Measuring the Potential Impact of Mitigation Policies in Indonesia: The Early Finding

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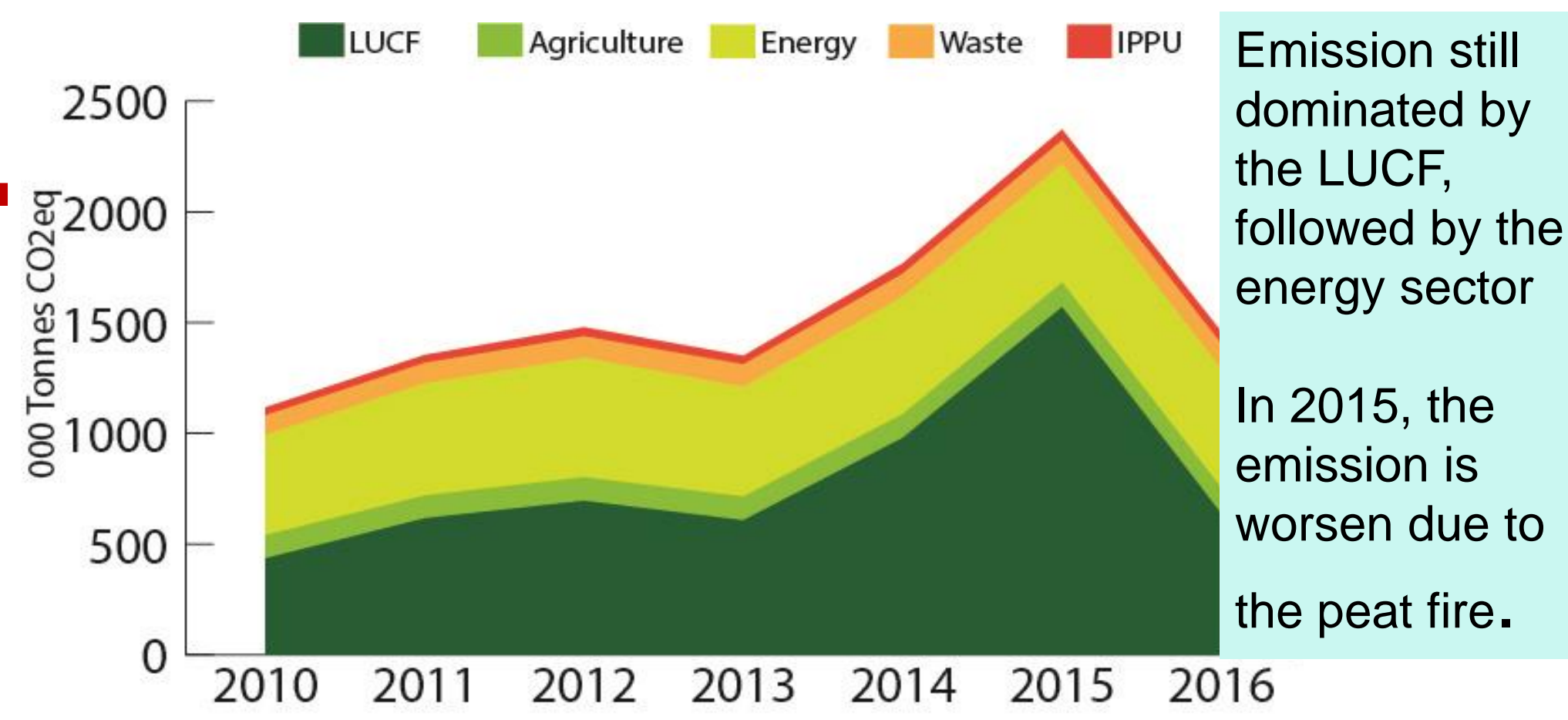
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AIM ASIA-PACIFIC INTEGRATED MODEL

National Institute for Environmental Studies

Introduction

Ambitious Emission Reduction

High Economic Target
"*Nawacita*" → strategy to boost the economic growth;
Reach food and energy sovereignty;

In RPJMN (Medium Term Development Plan) 2020-2024 → Indonesia reach high-middle income country in by 2025

Note:
LUCF: Land Use Change and Forestry
IPPU: Industrial Process and Product Use

Emission still dominated by the LUCF, followed by the energy sector

In 2015, the emission is worsen due to the peat fire.

The emission reduction may lower the GDP expectation.

Indonesia doesn't have any information related to the economic impact.

Indicators	RAN-GRK	Indonesia NDC
Target Year	2020	2030
Emission Reduction Target	Voluntary: 26% Involuntary: 41%	Voluntary: 29% Involuntary: 41%
BaU emission projection	2020: 1791 MtCO2eq 2030: 2881 MtCO2eq	2020: 1980 Mton CO2eq 2030: 2869 Mton CO2eq

There is no impact specific impact calculation→ the government keep change the target, and tend to be increasing.

This study tried to measure the potential impact of the present mitigation policy for Indonesia.

Data and Method

Main Data

The main data used in this study is the Indonesia Input-Output Table 2010 (the newest version of IO Table in Indonesia), that disaggregated from 185 sectors. Moreover, the "electricity" sector is disaggregated into 5 sectors based on its energy source: coal pp, oil pp, gas pp, renewable pp, biomass-waste pp.

Code	Sector	Code	Sector	Code	Sector	Code	Sector
1	Paddy	14	Natural gas mining	27	other industry	35	amusement and telecommunication
2	Corn	15	Other mining	28	Electricity	36	Financial Services
3	Cassava	16	Food, beverage and tobacco	28a	Electricity- coal pp.	37a	Public services-Gove
4	other agriculture	17	Textile, foot and leather	28b	Electricity- oil pp	37b	Public services-private
5	Rubber	18	Processed wood products	28c	Electricity- gas pp	38	Other Services
6	Palm oil	19	Pulp and Paper	28d	Electricity-renewable pp		
7	Other Plantation	20	Petroleum refineries	28e	Electricity- biomass pp		
8	Livestock	21	Chemical industry	29	Gas		
9	wood	22	fertilizer and pesticide	30	Water supply		
10	other forest	23	non-mental ind	31	Waste and recycling services		
11	Marine and fishery	24	Cement	32	building and construction		
12	Coal mining	25	Iron and steel	33	Transportation		
13	Crude oil mining	26	metal based industry	34	Trade, hotel, restaurant		

$$ELE_i = \sum ELE_i \cdot \frac{q_{ele_i}}{\sum q_{ele_i}}$$

$\frac{q_{ele_i}}{\sum q_{ele_i}}$: Proportion of electricity production (GWH)
$\sum ELE_i$: Electricity output in sector i

The disaggregation is based on the ration of electricity production gained from the official statistic
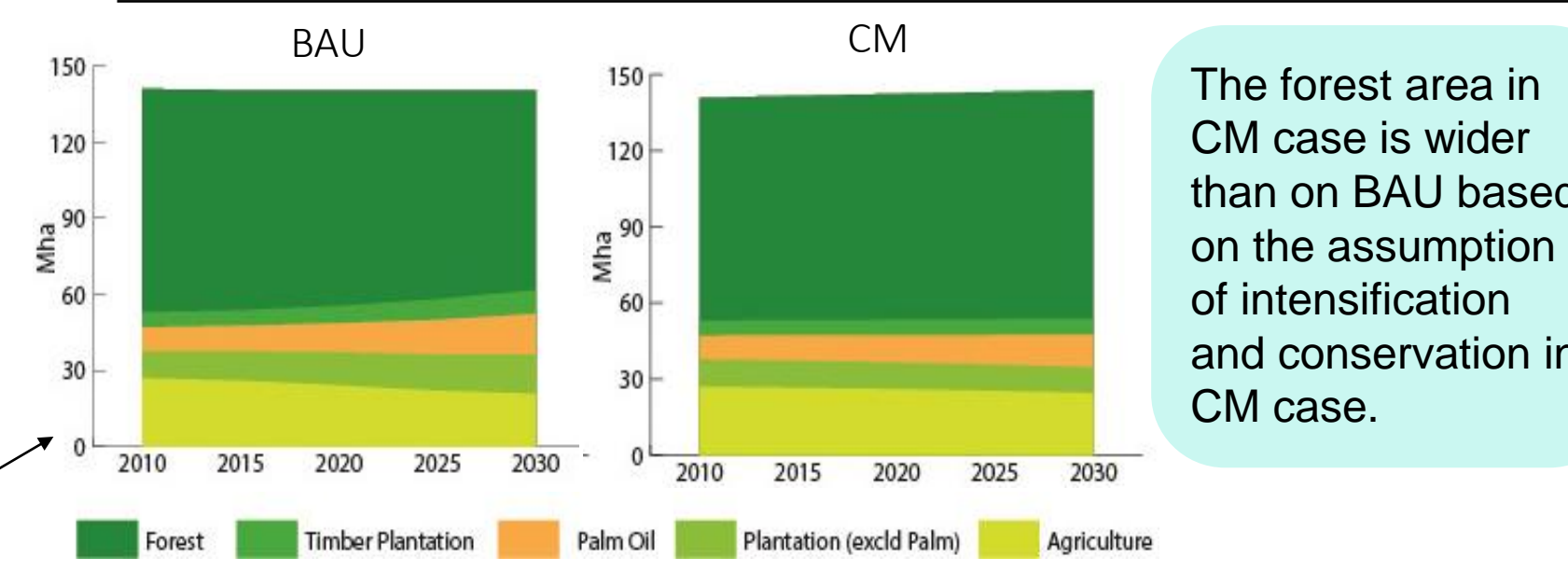
Parameter Setting

The **GDP projection**→ 2010-2017 are from the actual data. 2018-2030 are projection that decided from government estimated; 5.1 % until 2020, 5.2% until 2030

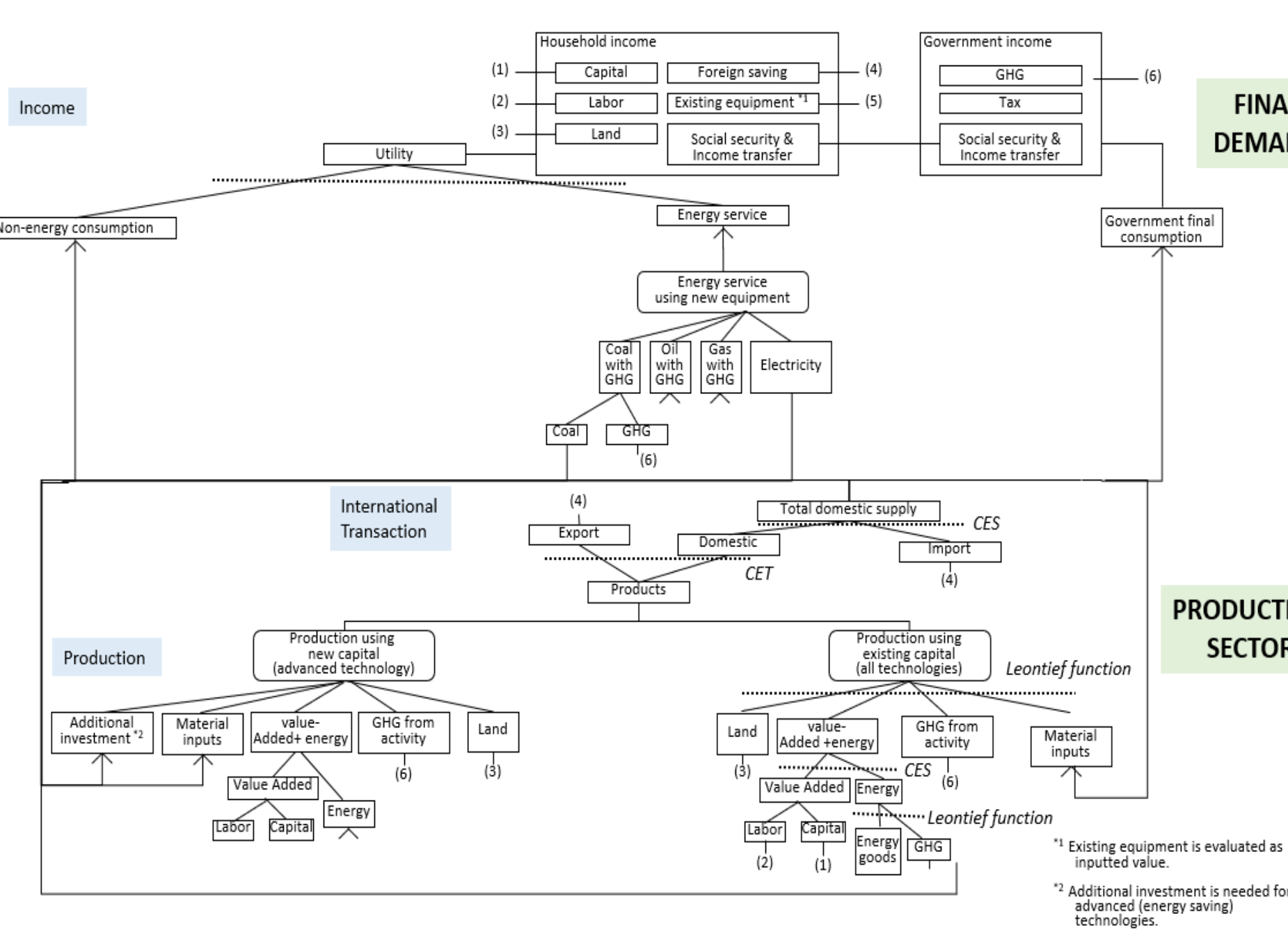**International Price** are assumed the same between BAU and mitigation scenario

Population projection → Indonesia has official population projection: Population projection 2010-2035 and 2015-2045 → Both dataset are then extrapolated

Land area is treated exogenously → (Malahayati and Masui, 2019)

Year	Population (Million People)	Growth/year	Notes
2010	238.5	1.3%-1.4%	Using BPS (2013) but the ratio is extrapolated from BPS (2018)
2015	255.6	1.1%	
2020	269.6	1%	
2025	282.5	0.9%	
2030	294.1	0.8%	

The forest area in CM case is wider than on BAU based on the assumption of intensification and conservation in CM case.
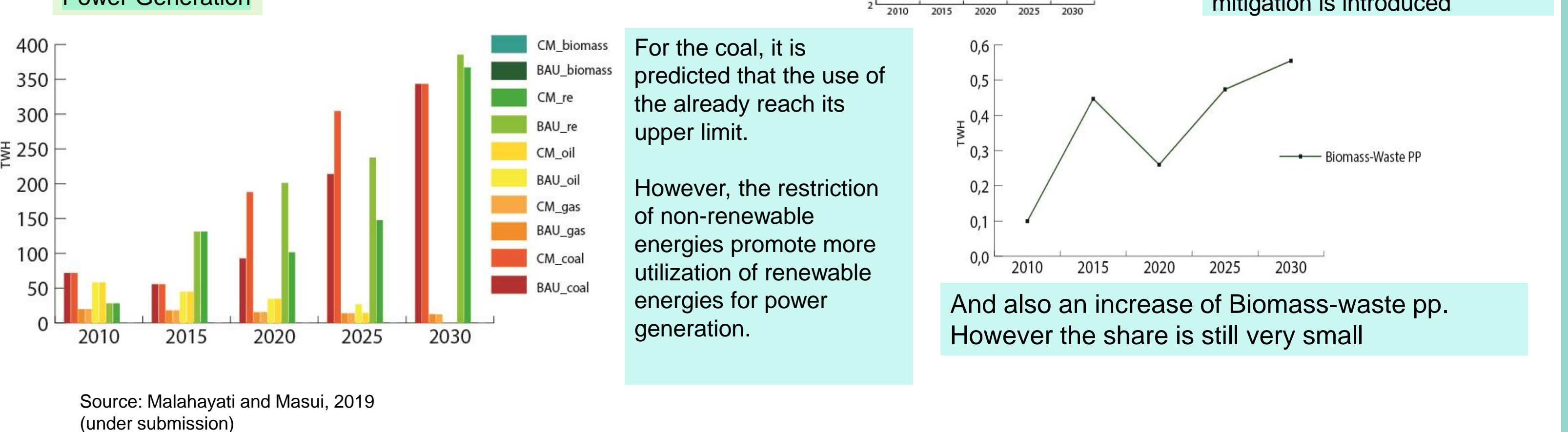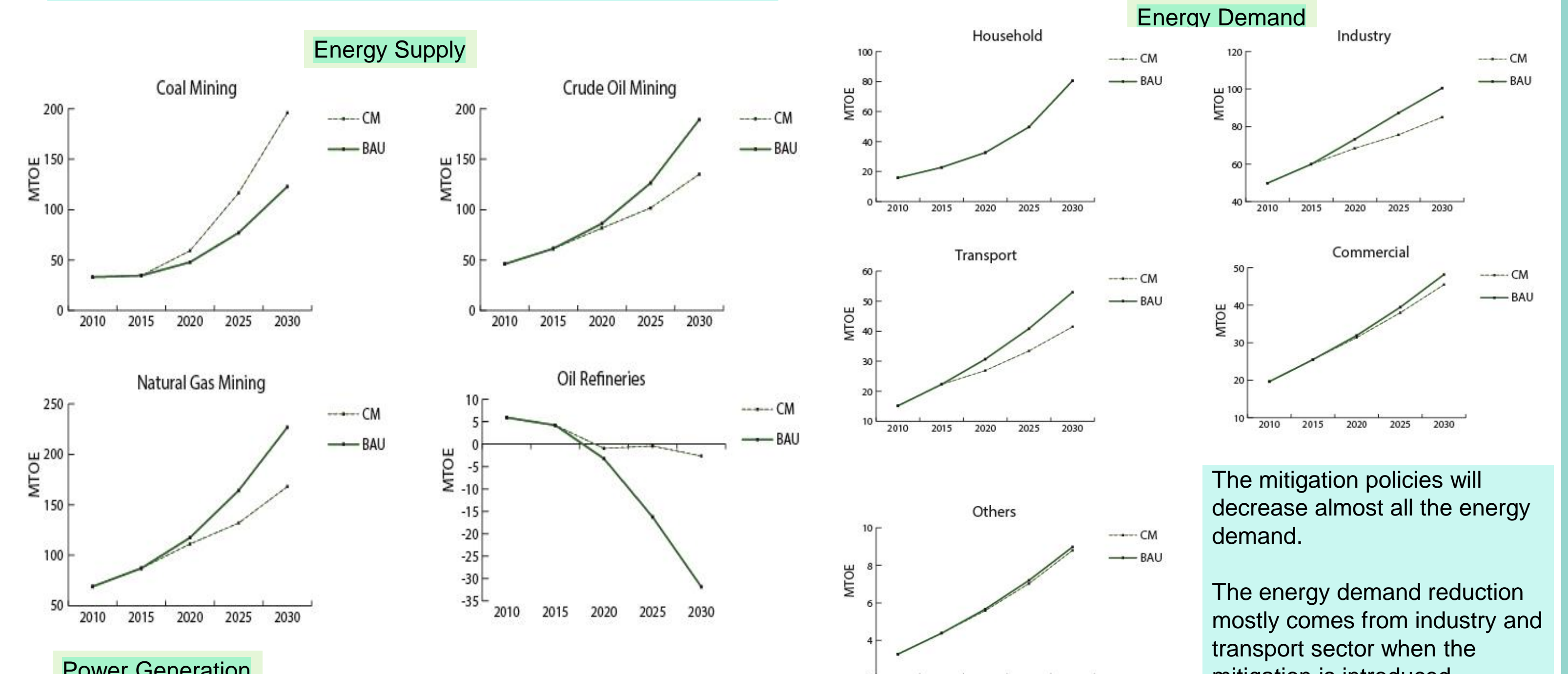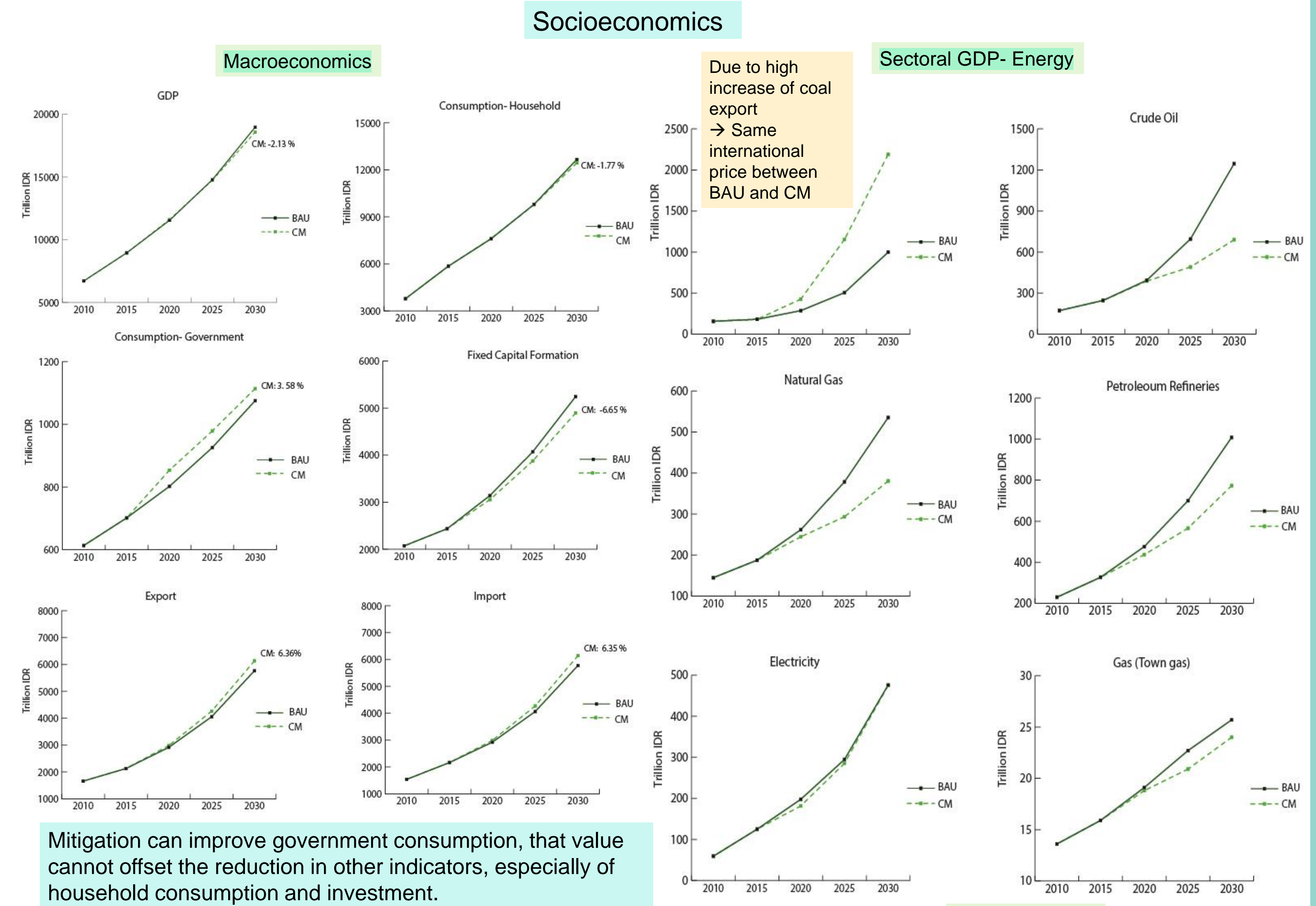
Method and Scenario

The method use in this study is Computable General Equilibrium (CGE) for the country level.

There are two scenarios in the simulation:
BAU : Business as Usual
CM : Counter Measure (involve all mitigation list from energy and activities).

- The mitigation technology here can come in two main forms: reduce the GHG emission and/or reduce the energy use.

- To achieve such reduction, some additional cost that comes from the increase of capital from the related sector will be needed.

Results

Socioeconomics

Macroeconomics

Due to high increase of coal export → Same international price between BAU and CM

Sectoral GDP- Energy

Mitigation can improve government consumption, that value cannot offset the reduction in other indicators, especially of household consumption and investment.

Energy Supply

Energy Demand

The mitigation policies will decrease almost all the energy demand.

The energy demand reduction mostly comes from industry and transport sector when the mitigation is introduced

Power Generation

Source: Malahayati and Masui, 2019 (under submission)

For the coal, it is predicted that the use of the already reach its upper limit.

However, the restriction of non-renewable energies promote more utilization of renewable energies for power generation.

And also an increase of Biomass-waste pp. However the share is still very small

Conclusion

- The introduction of mitigation scenarios is predicted to create around 2.1% of GDP loss compared to BAU level by 2030 caused by lower household consumption and investment.

- If the sectoral GDP from energy is looked in more detail, the GDP from coal is increasing significantly under the CM scenario. It is because the export of coal is expected to be increased significantly.

- From the energy sector, the supply of coal is projected to be significantly increased. As the mitigation policy is introduced, and the domestic energy demand of coal is reduced while the use of coal for power generation also projected to reach its upper limit, Indonesia is expected to export more coal. This also to compensate for the GDP loss caused by the mitigation policies. Again, this is also a reason why the sectoral GDP for coal is increasing significantly under the CM scenario.

- While the coal use is projected to reach its maximum capacity for power generation, the share of renewable energy for power generation is expected to increase significantly, especially because Indonesia has a big potential of hydro and geothermal resources.

- The use of biomass and waste for power generation, although it will increase, it still at a very low rate compared to other renewables especially hydro and coal.

Further Improvement and Works

1. Revise:
   a) Mitigation technologies assumption
   b) Data update (e.g. fuel shift mechanism, energy efficiency in the household, international price)
2. Improvement:
   a) Bring the LUCF) part run simultaneously with other sectors
   b) Add more detail on the mitigation technologies.
   c) The further mitigation target; Indonesia plan to make a further reduction (41% from BAU level in 2030 by foreign help).
3. Longer analysis period → long term target and SDGs
4. Comparison study to other Asia countries, especially in Southeast Asia.