

# Indonesia Case Studies

## LANDMARC and TIPPING+

### Indonesia case studies on LANDMARC and TIPPING+

#### Background

Indonesia is the largest archipelagic country comprising around 17,508 islands with many remote areas, inhabiting over 265 million people. Indonesia is one of the world's biggest emitters, with emissions from land-use contribute significantly (65.5%) to the nation's total GHG emissions (USAID, 2017). To address emerging impacts of climate change, Indonesia has pledged to reduce its greenhouse gas emissions (GHGs) by 29% by 2030 to meet the Paris Agreement. However, this international climate mitigation policy and strategies often do not consider the nuanced needs and real conditions as well as opportunities present at the regional level, resulting in misalignments between (inter) national climate policy goals and local priorities.

For the energy sector, the primary energy sources are still dominated by fossil fuels (e.g. coal, oil, and gas), with renewable energy only making up 17.1% for all electricity production (DEN, 2019). Although Indonesia had achieved 98.83% electrification rate in 2019 (PWC, 2019), the distribution is unbalanced as electrification rates in Eastern Indonesia is lower compared to Western Indonesia. For example, Jakarta's rate reaches almost 100%, while Nusa Tenggara Timur and Papua (the eastern islands) only have rates of around 72% and 94% respectively. Besides that, these rural households still highly depend on traditional biomass (firewood) for cooking (OECD, 2019) that leads to deforestation and indoor air pollution. At the same time, these areas are occupied with around 23.5 M ha of agricultural land that produces 345,700 tons livestock manure daily, while Bali alone has 81,744 ha of agricultural land and 13,148 tons/day of livestock manure (BPS, 2020). With that, an alternative energy that can utilize the resources of rural Indonesia is desirable to support rural livelihoods while reducing the country's excessive reliance on fossil fuels. Based on the massive potential of livestock manure, biogas becomes the most realistic all-inclusive solution that can supply clean energy and help the Indonesia achieve their Nationally Determined Contributions (NDCs).

To mitigate the emission and climate impact in land-use and electricity sector, the potential and options of decarbonisation, clean cooking, and coal removal can be explored through specific case studies in Indonesia. Indonesia case studies in LANDMARC and TIPPING+ project will focus on the scientific assessment of decarbonisation processes through biogas and compost, and policy engagement to enable clean-energy transition in coal- and carbon-intensive regions like Indonesia. This project is led by su-re.co, an environmental think-tank based in Bali, Indonesia. To address the problem of land-use based mitigation impact and enabling clean-energy transition in Indonesia, su-re.co will promote biogas and composts in Bali and policy engagement in coal removal in electricity system in Banten. Biogas is considered as a



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realistic option for Indonesia case to address the issues of lacking clean energy for cooking in addition to providing organic fertiliser or bio-slurry for agricultural activity as the main sector in this country. LANDMARC project also aims to provide modelling and simulation of earth observation, climate risk assessment, and economic impacts of land-use based mitigation technology (LMT) at the case study level, while for TIPPING+, the project aims to conduct stakeholder engagement and policy dialogues.

## Approach, Delivery, and Challenges

As aforementioned, the case studies are addressing LMT and clean energy transition challenges with focus analysis on biogas and coal removal in Indonesia. There are some concurrent problems for biogas distribution in Indonesia. First, initiating biogas programs is still dependent on community interest and regional government initiative. Second, the national biogas distribution target from the national authorities (The Ministry of Energy and Mineral Resources and The National Development Planning Agency) is unclear. Lastly, giving training sessions about biogas production and maintenance to local communities is insufficient.

LANDMARC project in Indonesia case study will enhance understanding in the area by providing improved estimates on the realistic potential of land-based negative emission solutions in agriculture. This is done by using biogas and compost for farming and cooking at households level. Some simulations, modelling, and stakeholders mapping and engagement will be done to assess the impact of land-use based mitigation technologies. The project activities will be tailored in order to:

- Estimate the climate impact of land-based negative emission solutions, for example in agriculture, forestry, and other land-use sectors
- Assess the potential for regional and global upscaling of negative emission solutions
- Map their potential environmental, economic, and social co-benefits and trade-offs

Simultaneously, the TIPPING+ project in Indonesia case study will explore Social-Ecological Tipping Points (SETPs) in Bali and Banten. “Tipping point” refers to a moment in time which triggers a cascade of changes in techno-socio-economic systems towards low-carbon development. A positive tipping point happens when the reference system is transformed irreversibly in a way that matches or even exceeds a vision. A vision of clean energy transition, in this case, is assumed as the result of policymaking process as the main driver, and cumulative effects of multiple interlinked actions of transformative solutions. Achieving the vision can occur swiftly if the key agents are equipped with the required transformative capacities to implement pathways of solution towards, in this case, decarbonisation (as the result of transformation), as described in Figure 2. Overall, TIPPING+ will be working to:

- Co-produce of knowledge concerning the driving forces and deliberate interventions (both positive and negative) leading to clean-energy transition
- Enact positive tipping interventions for the clean-energy transition to support climate policy
- Assess and provide practical recommendations to support the most effective tipping interventions to be implemented by regional actors



## Benefits, Lessons Learned, and Outcomes

In LANDMARC project, addressing reliance on land-based mitigation in 1.5C pathways will contribute to some SDGs (Sustainable Development Goals), such as SDG 2 (zero hunger), SDG 6 (clean water and sanitation), SDG 7 (renewable energy), SDG 8 (economic growth), SDG 12 (responsible consumption and production), and SDG 15 (life on land). For Indonesia case studies (biogas and compost), su-re.co and other LANDMARC modelling partners will deploy:

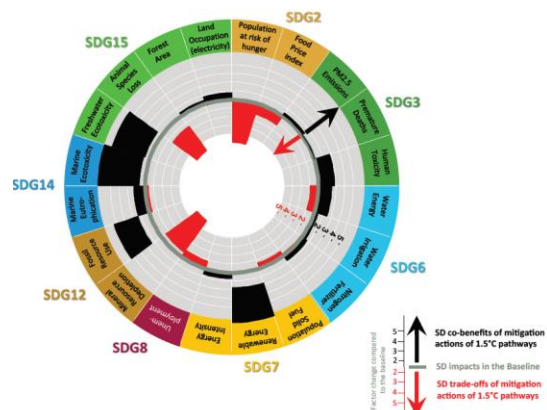


Figure 1 SDGs in LANDMARC project (in red)

- A mix of earth observation technologies, to be able to (better) monitor and estimate the effectiveness of land-based negative emission solutions
- A suite of climate, land-use, and economic simulation models, to better estimate the true (scaling) potential of land-based negative emission solutions, both from earth systems and human systems perspective
- A social sciences-based approach for effective impact assessment and engagement with local and regional stakeholders that are already working on implementing negative emission solutions.

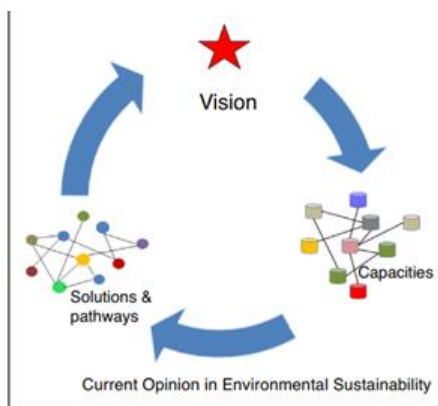


Figure 2. Principle of Positive Tipping Points

On the other side, the activities of TIPPING+ project for Indonesia case study (coal removal and biogas), include:

- Socio-structural regional systems' characterisation to identify social drivers and triggers that lead to deliberate positive transformations
- Integration framework to understand positive tipping interventions towards clean energy transitions in a complex system like CCIRs, including Indonesia
- Actionable knowledge to support clean energy transitions so that the positive tipping interventions can be realised, and negative ones can be avoided in Europe and beyond, including Indonesia

Both projects are actively seeking collaboration with fellow research projects operating in our case study. Collaborations can include:

- Exchanging / sharing earth observations data and information (e.g. satellite, remote sensing, in-situ) and social, ecological, economic, cultural conditions to visualise clean-energy transitions.
- Climate change and land-use scenario development and modelling
- Assessing climate resilience and climate sensitivity of negative emission solutions and co-benefits and trade-offs of land-based mitigation solutions (environmental, societal, economic)
- Assessing the positive and negative tipping interventions to support clean-energy transition and practical recommendations to support the most effective tipping interventions in CCIRs (policy, environmental, societal, economic)



- Engaging with local and regional societal actors such as NGOs, coal industries, local and national governments (i.e. co-hosting events), research institutions and local communities

We encourage researchers to contact us to introduce themselves, their activity/project and express their area(s) of interest for possible collaboration with the LANDMARC & TIPPING+ team.

## Contact Information

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## Project Information

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 869367 and No 884565.

Project duration for LANDMARC: 2020-2024 (48 months)

Project duration for TIPPING+: 2020-2023 (36 months)



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