panellist discussion, a representative from MoEF concluded that capacity building to monitor systems at the site, regional and national level should be accomplished. An integrated developed system is essential to access and observe the forest cover area data at all levels.

3.3 The Importance of Co-production Knowledge, Collective Action, and Data for Undergoing Tipping Point

Three aspects are influential in preparing systems to launch tipping points: knowledge, action, and data. Co-production of knowledge can be a key element in organising the reference system to undergo tipping phenomena in which data availability becomes crucial. A representative from Cambridge Econometrics (LANDMARC) stated that co-production knowledge should not be treated individually in each sector because there would be a lot of interactions, synergies, and trade-offs. For example, In-situ collection in soil analysis or biomass sampling in large-scale surveys could be done with remote sensing or GIS for land mitigation modelling to understand the decarbonisation potential of LMTs. In order to optimise the data collection, more fine-grained data is required to view the potential of the system on a larger scale, such as which areas are more appropriate to intervene with the right LMTs. A proper database would benefit modelling purposes and development planning by Bappenas. Without robust data, adequate planning and evaluation would be difficult. Lastly, inclusive collaboration among stakeholders is key to generating a systemic change in the reference system. Engagement with landowners, farmers, energy users, academia, practitioners, financiers, and policymakers will encourage synergies between sectors. Furthermore, to generate integrative policy packages in tackling carbon emission in interlinked sectors such as energy and land use.

4 Concluding Remarks

The Workshop closed with a hopeful note to keep up the rich discussion on innovative climate actions, including technological and knowledge advancement across all sectors and regions, contributing to the progress of the Paris Agreement towards avoiding adverse climate change impacts. The Sixth Sustainability and Resilience Workshop will continue the active engagement to lead the progress on land use and energy transition, including promoting biogas development in Indonesia. With the strong foundation established from the Kick-off workshop in March 2021, this Workshop optimised Su-re.co's vision to contribute to Indonesia policy and achieve contribution in the low carbon development initiative.

The existing Su-re.co's projects and activities are essential to accelerate tackling climate crisis through co-production of knowledge and multi-actor collaboration with governments, businesses, non-governmental organisations, and civil society. The Indonesian government emphasised that synergies between stakeholders are crucial to implementing these policies at a multilevel and across sectors. For instance, the TIPPING+ project promotes how the regime energy system can be shifted towards clean energy (e.g., solar energy, biogas) through multi-actor collaboration. On the other hand, the LANDMARC project emphasises the huge potential in utilising organic waste as one of LMTs to restore carbon. While a blockchain system with NFTs is a promising option to tap into the carbon market for biogas digesters as the alternative cleaner fuel.

Lastly, the interactive panel discussion from six organisations generated insightful perspectives to anticipate social-ecological tipping phenomena in the energy and land-use sector. Co-production of knowledge was highlighted as the next step, especially between those working on the land, farmers, government policies, and policymakers. Robust renewable energy and land-based data and technologies are needed to support integrative policy packages related to low carbon and climate resilience to address a high-end climate change scenario (maintaining the global temperature increase by 1.5^{o}C).

5 Appendix

5.1 Event Agenda

Time (*Bali Time*)	Activity	Speaker			
14.00 – 14.05	Opening and registration	MC (Su-re.co) – Amanda Puspa Ramadhani			
Introduction Session					
14.05 – 14.10	Welcoming	MC			
14.10 – 14.25	Introduction of Su-re.co	Dr Takeshi Takama, CEO of Su-re.co			
14.25 – 14.40	Project Update: 1. LANDMARC, 2. IKI: Biogas Initiative, 3. TIPPING+	**Su-re.co's Team:** 1. Siti Indriani 2. Fabian Wiropranoto 3. Cynthia Ismail			
14.40-14.55	General Q&A	MC			
14.55 – 15.05	FGD introduction	MC			
Focus Group Discussion					
15.05 – 15.10	*FGD Method Introduction*	Each facilitator			
15.10 – 15.35	**Breakout room discussion**	*Room 1: LANDMARC* - Land-based mitigation	*Room 2: IKI – Biogas carbon offset initiative*	*Room 3: TIPPING+* - Clean energy transition	*Room 4: Gift Room*
		Risk assessment on LMT implementation	*Evaluating options to scale up Biogas Proof of Concept*	*Visioning Indonesia's energy transition towards clean energy*	*Su-re.co do and be tanks showcase*
15.35 – 15.50	**General Room:** FGD Report and QnA	Moderator: • Siti Indriani • Fabian Wiropranoto • Cynthia Ismail			
Guest Presentation and Panel Discussion					
15.50 – 16.05	Presentation: Progress and Status in Achieving NDC Target	Ministry of Environment and Forestry, Research and Development Centre – I Wayan Susi Darmawan			
16.05- 16.30	**Interactive Panel Discussion:** Understanding tipping phenomena in the energy and land-use sector	Panellists: • Dr. Zainal Arifin – PT PLN (Persero) • Marlistya Citraningrum – IESR • J David Tàbara – TIPPING+ Project Coordinator • Pilar Martin Gallego – AMBIENTA • Eva Alexandri – Cambridge Econometric • Moritz Laub – ETHZ • Dody Setiawan – GIZ ExploRE			
16.30 – 16.45	Q&A discussion and closing	MC			

5.2 Total Participant List

NO	NAME	AFFILIATION
1	Abu Bakar	YTL Jawa Timur
2	Aditya Hani	Research Institute for Agroforestry Technology (BPPTA)
2	Aditya Hani	Research Institute for Agroforestry Technology (BPPTA)
3	Afzanizam Muda	Forest Department of Peninsular Malaysia
4	Ahmad Hapiz	Universiti Teknologi Mara
5	Alan Saputra	SSS Pundi Sumatra
6	Amanda Maishella	UGM
7	Amanda Martinez Reyes	TU Delft
8	Amanda Ramadhani	Su-re.co
8	Amanda Ramadhani	Su-re.co
9	Amelia Nugrahaningrum	Genau Indonesia
10	Andi Cintana Nurmilad	MICRA Indonesia
11	Anella Retna Kumala Sari	Bali Assessment Institute for Agricultural Technology (BPTP Bali)
12	Annisa Urfa	PT PLN
12	Annisa Urfa	PT PLN
13	Anugerah Yuka Asmara	Indonesian Institute of Sciences (LIPI)
14	Ardi Nur Armanto	LCDI BAPPENAS
14	Ardi Nur Armanto	LCDI BAPPENAS
15	Ardian C	
16	Asri Joni	CIFOR
16	Asri Joni	CIFOR
17	Bayu Setyo Nugroho	Jawa Power
18	Bob Effendi	PT Thorcon Power Indonesia
19	Carlos Picon	JIN
20	Chandra Kusarianto	DGREEC, MEMR
21	Chandra Kusaristianto	MEMR
22	Chisato Saito	ASEAN Initiative (Kyoto Uniersity)
22	Chisato Saito	ASEAN Initiative (Kyoto Uniersity)
23	Christopher	RAPEL
24	Citra Cininta	HighScope Indonesia Institute
25	Cynthia Ismail	Su-re.co
26	Cynthia Wardhana	Su-re.co
26	Cynthia Wardhana	Su-re.co
27	Danny Dwi Saputra	Wageningen University
28	David Ganda Silalahi	Jawa Power
28	David Ganda Silalahi	Jawa Power
29	David Ismangil	TU Delft
30	Dewi Yunita Widiarti	SSS Pundi Sumatra
30	Dewi Yunita Widiarti	SSS Pundi Sumatra
31	Dian Hasanuddin	Indonesian Association of Urban and Regional Planner
32	Dini Putri Permatasari	Sekolah Alam Cikeas

NO	NAME	AFFILIATION
33	Dinna Safitri	Four Seasons Resort Bali at Jimbaran
34	Dody Setiawan	GIZ
34	Dody Setiawan	GIZ
35	Eise Spijker	JIN
36	Eki Dwi Wijanarko	MEMR
36	Eki Dwi Wijanarko	MEMR
37	Elvira Apriana	Su-re.co
38	Ernitia Paramasari	Dagangan
39	Erwin Widodo	Tropical Forest Alliance (TFA)
40	Eva Alexandri	Cambridge Econometric
40	Eva Alexandri	Cambridge Econometric
41	Fabian Wiropranoto	Su-re.co
42	Federico Julian	AMBIENTA INGENIERIA Y SERVICIOS
42	Federico Julian	AMBIENTA INGENIERIA Y SERVICIOS
43	FR	-
44	Gita Singh	GMIS Jakarta
45	Gusti Ayu Isma Yanti	Su-re.co
46	Habibah Nureniati	Thursina IIBS Malang
47	Harris Yahya	MEMR
48	Harry Bahri	PT. Asindo Tech
48	Harry Bahri	PT. Asindo Tech
49	Hemavathi Ramamurthi	Quest International University Perak
50	Herry Arum	Su-re.co
50	Herry Arum	Su-re.co
51	I Dewa Ayu Yona Aprianthina	Agriculture and Food Security Services (Distanpangan) in Bali
52	I Gede Alexander Merlin Landmann	Su-re.co
52	I Gede Alexander Merlin Landmann	Su-re.co
53	I Irawati	NA
54	I Ketut Soma	Distanpangan Bali
55	I Made Dwi Wiratmaja	Meteorological, Climatological, and Geophysical Agency (BMKG of Jembrana, Bali)
56	I Wayan Andi Yuda	BMKG of Jembrana, Bali
57	I Wayan Sushi Darmawan	Ministry of Evrionment and Forestry (MOEF)
58	Ichsan Hafiz Loeksmanto	Independent Consultant
59	Icmi Safitri	IESR
60	Ida Bagus Bawa Adiputra	Energy and Mineral Resources Agency of Bali (ESDM Bali)
61	Intan Sofiah	PT DCLI
62	Intan Sofiah	PT DCLI
63	Irfa Novita	Ketemu Project
64	J David Tabara	Global Climate Forum
65	Janina Onigkeit	Kassel University

NO	NAME	AFFILIATION
66	Jayanti Maharani	-
67	Jenny Lieu	Ministry of National Development Planning (BAPPENAS)
68	Kana Watando	TU Delft
69	Lisa-Marie Mahler	INOWKamikatsu
70	Luthfi Budiman	GIZ
71	M Asrofi	Bandung Environment and Clean Agency (DLHK Bandung)
72	Made Dwi	BMKG Jembrana
73	Margareth P Ismail	Noicymart
74	Marlistya Citraningrum	BAPPENAS
75	Meily Priliani	Institute for Essential Services Reform (IESR)
76	Melly Mulya Ningsih	PT PLN
77	Michihiko Tonouchi	Society of Renewable Energy
78	Mihata Takahashi	Japan Meteorological Business Support Center
79	Moristanto	Caritas Girls' Junior & Senior High School
80	Moritz Laub	MEMR
81	Muhammad Arvianda Vinci Kurnia	ETHZ
82	Muhammad Hasan Imaduddin	University of Southampton
83	Muhammad Hasan Imaluddin	-
84	Muhammad Irvan Nurliansyah	Kyoto University
85	Muhammad Rizki Maulana	Sanggau Environmental Agency (DLH Sanggau)
86	Na	GIZ
87	Natasha	-
88	Natsumi Tamura	Caritas
89	Ni Putu Sekar Trisnaning Laksemi	CIFOR (Center for International Forestry Research)
90	Nocturno	-
91	Nur Astuty	Interpreter
92	Octafiana Santi Dwihapsari	MEMR
93	Oktavianna Winda	Su-re.co
94	Pasthika Maya	Su-re.co
95	Pilar Martin Gallego	AMBIENTA INGENIERIA Y SERVICIOS
96	Pradipta Andaru	MEMR
97	Puspita Wardani	Singapore Management University
98	Radhya Avisya	Interpreter
99	Raphaela Maier	Wegener Center for Climate and Global Change, University of Graz
100	Rey Fachrevi	Ministry of Energy & Mineral Resources (MEMR/ESDM)
101	Rima Agustin	MEMR

NO	NAME	AFFILIATION
102	Sajida Ayu Kusuma Wardhani	SMA Negeri 3 Kota Serang
103	Sarah Wibisono	Su-re.co
104	Senda Hurmuzan	DGE, MEMR
105	Senda Hurmuzan Kanam	MEMR
106	Setiari Marwanto	The Indonesian Agency for Agricultural Research and Development (IAARD)
107	Sevina Rahmi	Universiti Teknologi MARA
108	Siti Indriani	Su-re.co
109	Sridewanto Pinuji	CARI!
110	Stanislav Martinat	Czech Academy of Sciences (CZ), James Hutton Institute (UK)
111	Steci Desilia Basompe	Environment and Soil Agency of Banggai laut
112	Suhandono	BAPPENAS
113	Sunil Kumar Pal	Gandhi Memorial Intercontinental School, Jakarta
114	Syaimma Nur Hidayat	Center for Southeast Asian Studies
115	Takeshi Takama	Su-re.co
116	Tina Triasih	Nutrial Inside
117	Todor Arpad	SNSPA
118	Tonouchi	JMBSC
119	Vini Charloth	PT PLN
120	Wahyu Aji	Pemuda Tata Ruang/Spatial Youth
120	Wahyu Aji	Pemuda Tata Ruang/Spatial Youth
121	Wilistra Danny	LCDI BAPPENAS
122	Yuda	BMKG Jembrana
123	Yuliana Bakari	University of Gorontalo
124	Yuliana Nike Ndaumanu	Pepelingasih NTT (East Nusa Tenggara)
124	Yuliana Nike Ndaumanu	Pepelingasih NTT (East Nusa Tenggara)
125	Yustina Artati	CIFOR
126	Yusuf Suryanto	BAPPENAS
126	Yusuf Suryanto	BAPPENAS
127	Zahra Shafira	Greeners.co
128	Zainal Arifin	PT PLN
128	Zainal Arifin	PT PLN
129	Zois Katiforis	University of Piraeus Research Center
130	Zulaika Rahayu	Telkom University
131	na (Japanese letter)	-

5.2.1 Participant list in break room LANDMARC

No.	Name	Affiliation
1.	Eise Spijker	JIN LANDMARC
2.	Eva Alexandri	Cambridge Econometrics
3.	Jenny Lieu	Technische Universiteit Delft
4.	Moritz Laub	ETH Zurich

5.	Pilar Martin Gallego	AMBIENTA
6.	Yustina Artati	CIFOR
7.	Adha F Siregar	MoA
8.	Erwin Widodo	CIFOR
9.	Aditya Hani	Agroforestry Research Centre
10.	Anella Retna Kumala Sari	Bali Agricultural Research and Development Agency
11.	David Ismagil	TU Delft
12.	Senda Hurmuzan	Directorate General of Electricity, MEMR
13.	Harry	PT. Asindo Tech
14.	Janina Onigkeit	University of Kassel
15.	Nike Ndaumanu	-
16.	Sekar Trisnaning	University and Research Center
17.	Zahra Shafira	-
18.	Bob S Effendi	ThorCon
19.	Made Dwi	Jembrana Climatology Station
20.	Yusuf	Directorate of Electricity, Telecommunications and Informatics- BAPPENAS

5.2.2 Participant list in break room IKI Biogas Initiative

No.	Name	Affiliation
1.	Ahmad Hapiz	Universiti Teknologi MARA Shah Alam
2.	Lisa-Marie Mahler	GIZ
3.	Sridewanto Pinuji	Cari!
4.	Abu Bakar	Paiton II Power Station
5.	David Silalahi	PT. Jawa Power
6.	Department of Agriculture and Food Security of Bali Province	
7.	M. Arvianda Hymes Vinci Kurnia	ETH Zurich
8.	Christ Nugroho	Rapel.id
9.	Rima Augustin	Ministry of Energy and Mineral Resources
10.	Stanislav Martinat	Czech Academy of Sciences (CZ), James Hutton Institute (UK)
11.	Steci D. Basompe	North Bali Environmental Services
12.	Syaimma Nur Hidayat	Center for Southeast Asian Studies
13.	Tina Triasih	Nutrial Inside
14.	I Dewa Ayu Yona Aprianthina	Agriculture and Food Security Services (Distanpangan) in Bali
15.	Yuda	Climatology Station
16.	Chandra Kusarianto	DGREEC, MEMR
17.	M Rizki Maulana	GIZ
18.	Dody S	GIZ
19.	Nike Ndaumanu	-

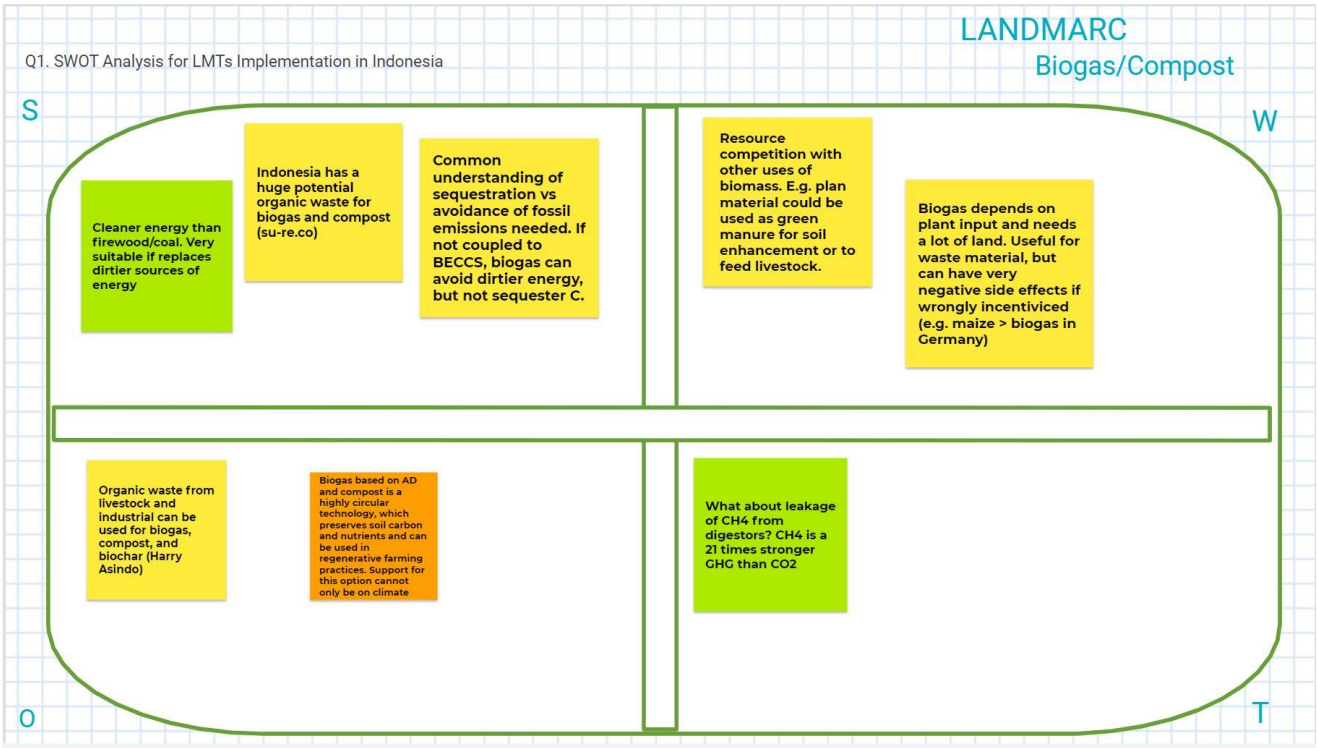
5.2.3 Participant list in break room TIPPING+

No.	Name	Affiliation
1.	Raphaela	University of Graz
2.	Bayu	PT. Jawa Power
3.	Marlistya Citraningrum	IESR

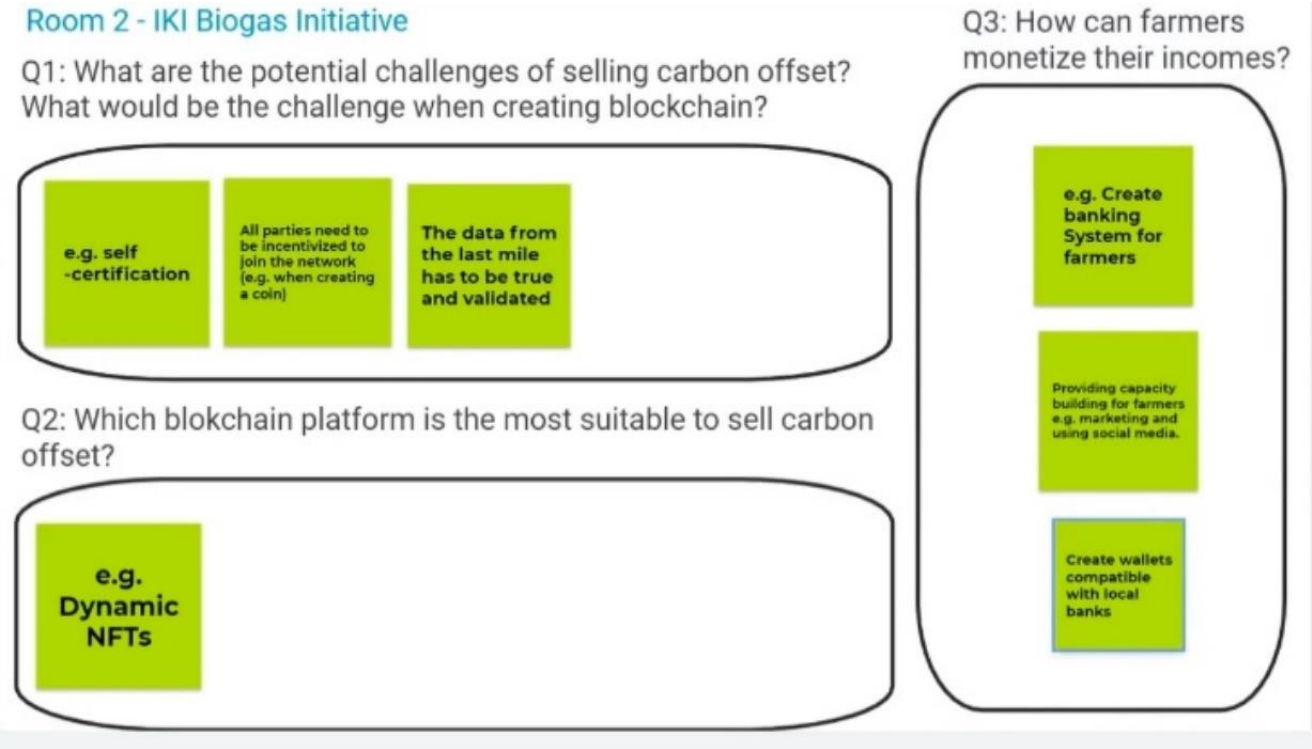
No.	Name	Affiliation
4.	David Tábara	GCF - TIPPING+ Coordinator
5.	Eise Spijker	JIN LANDMARC
6.	Meily	PT PLN
7.	Amanda Martinez	TU Delft
8.	Sevina	UiTM
9.	Vini Charloth	PT PLN

5.3 The Discussion Figure of FGD

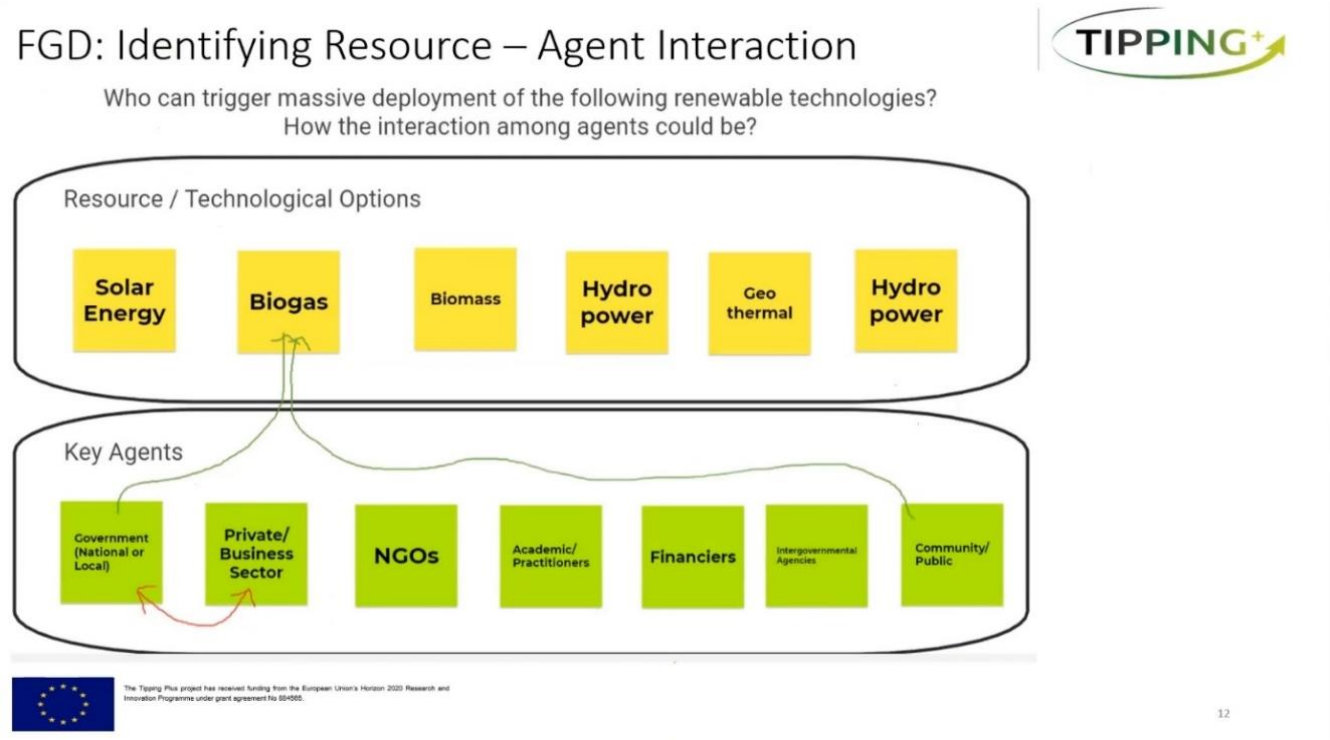
5.3.1 LANDMARC discussion on land-use mitigation technologies and practices



5.3.2 IKI Biogas Initiative Discussion on Blockchain for Biogas Development

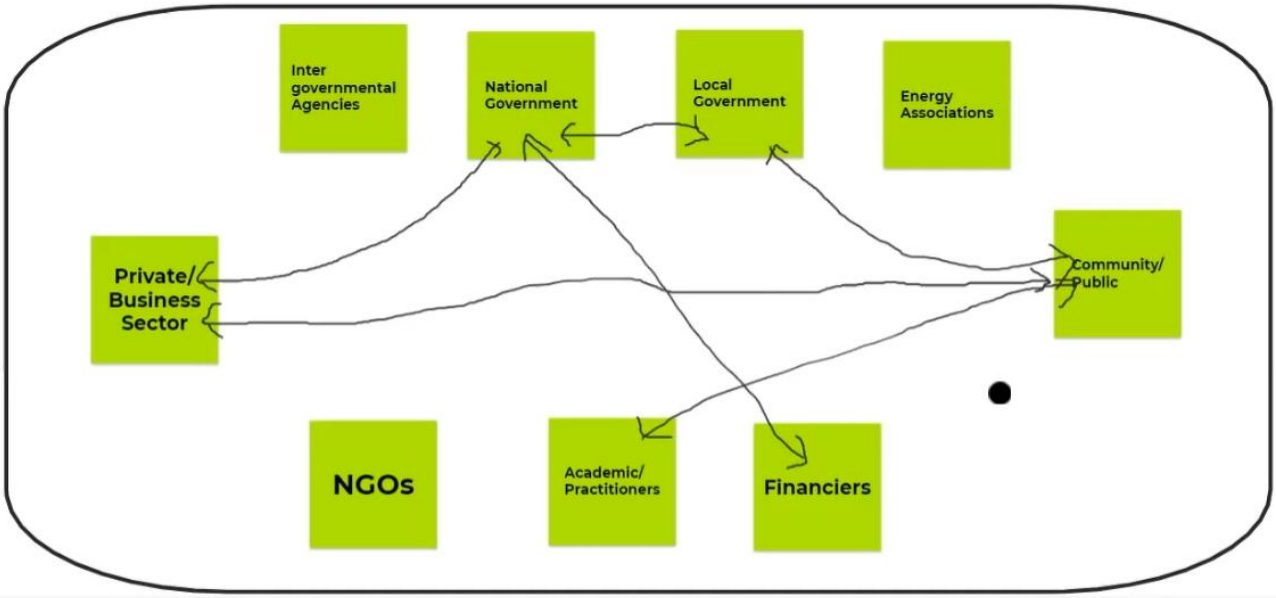


5.3.3 TIPPING+ Discussion on Clean Energy Transition in Indonesia



Solar Energy

Who can trigger massive deployment of the following renewable technologies?



5.3.4 Question and Answer Session

Harry - Asindo Tech	**:**	**Our own industrial business produces starch from cassava and sago palm trees. We have optimised liquid and solid waste biogas for tapioca and sago. We changed to become feed for animals. Ready to collaborate with Su-re.co because the company only do green practising, not researching. However, right now, there is no one to continue the activity. We have the opportunity to optimise waste from tapioca starch.** **Indri: Organic waste management** and how to **scale up biogas and composting technology** are h**uge potentia**ls **in Indonesia.**
Harry - Asindo Tech	:	We have biogas to electricity 1 MW. Still have much opportunity to optimise waste. Want to collaborate and optimise the condition. Pak Dodi from GIZ knows about our current situation and the Indonesian biogas association. **Indri**: Many co-products from waste management such as biochar. Biogas and compost would assess bio-slurry to store carbon material in the soil to improve soil condition and carbon stock.
Harry - Asindo Tech	:	We have 100 cows in the location, and we do not know the template. We want to do something right, integrate zero-waste technology. Contact me for future opportunities on cooperation between Su-re.co's research and our practice.
Yustina Artati - CIFOR	:	Agroforestry provides benefits for the environment. Improve biodiversity. Landowners' direct benefits include food, fruits, and fish (silverfish) for restoration in Indonesia. However, there is a challenge in applying agroforestry because interviewing the farmers about dividing the land to planting trees and growing crops. The trade-off for farmers because trees grow very slowly because they do not get direct benefits. No direct incentives for farmers to plant trees. Farmers expect to implement agroforestry, but there are limitations and a lack of incentives. Incentives are money and could be another income or other incentives for their welfare. **Indri**: How agroforestry failed to provide benefits for farmers. Provide an example of how agroforestry has a huge challenge or has failed
Yustina Artati - CIFOR	:	Fishery in peatland area. In South Sumatra in peatland restoration. They are collaborating with intrusions in south Sumatra in Palembang ministry of environment and forestry, trying to develop a model for agrosilvofishery. When introducing the model to farmers, they were reluctant because it is costly and different from Javanese farmers, cultivated intensively. Second challenge: South Sumatra farmers have different cultures; it is more small-scale plantation like rubber or fruit (duku/durian) plantation. They use peatland during the dry season, and they burn the peatland areas in the dry season and spread the paddy seeds. One of the challenges made it to apply agrosilvofishery in South Sumatra.
Eise Spijker - JIN LANDMARC (in chat)	:	Could Indonesia itself ensure that agroforestry is adequately and timely scaled up? OR what type of support would be needed from the international community? **Indri**: International support to scale up agroforestry. Low carbon planning in Bappenas. Need government to government relationship. Best practice from Europe and implemented in Indonesia. Closing the

		stakeholder capacity gap can be done through training and pilot projects.
Yusuf - BAPPENAS	:	I am not responsible for the agroforestry sector. International support for expertise and funding. Expertise = skill, technology etc. **Indri**: Increasing knowledge transfer, stakeholder capacity
Yusuf - BAPPENAS	:	I am not following agroforestry. Based on what I have heard, a collab with Norway can learn from Norway and share the responsibilities.
Moritz Laub - ETHZ (in chat)	:	What schemes exist in Indonesia to monitor the GHG sequestration or emissions of different land-use types, especially under land-use change?
Jenny Lieu - TU Delft (in chat)	:	One of the challenges I hear is adequate resources (e.g., money); are there plans to divert fossil fuel subsidies or policies to provide funds to support more sustainable lad use activities? Having good intentions is important but needs to be backed by resources, especially for costly practices with low economic yields (as Yustina mentioned in agroforestry on peatlands)
Fabian W	:	What are the potential challenges of selling carbon offset? **M Rizki Maulana – GIZ**: All the parties should be involved and get the incentive. Blockchain is mainly still decentralised. **Department of Agriculture and Food Security**: The presence of a digester is included in the mitigation action of livestock management, livestock manure that is left open causes GHG emissions. In addition, the presence of gas can be used for daily needs.
Fabian W	:	Which blockchain platform is the most suitable to sell carbon offset? **Sridewanto Pinuji – CARI!**: Capacity building is an important factor nowadays, especially for marketing (social media). Also, farmers do not have this capacity (using social media platforms).
Fabian W	:	How can farmers monetise their incomes? **M Rizki Maulana – GIZ**: Create banking system for farmers. Bank in Indonesia has not permitted blockchain as the currency. People in Indonesia are starting to realise NFT can be other assets rather than stocks, etc.
Fabian W	:	What are the important things to consider when using blockchain technologies? e.g., using NFTs must consider the environmental impacts **M Rizki Maulana – GIZ**: We need to make sure we solve the last mile problems, what things the blockchain cannot do. Connecting online data with offline data is through IoT; therefore, we need to ensure the origin of data is correct. What if the origin of the data is already correct? **M Rizki Maulana – GIZ**: All the parties need to be incentivised to join the network (e.g., when creating a coin)
Fabian W	:	What if the data is already true? What are the systemic challenges? **M Rizki Maulana – GIZ**: I agree. When we want to develop a coin, we need to make sure that all parties involved have an incentive so that they all want to join. Proof of concept is a good start; however, it is best to connect with the current platform rather than make it from scratch.
Fabian W	:	Creating data for carbon offset will take time. Henceforth we want to start selling Nature-based Solutions, so selling a story, not facts.

		Sridewanto Pinuji - CARI!: Works with disaster management but suggest using the capacity building to marketing and social media for farmers, as they cannot market their products. Did you do capacity building with farmers? **Sridewanto Pinuji - CARI!**: No, this came to my mind. We almost collaborated with Agunity. We have done this with some farmers and introduced agrotourism, a service we can offer to farmers. Indonesia is unique since many farmers have smartphones, especially in Bali, since many have no KK. Thus, there are initiatives for creating a wallet for farmers. How do you see this?
M Rizki Maulana - GIZ	:	Connect the blockchain wallet to the current banking system, blockchain is decentralised, but the financial system is centralised. Blockchain is a revolutionary technology. **Fabian W**: So wallet needs to be connected to banks However, blockchain is not yet massive in Indonesia since the central bank did not permit blockchain yet, like NFT, because it incentivises the value and can have increased value. **Fabian W**: Is not the NFT market a Niche market? Would you buy an NFT? If the price is good, people will buy it. NFT is becoming more popular in Indonesia
Fabian W	:	How can incentivise farmers even more? **Department of Agriculture and Food Security**: Most Balinese Farmers have livestock, supporting mitigation and adaptation. We would highly appreciate it if each farmer could be facilitated with Biogas.
Lisa-Marie Mahler – GIZ	:	How open are farmers to trying new technologies like blockchain? Is there a trust issue to consider?
Ahmad Hapiz – UiTM	:	Maybe here I am, still trying to be the audience. I got no idea about biogas but am interested in it, because most people here in my hometown are cattle farmers, maybe from here I got an idea how to persuade them to try this idea.
Nocturno	:	What is your target? Traditional Farmer or Modern Farmer? **Fabian W:** It is an interesting question because even the most traditional farmer is likely to receive subsidies for technology and LPG and be equipped with smartphones. Most importantly, we target farmers who have livestock for the biogas, we do not need them to be tech-savvy, but we want to find ways to provide the money from our carbon offset income.
Nocturno (in chat)	:	What is your target? Traditional farmer or modern farmer? **Fabian W**: It is an interesting question because even the most traditional farmer is likely to receive subsidies for technology and LPG and be equipped with smartphones. Most importantly, we target farmers who have livestock for the biogas, we do not need them to be tech-savvy, but we want to find ways to provide the money from our carbon offset income.
Raphaela - Uni Graz Austria	:	The citizen installs solar power where the power. Funding from the national Government decentralises the power. Community/public can rent other rooftop houses or land for solar panel installation.
Bayu - Jawa Power	:	The national government has a big role. The function of the government is to share more knowledge with citizens and fund solar panels in houses. Many people still do not know about the function of using solar

		energy in their households. So, the government has responsibility for the society using solar panels.
Marlistya Citraningrum -IESR	:	Agree with Raphaela and Bayu. The national government in massive deployment to commercial and industries and households, and the local government then followed them. There is a mandate for national renewable energy planning—the current trend for the last three years. With the proper regulation, we can see the progress in industry users for ren. Energy with reduced parallel charged. Installation on their facilities. Once the market grows, the non-government rules will be more prominent. Many projects do not seem bankable because they are not profitable/risky.
David Tábara - Tipping+	:	There will be different roles and types of agents at different stages of transition. The tipping point is to deploy/remove one source of clean energy and have multiple sources of energy - diversification. Diversify the financing scheme. The accounting system is important to evaluate solar energy projects.
Eise Spijker - JIN LANDMARC	:	Based on the needs of each community, regional level and boundaries. How the public perceive renewable energy is very important. Prices and implementation technique
Meily - PT.PLN	:	PLN - Business plan 2021- 2023 seems as the greenest RUPTL electricity business plan. We will establish more renewable energy plans, from retiring diesel to the solar power plant.
Eise Spijker - JIN LANDMARC (in chat)	:	How are the regulations banning forest and peatland conversion monitored and enforced? Are the earth observation/remote sensing monitoring systems adequate here? **Mr Wayan**: Using high tech remote sensing system developed by MoEF. This system is good for Indonesia, and the local government monitors them. Regulation is important to monitor the evaluation and management of peatland conversion activities.
Eise Spijker - JIN LANDMARC	:	Indonesia deploys the technology. Curious about gaps or quality issues with that. Remote sensing systems still make use of models. If there are gaps, does it frustrate anyone? Is there room for improvement? **Mr Wayan**: Indonesia has a large forest area, making it difficult to cover all the imagery. This is the gap to be improved. Use satellite imagery validated with high-resolution satellite imagery in all parts of Indonesia, especially how to validate the interpretation from the national level to the site level.
Moritz Laub - ETHZ (in chat)	:	What does Indonesia need to monitor the GHG sequestration or emission of different land-use types, especially under land-use change? **Mr Wayan:** enough and very complex. Next, monitoring greenhouse gas should align with national methodology and national and sub-national standards, not only international.
David Tábara - Tipping+	:	What kind of capacities is lacking and needed to implement these plans? **Mr Wayan**: The first is about the capacity to validate and verify the forest cover area at the site level. Secondly, the capacity to develop the system for forest cover monitoring at the national level. The third is the capacity to increase the capability of local government for monitoring, evaluation, etc., to safeguard implementation.
David Tábara - Tipping+	:	On global positive tipping points (in the chatbox): https://council.science/current/blog/enabling-positive-tipping-points-

		towards-global-sustainability-in-uncertain-times/
		Introducing about Tipping+ How to move tipping points from a particular point to another one is this project's topic. We can also have systemic tipping points: changing regulation, etc., changing just one sector or system. We have conditions that change. There is a system that changed, and then we have a new system. China policy at the moment then is pulling down inefficient coal power plants. There is a sector of tipping point but not a systemic tipping point. In the case of Germany: it decided to stop nuclear after Japan Fukushima. They changed the whole constitution of a country. Changes due to small disruption.
Fabian W	:	Perhaps ask one of the teams in Indonesia to respond, perhaps Bpk. Zainal elaborates on the current interventions.
Zainal Arifin - PT.PLN	:	If we look at the tipping point, we should look at all determinants. With tipping point, of course, we look at the alternative to accelerate shifting. We should penetrate renewable energy. However, the main question is where renewable energy should be absorbed? The market is an oversupply of electricity, in Java-Bali oversupply 6 thousand MW. If we want to build renewable energy, we should solve the problem of oversupply. We cannot supply new energy to the existing market. One solution is to phase out the coal power plant. The trade-off is huge. Should provide 250 trillion Rupiah to compensate for the phase-out of the power plant. Consequently, we should provide compensation.
Fabian W	:	Response from Ibu Citra?
Marlistya Citraningrum - IESR	:	Energy transition in Indonesia has made good progress in the past four years, and government embraces transition much more. Challenge: we have legal issues on how to solve the issue. Solar energy has played an important role in disrupting coal—solar energy from individual and industrial sectors. The past three years have shown the acceleration of solar power, which could be the tipping point of the energy transition for Indonesia. In this case, we hope the government will be more ambitious in the climate sector in COP26 and can achieve 100% of renewable energy, given the proper support and incentives.
Wilistra Danny - LCDI BAPPENAS	:	We have a secretariat to help BAPPENAS. Currently, we have a national roadmap for 2024 in this planning, energy and other sectors related to climate change, including energy-transportation, waste management, marine and coastal—Climate-resilient development covering marine and coastal, water resource, agriculture, and health. Support BAPPENAS, government and private sector community to prepare low carbon development.
Fabian W	:	Some of the challenges mentioned before were legal issues. How do you respond to such statements? What are the policy challenges in achieving tipping points in Indonesia?
Wilistra Danny - LCDI BAPPENAS	:	To cope with this issue. Government has to collaborate intensively with other stakeholders, such as private sectors. In a good collaboration, we have to be at the same understanding of what we will do because this affects us. The second thing is building common perception and financing this plan. How excellent/perfect plan without tools or financial support cannot go.
Fabian W	:	How do we see the project renewables in Indonesia maybe methods to achieve this tipping point?

Dody - GIZ	:	I think everyone is questioning how to get renewables more—supported by RUPTL earlier this month. PLN announced a net-zero plan. Everyone is working on getting there. Inline, they are working with policymakers and working with the private sector. One is top-down (giving policy recommendations in renewable energy), also working private sector giving advice and financial support for renewable energy. Encourage the private sector to develop renewable energy for their use, but the development slows down after the CDM project. We also encourage companies to utilise their palm oil effluent to produce biogas and upgrade it for their individual energy needs—a role not only of government but also the private sector.
Fabian W	:	Would any modellers like to comment on this?
Eva Alexandri - Cambridge Econometric	:	From my modelling experience, the best examples I have seen is where you do not treat the systems as separate because there is trade-off and synergies due to policies and other aspects. When looking at transition, remember that there are many interactions, and use the interactions between the areas.
Moritz Laub -ETHZ	:	Linear interpolation. Every mitigation comes from plants capturing the carbon and putting it into their biomass or soil has seen best reactions different pathways. IPCC reports projections based on simple assumptions, and the soil and climate are not considered. The goal is to get data to represent these systems (how much carbon we can store, rainfall, potential trade-offs such as fertilising). It will be great if we can get better data and get a finer scale understanding of where the potentials are and where it makes more sense to create data.
Pilar Martin Gallego - AMBIENTA	:	Tie in-situ collection (biomass surveys etc.) what could be done with remote sensing that is a key point in the modelling process for land mitigation. We must gather as much data as possible.
Fabian W	:	So, to wrap up, there are two things: The necessity of fine-grain data and interactions between parties. Question: to what extent are some of these interventions from the land use energy sector synergised so that it does not act as a separate intervention. Second question: Are there available data regarding this intervention that the modellers can use?
Wilistra Danny - LCDI BAPPENAS	:	Several sectors, including land and energy, such as forestry, agriculture and other development based on land. They are related to each other, so they cannot separate. However, they all have their characteristics to respond to climate change. Like energy, how to develop green energy. Besides using fossil fuel energy, we have an alternative to using biomass. As mentioned by Bpk Dody, fuel using palm oil or palm kernel oil, based on the research, has quite high calories. When we develop energy-based land, the conflict between these developments can be found. We have to harmonise them to prevent clashes. The second question about data is that we cannot prepare good planning for development without good, robust data. That is why we need to have a good database. With that, we can set up planning and evaluation.
David Tábara - Tipping+	:	Link climate with diversity, and this is crucial. Let us hope that this is the beginning of the tipping point that hopefully, things can be more promising.