



Challenges and Opportunities toward Net-Zero Emissions for Indonesia

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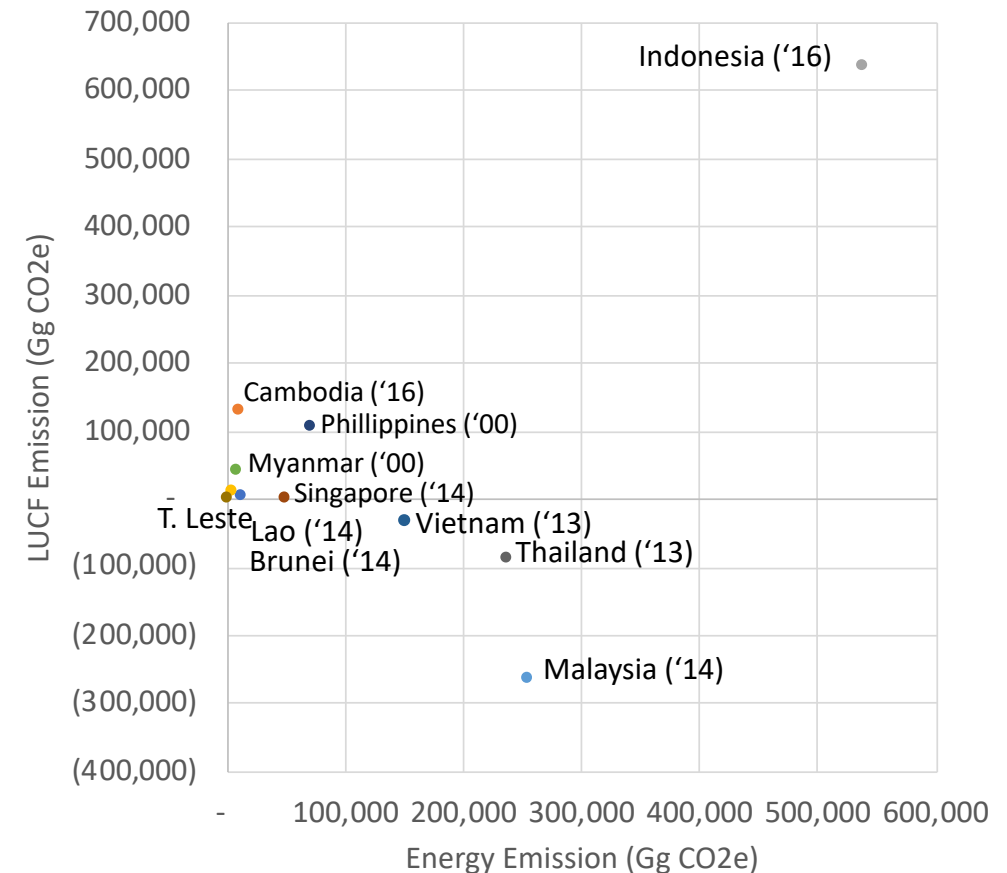
Centre for Climate Risk and Opportunity Management in Southeast Asia and Pacific, IPB University

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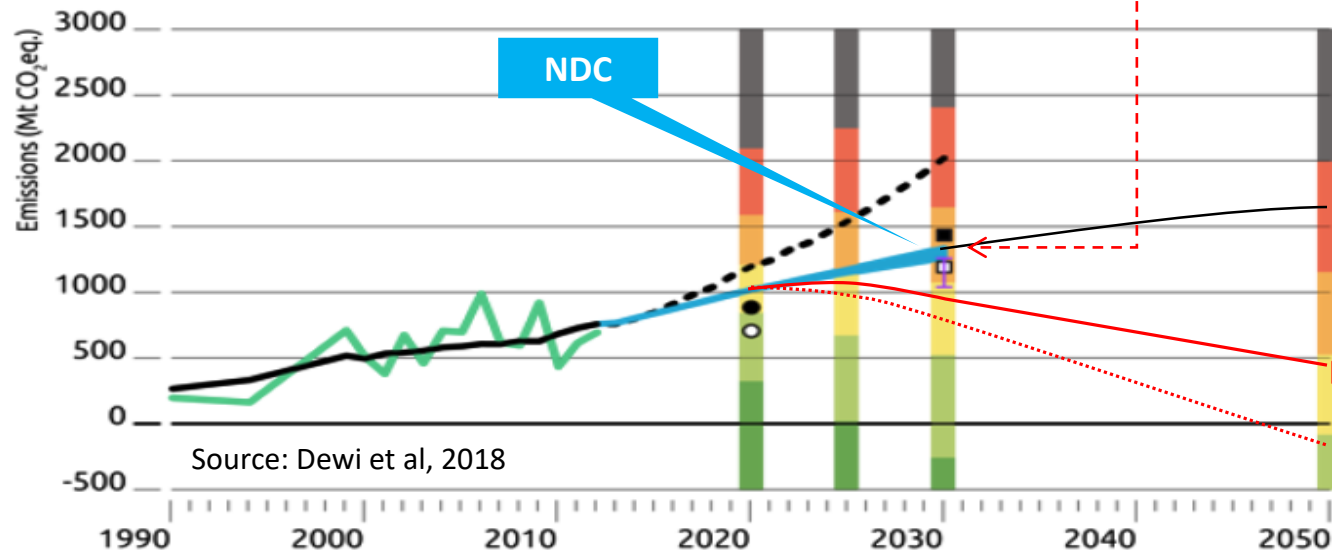
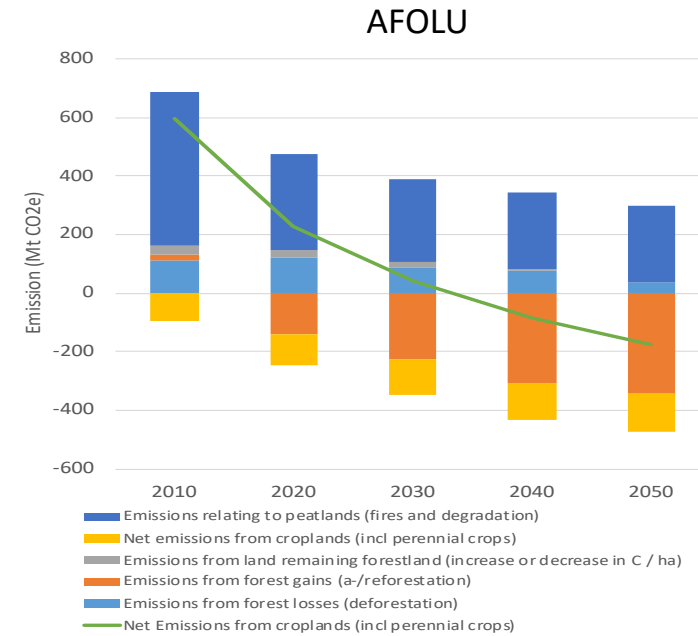
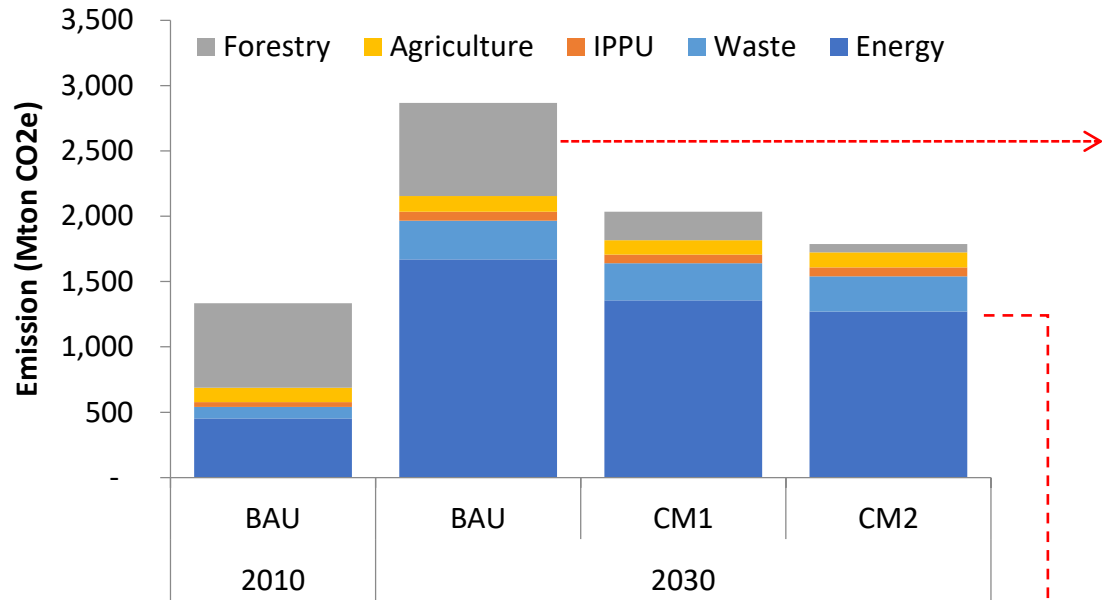
Significance and necessity of exploring the transformation toward net-zero emissions

- ASEAN countries accounts for 3.5% of global greenhouse-gas emissions – expected to increase substantially due to population growth and increasing urbanisation and industrialisation
- Among ASEAN, Indonesia has the largest contribution to the total emission in which LUCF as main source of the emission followed by energy sectors

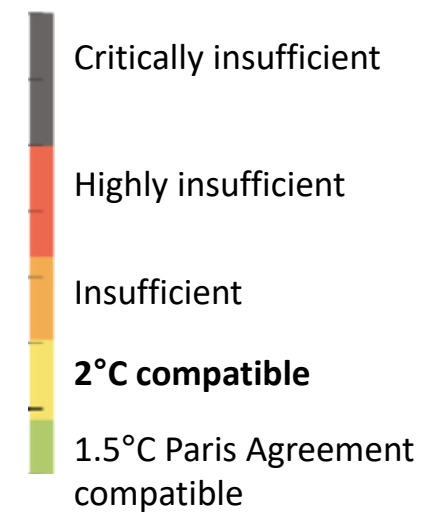


Source: NCs and BURs of AMS (<http://unfccc.int>)

NDC INDONESIA



- Historical emissions, excl. forestry
- Historical emissions/removals from forestry
- Current policy projections
- ○ 2020 pledge unconditional/conditional
- □ NDC unconditional/conditional
- - - Reference for pledges (BAU)
- I National Energy Policy targets and biofuel targets

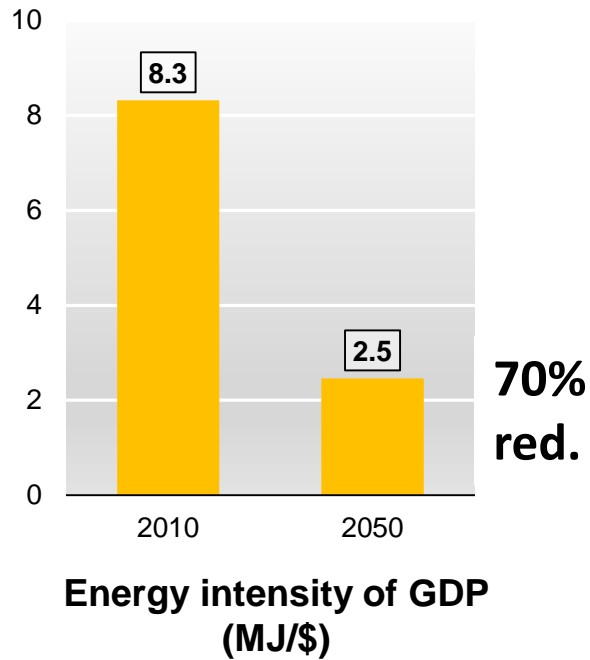


Energy Scenarios toward Paris Target 2050

(Source: Siagian et al., 2016)

1. “Renewable” scenario puts the emphasis on the large-scale deployment of renewable-based power generation complemented by nuclear energy.
2. “Renewable + CCS (Carbon Capture and Storage) Scenario” considers a more balanced technological deployment in power generation, in which renewables would still play an important role but be complemented by the diffusion of CCS and nuclear power.
3. “Economic Structural Change Scenario” considers the role of structural changes in the Indonesian economy, with the implementation of a more service-oriented economy, combined with more energy efficiency measures, and more fuel switching to low- or non-carbon energy by end-users.
4. Deep decarbonizing the AFOLU to become net sink by 2050

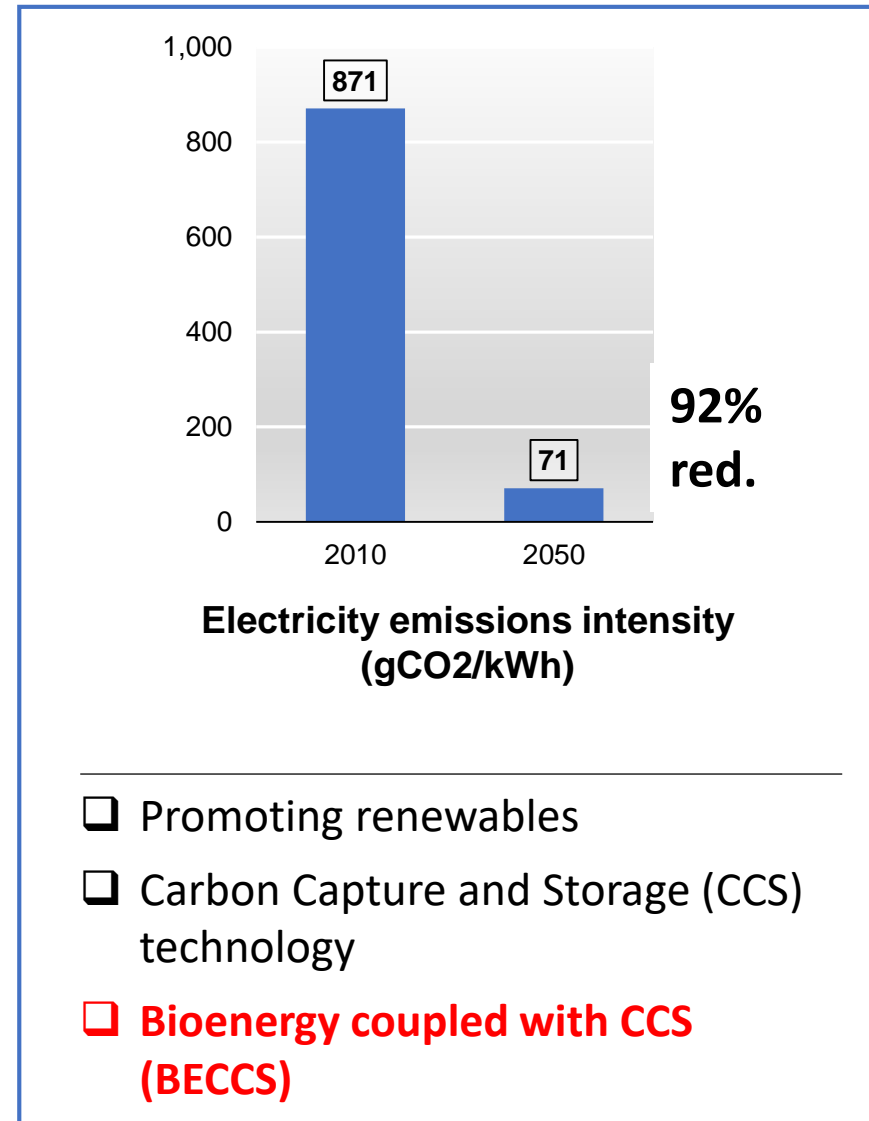
I. Energy efficiency and conservation



- Promoting the use of energy efficient technology and energy conserve lifestyle.

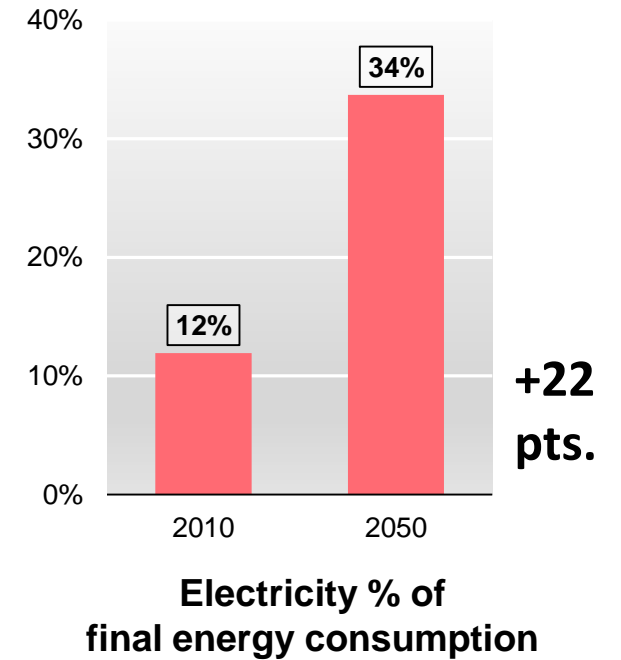
Sumber: Dewi et al., 2018

II. De-carbonization of energy carriers

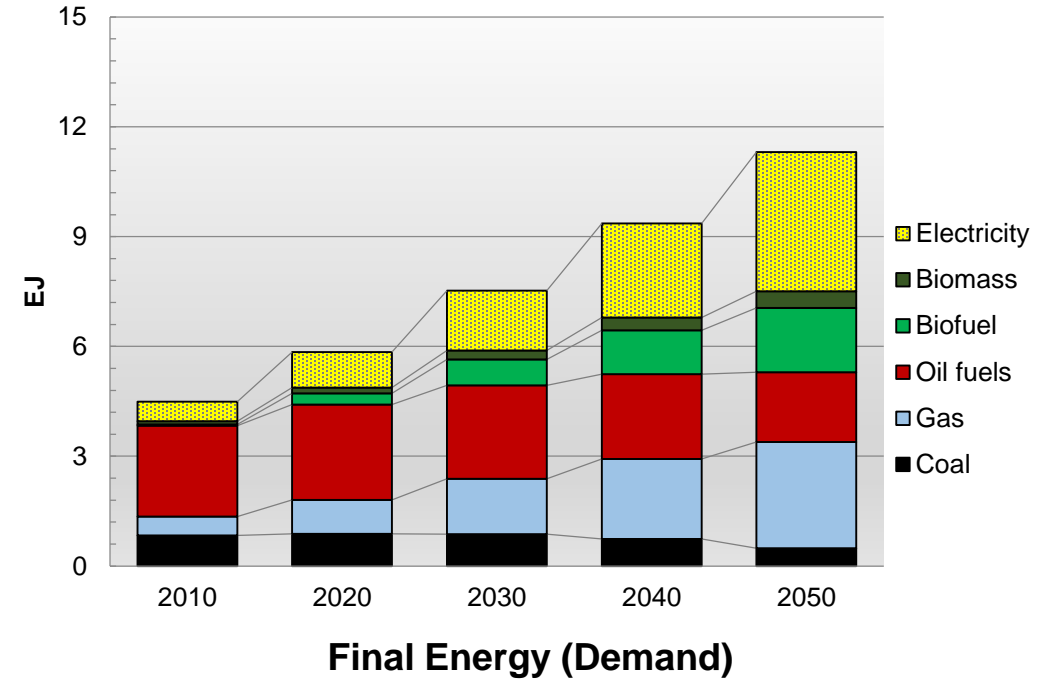
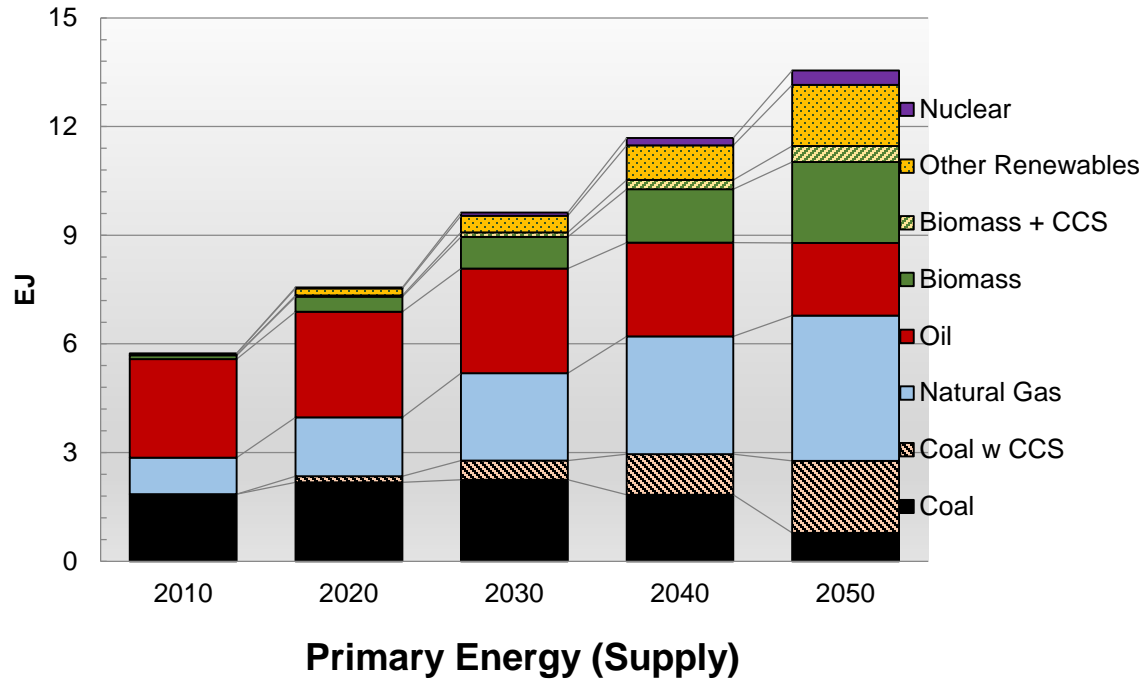


- Promoting renewables
- Carbon Capture and Storage (CCS) technology
- Bioenergy coupled with CCS (BECCS)**

III. Switch to low-/zero- emitting energies



- Substituting combustion with electricity system
- Switch to natural gas
- Biofuels in transport



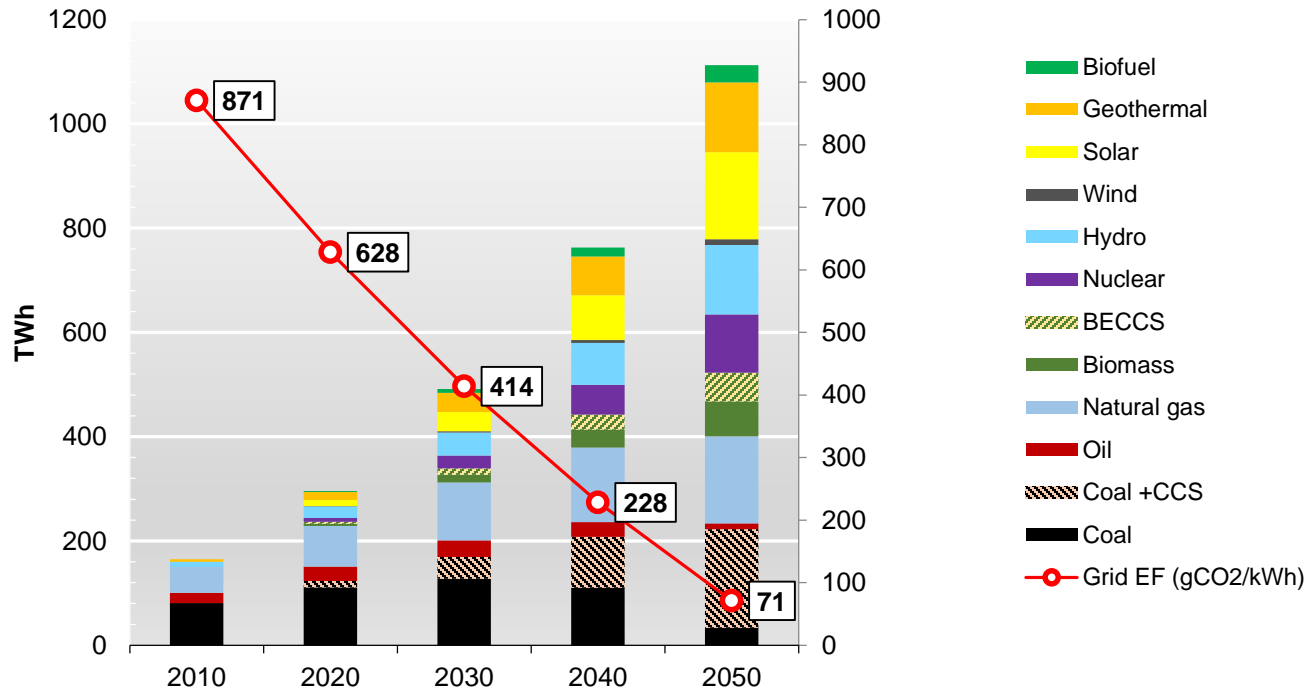
- Reduce oil & coal share
- Equip most of the remaining coal plants with CCS
- Increase Natural Gas share
- Significant increase in Renewables
- Nuclear power
- BECCS

- Energy efficiency improvement and conservation measures
- Low- and zero- carbon energy carriers in intensive energy sectors (electrification of industries and biofuels in transportation)

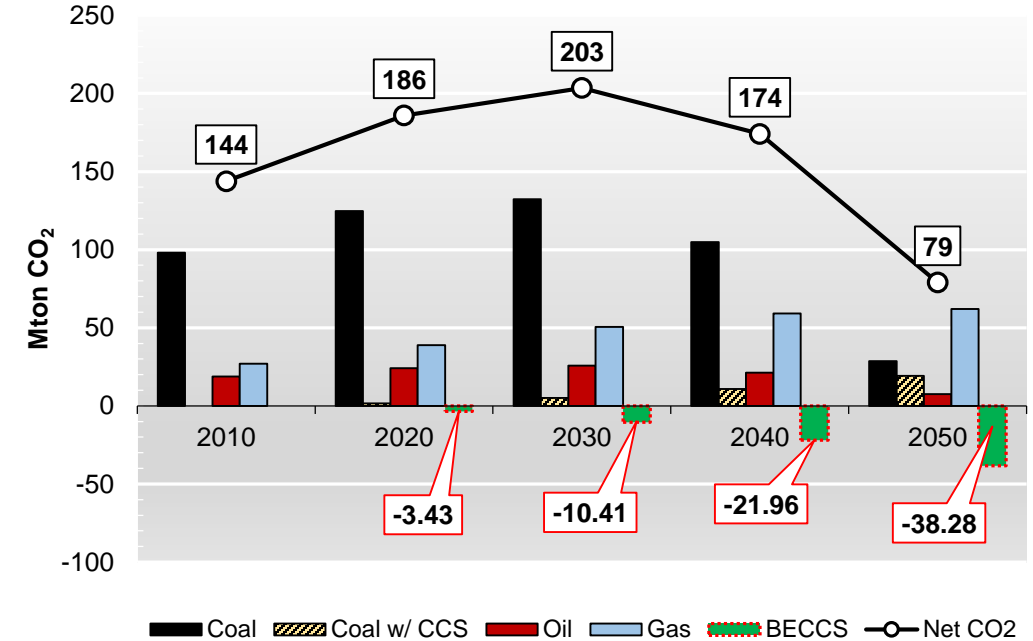
Sumber: Dewi et al., 2018

BECCS have large potential for emissions reduction while maintaining a safe landing for conventional fossil fuels (coal).

Electricity generation and Grid EF



Power sector emission

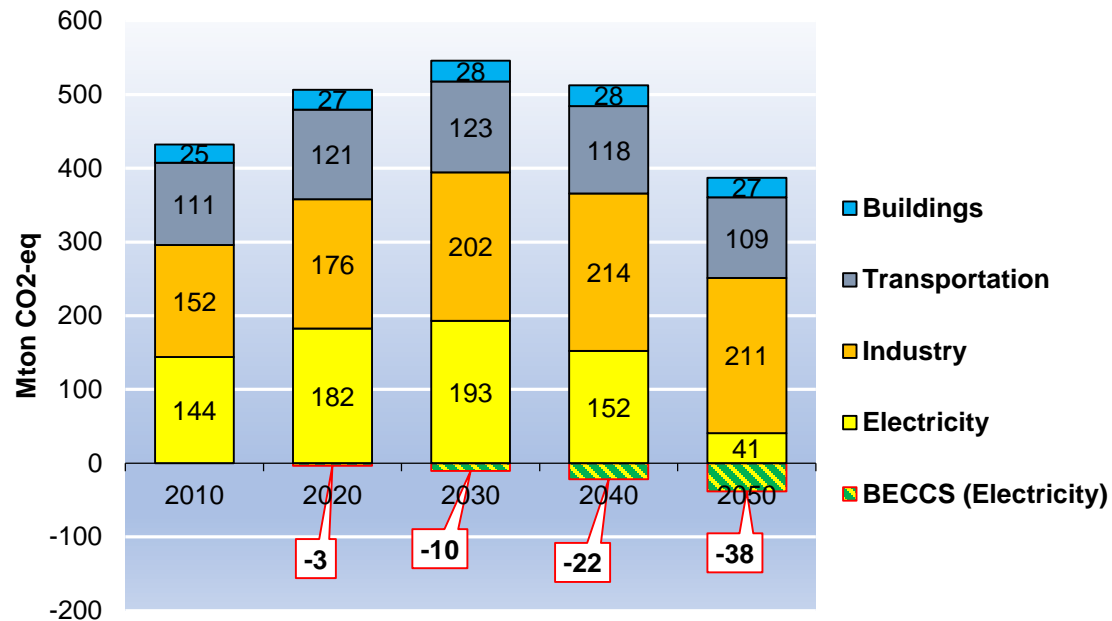


By 2050, electricity emissions factor reduced to 71 gCO₂/kWh (2010: 871 gCO₂/kWh) is achievable by adding new (nuclear) and renewable (mostly Solar, Hydro, Geothermal, and Biomass) energies, and deployment of CCS and BECCS.

Source: Dewi et al., 2018

Indonesia sees that BECCS is very promising to deliver large quantities of negative emissions needed to comply with ambitious climate stabilization targets.

CO2 Emissions Development Scenario



By 2050, 1.14 ton CO₂/cap is compatible with world 2DS (2.2 ton CO₂/cap*) under BECCS scenario

*world average DDPP

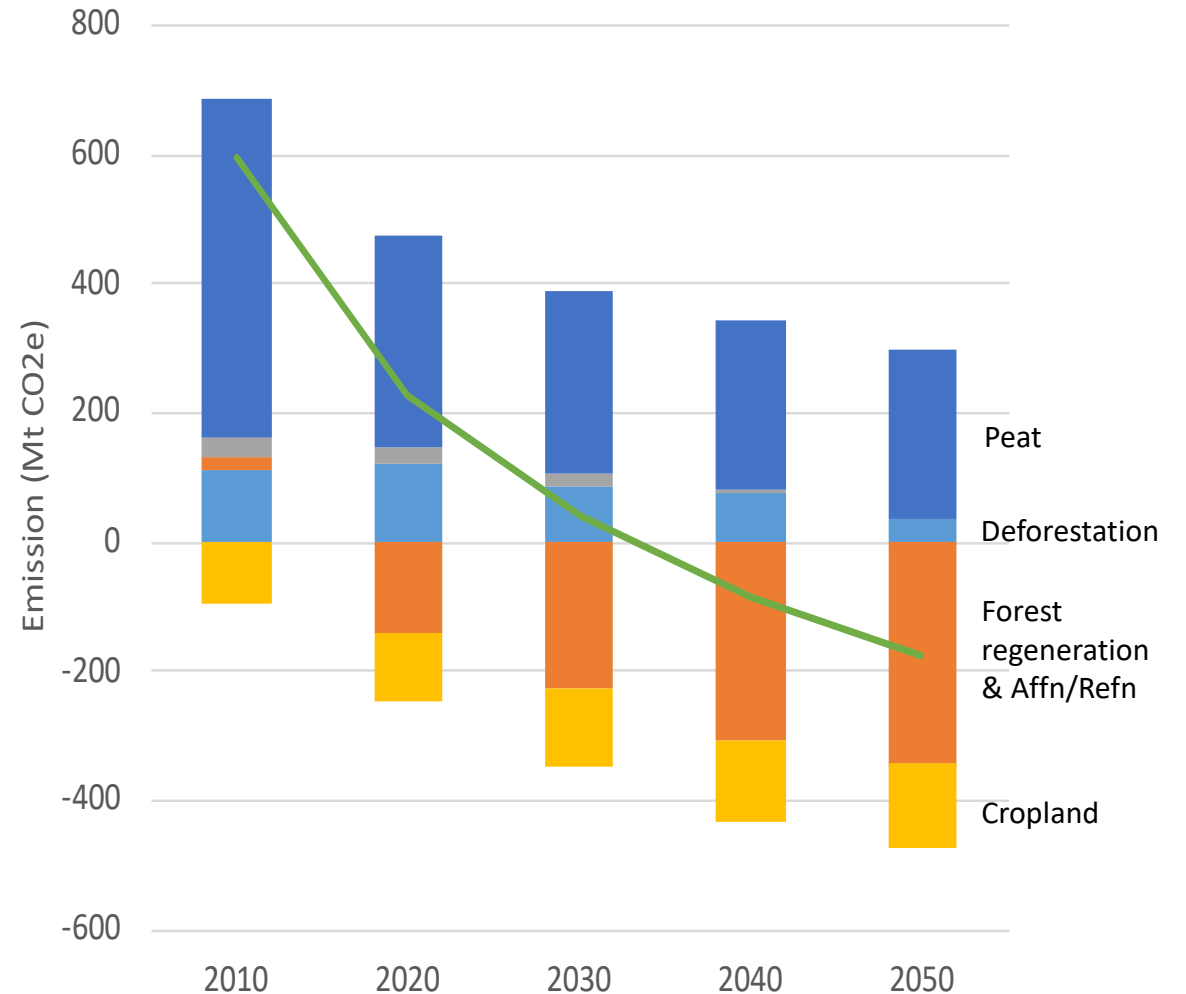
Source: Dewi et al., 2018

BECCS challenges:

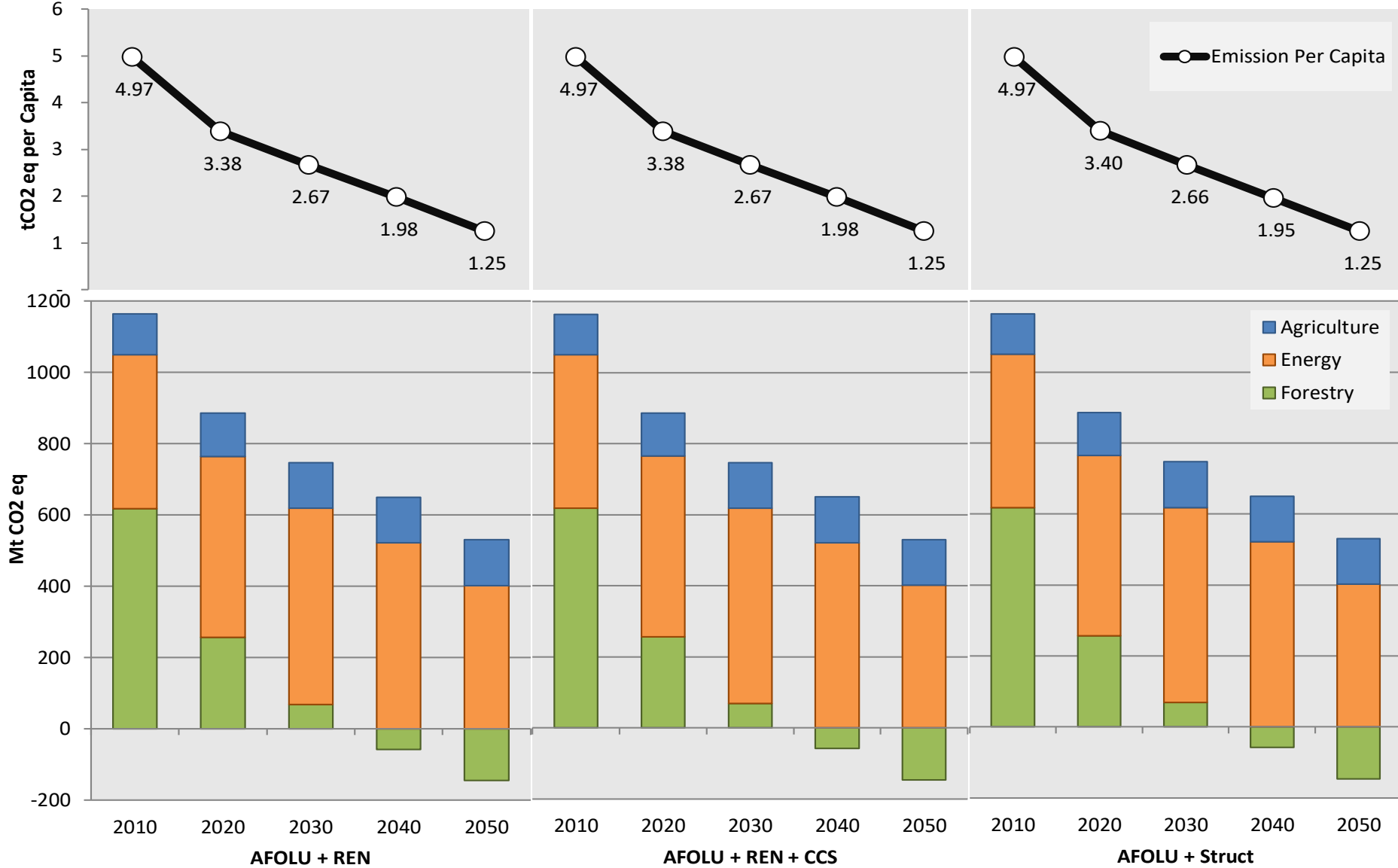
- Biomass availability** for a steady supply of feedstock (competition with other land-use)
- Sustainable source** of biomass for negative emissions
- Process and technologies** (feedstock collection & transport, energy conversion, CCS)
- Losses of Soil Organic Carbon**
- Implication to land-use sector** (food security, land-based climate change mitigation, etc.)
- Financial sustainability & market readiness**
- Social-institutional**

AFOLU SCENARIO TOWARD PARIS TARGET 2050

- Significant decreased in deforestation (zero unplanned deforestation)
- Enriching forest regeneration
- Restoring degraded peat land and introduced paludiculture (mix farming system which adapted to peatland ecosystem → lead to significant decreased in peat fire)
- Boosting the reforestation through Social forestry supporting food security and energy security
- Boosting the productivity of agricultural crops



Deep Decarbonization Strategies



CHALLENGES

Challenges in Energy Sector Transformation

- Limited renewables deployment due to **competition with low-cost fossil fuel** and **distribution infrastructure limitation**.
- Consideration in maintaining coal-related industries; national stakeholders are not interested in **leaving strategic assets stranded**.
- **Bioenergy production target (CPO-Biofuel)** induced risks of deforestation through land competition with food crops.

Challenges in Land-Based Mitigation

- **Optimizing the use of unproductive land**, particularly in addressing land tenure issues.
- Reducing agriculture workers due to urbanization – boosting productivity
- Producing HYV and tolerance to high environmental stress
- Modernization of farming activities (**precision agriculture**)
- Incentive system for **accelerating the development of timber plantation** and conserving production forest/**peat restoration**

OPPORTUNITIES FOR TRANSFORMATION TOWARD NET-ZERO EMISSIONS

- Ecological Fiscal-Transfer Policies
- Establishment of Public Services Agency for Environmental Fund
- Mandatory certification policies for concessions
- Implementation of moratorium policies
- Carbon Pricing Policy
- Multi Permits for concessions
- Allowing agriculture commodities to be managed in forest area
- Social forestry and agrarian reform