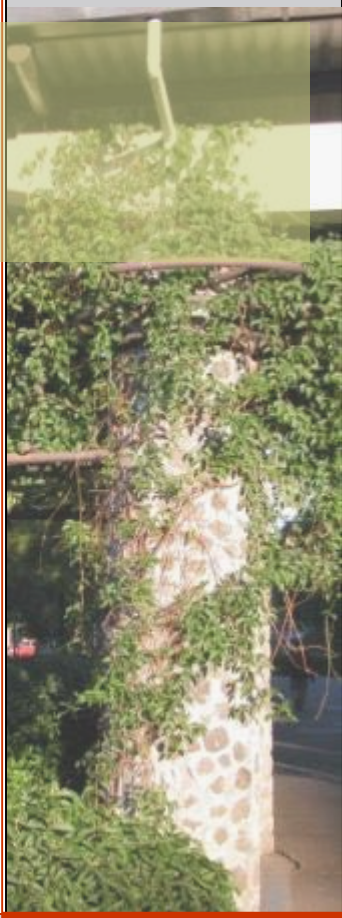
The 21st AIM International Workshop
Ohyama Memorial Hall, NIES, Tsukuba, Japan

INDONESIAN ENERGY CLIMATE CHANGE RESEARCH USING AIM: AN UPDATE

13 – 15 November 2015



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OUTLINE

- Introduction: Importance of Energy Sector in Indonesian GHG Emissions
- Brief of Indonesia Modeling Activities Using AIM
  - ExSS Low Carbon Development Path of Energy Sector Toward 2050
  - End-Use Modeling: Power, Manufacture, Transport, Residential/Commercial Sector
  - CGE Model: Indonesian LCD Toward 2050
- Science-Based Energy Climate Change Policy Recommendations
  - GHG Reduction Planning, Mitigation Actions, INDC

INTRODUCTION

IMPORTANCE OF ENERGY SECTOR IN INDONESIAN GHG EMISSIONS

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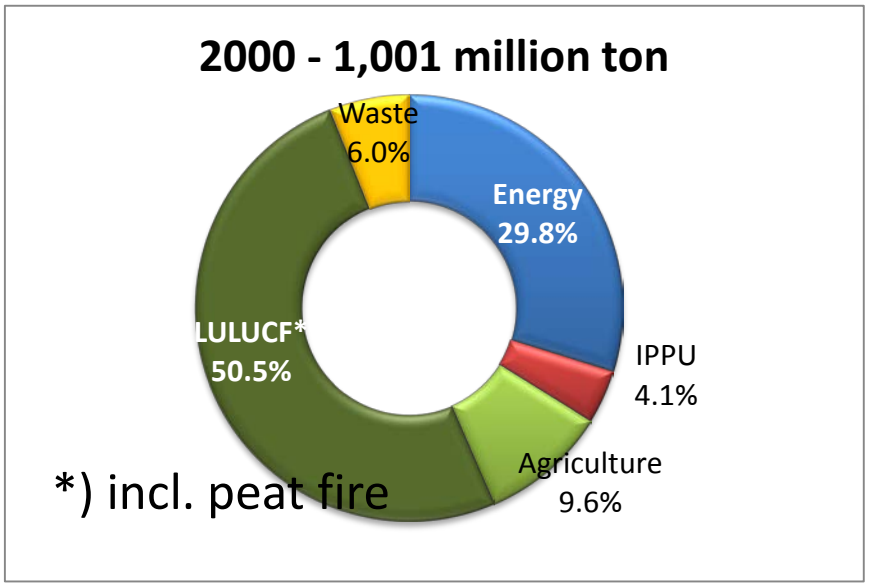
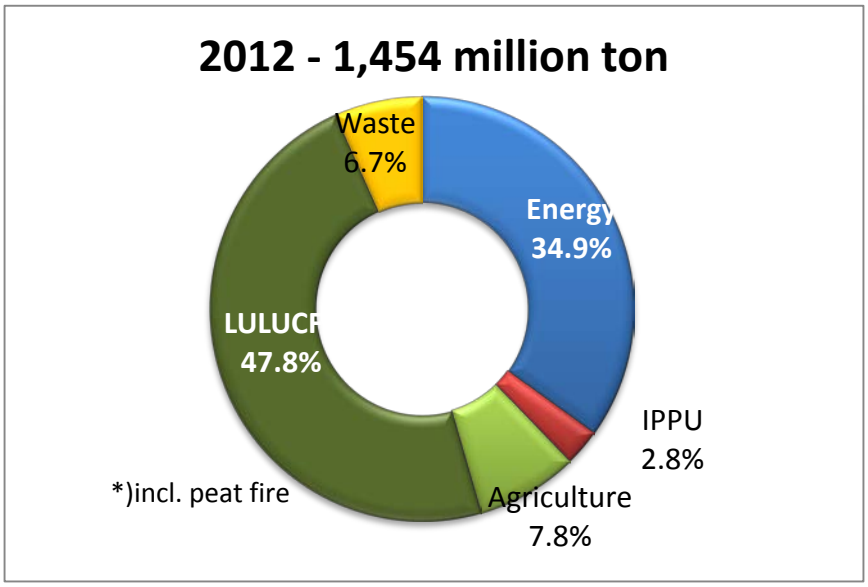
PAST TREND OF GHG EMISSION



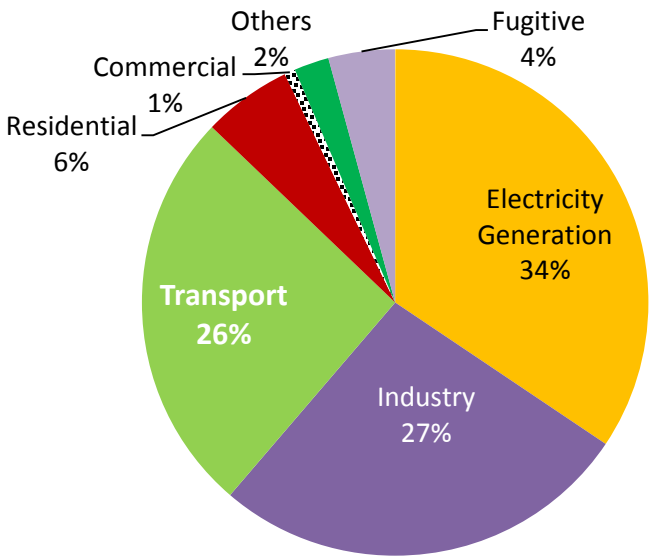


Sectors	Million ton CO2e		Percentage		Average annual growth
	2000	2012	2000	2012	
Energy	298	508	30	35	4.5%
IPPU	41	41	4	3	0.1%
Agriculture	96	113	10	8	1.3%
LULUCF *	505	695	51	48	2.7%
Waste	61	97	6	7	4.0%
Total	1,001	1,454			3.2%

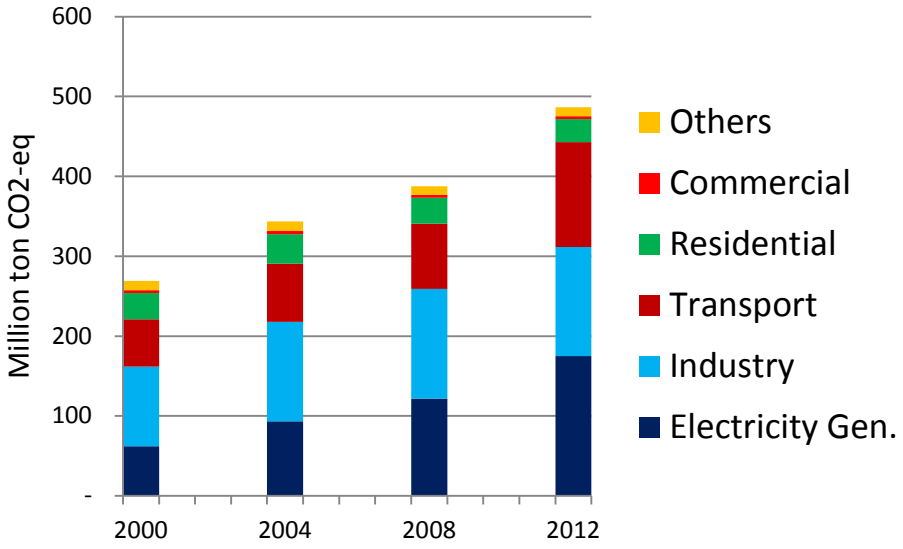
**) including peat fire*

Source: Draft Indonesia 1st BUR, 2015

Breakdown of Energy Sector Emissions



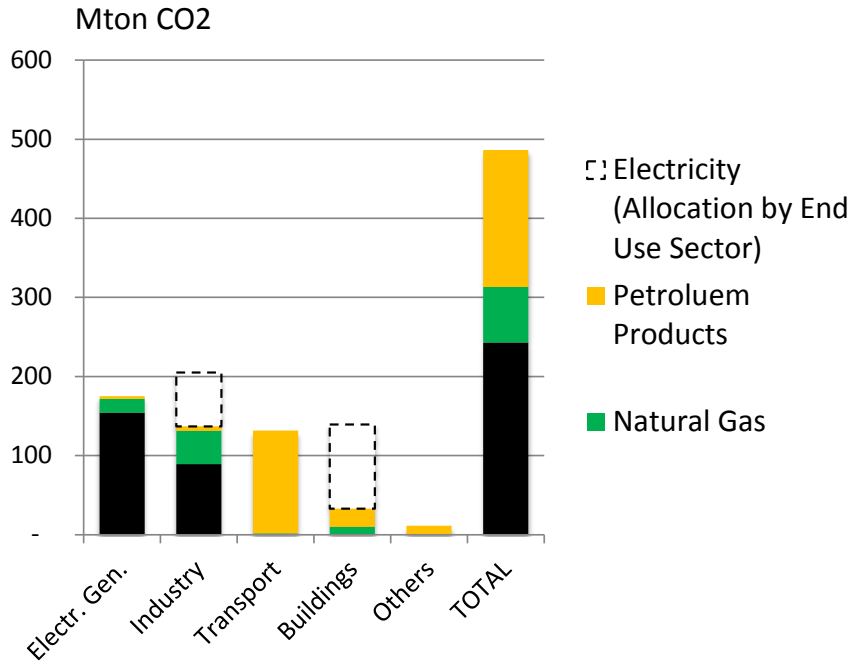
Energy 2012
508 mill ton



<u>Combustion Emissions</u>

Major sources: coal & oil used in power gen., industry, transport

End-use sector: 45% from fuel burning in industry;
Emissions from power generation is accounted by building (60%) and industry (40%) sectors.



Brief of Indonesia Modeling Activities Using AIM

ExSS , End-Use Modeling, CGE Model

Indonesia Energy Research Team in the AIM activities

Indonesia energy team is involved in the development of AIM in three models:

- AIM - ExSS Snapshot
- AIM - End-Use
- AIM - CGE

AIM-ExSS Snapshot

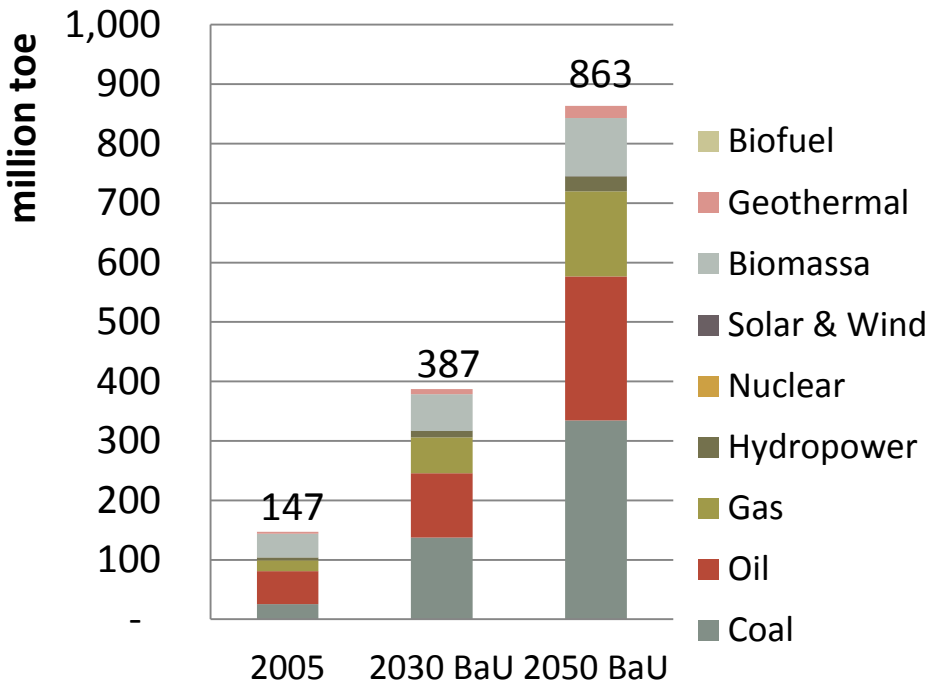
ExSS Snapshot model has been employed to develop three models:

- Low Carbon Development Path of Energy Sector Toward 2050 (publication)
- Low Carbon Development of Power Sector (to evaluate the impact of coal addition to power expansion plan by the state electric utility, submitted to National Council for Climate Change)
- Low Carbon Development in DKI Jakarta (submitted to DKI Jakarta Government and is being used in the re-evaluation of Jakarta's mitigation plan)
- Result of ExSS snapshot is used as the basis of End-Use modeling

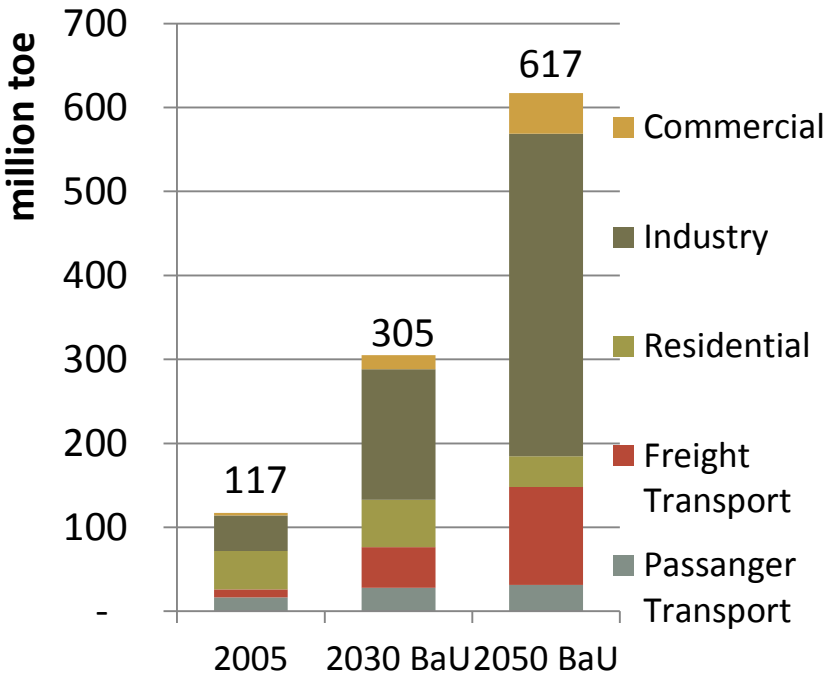
AIM - ExSS Snapshot

Indonesia energy development projection (used as input for AIM-End Use)

Primary energy supply



Final energy demand



AIM End-Use

In End-Use model, Indonesia energy team is involved in 4 sectors:

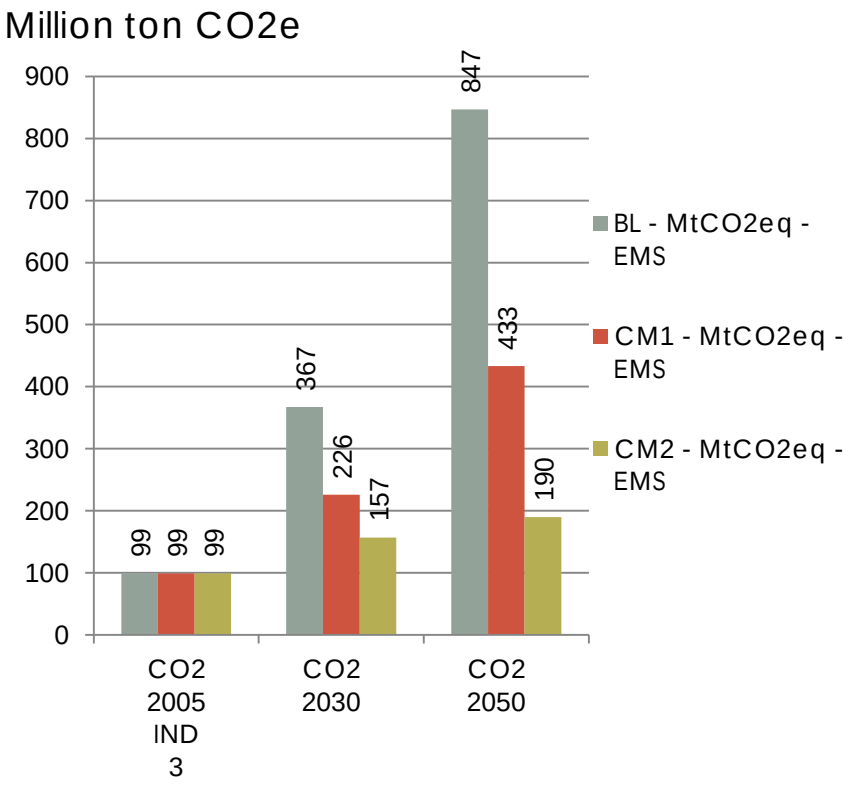
- Power
- Industry
- Transport and
- Residential and Commercial

Compared to other energy models AIM End-use model has more detailed feature of sectoral energy technology performance and costs.

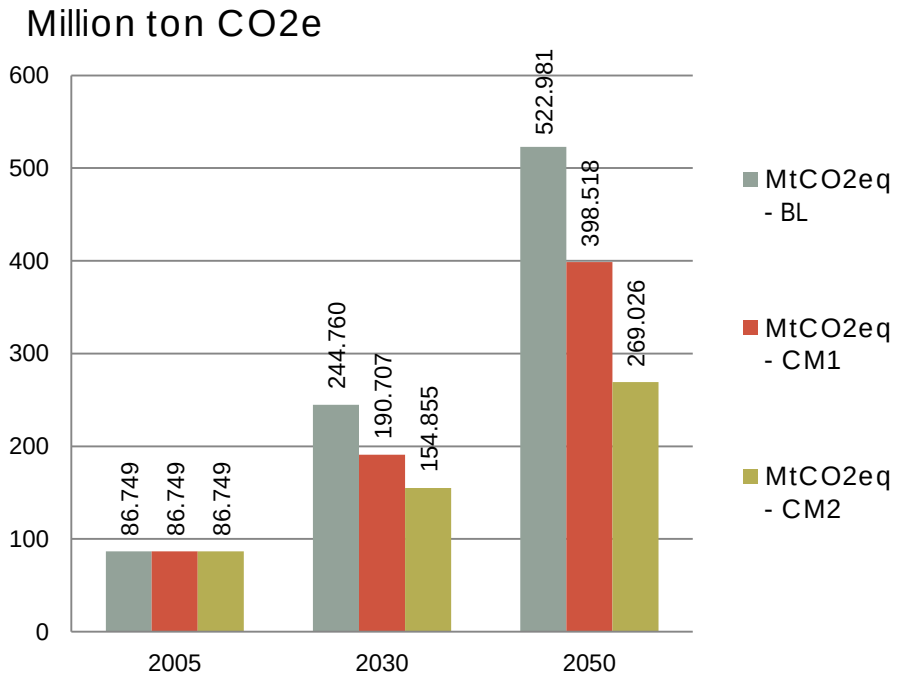
With such feature the model is expected to have better chance to contribute in the development of Indonesia energy plan (through dialogues with energy planners).

AIM End-Use

CO2 emission in Power Sector



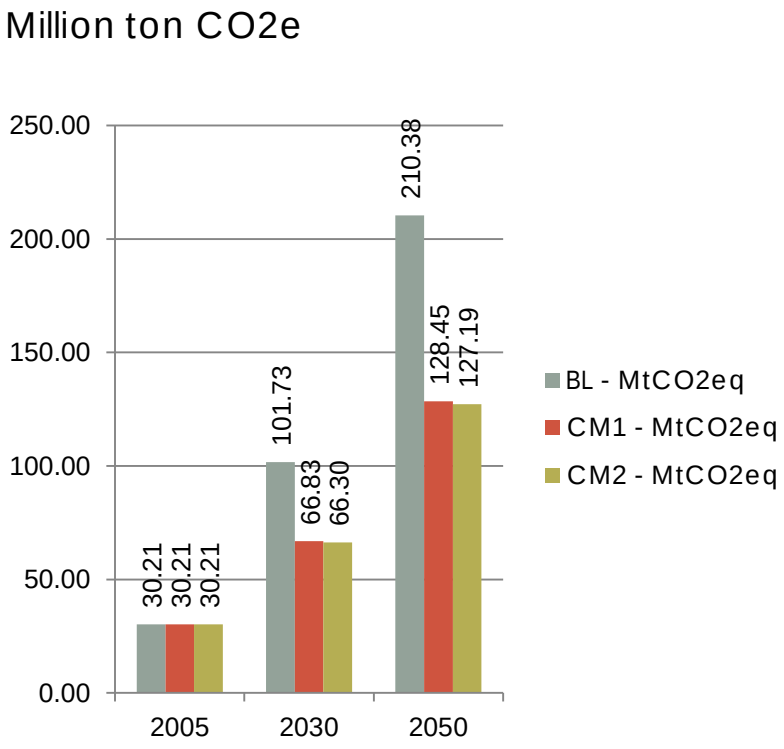
CO2 emission in Transport Sector



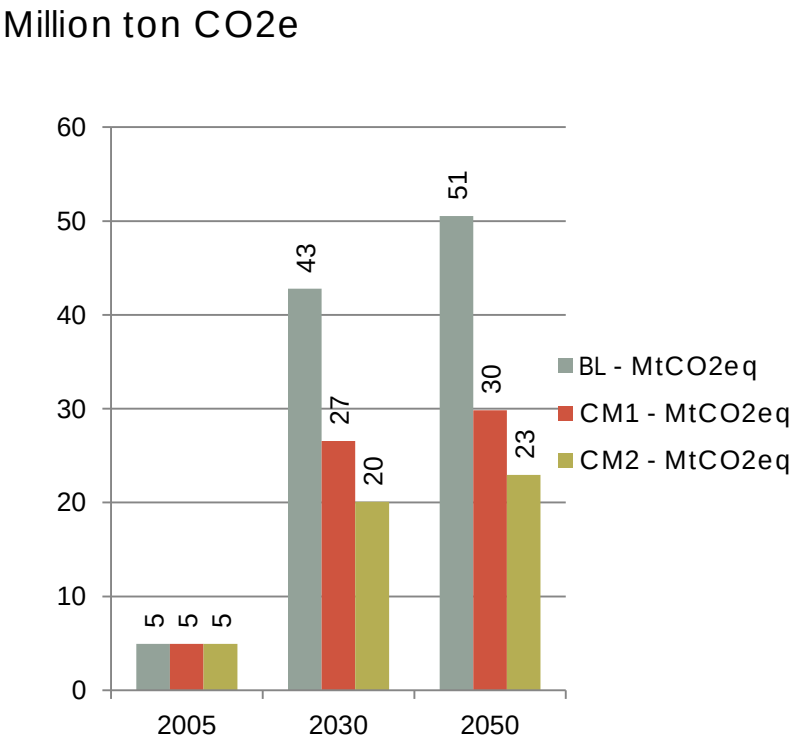
Note:
CM1 – based on National Energy Policy Council Scenario and efficiency measures
CM2 – extensive use of biofuel and more intensive energy efficiency measures

AIM End-Use

CO2 emission in Cement Industry



CO2 emission in Iron/steel Industry



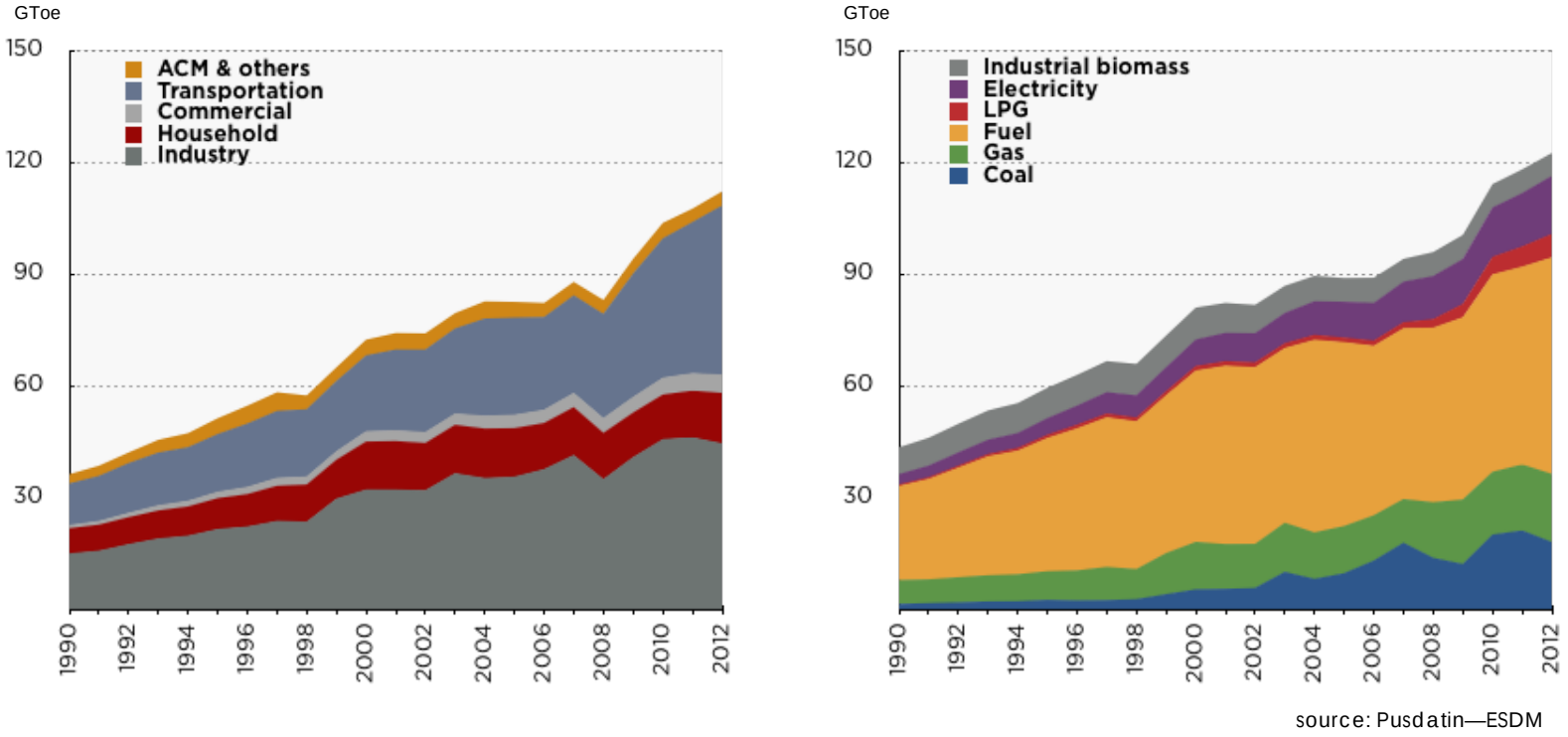
AIM-CGE

- AIM-CGE for Indonesia case combines energy sector with land based sector (agriculture and forestry)
- Most important feature of the model: to give answer to questions related to impact of mitigation actions to Indonesia economy (GDP).
- Currently the Indonesian model is still under development. The latest AIM training workshop has produced some preliminary results.

CURRENT ENERGY SITUATION

Significant trend of increase in energy demand over Commercial (7.06%p.a.), Transportation (6.23%) and Industrial (5.11%) sectors. 2005-2010 energy switch from OIL to COAL and GAS. *rate are based on “95- “12 average growth rate

FINAL ENERGY DEMAND (“90- “12)



source: Pusdatin—ESDM

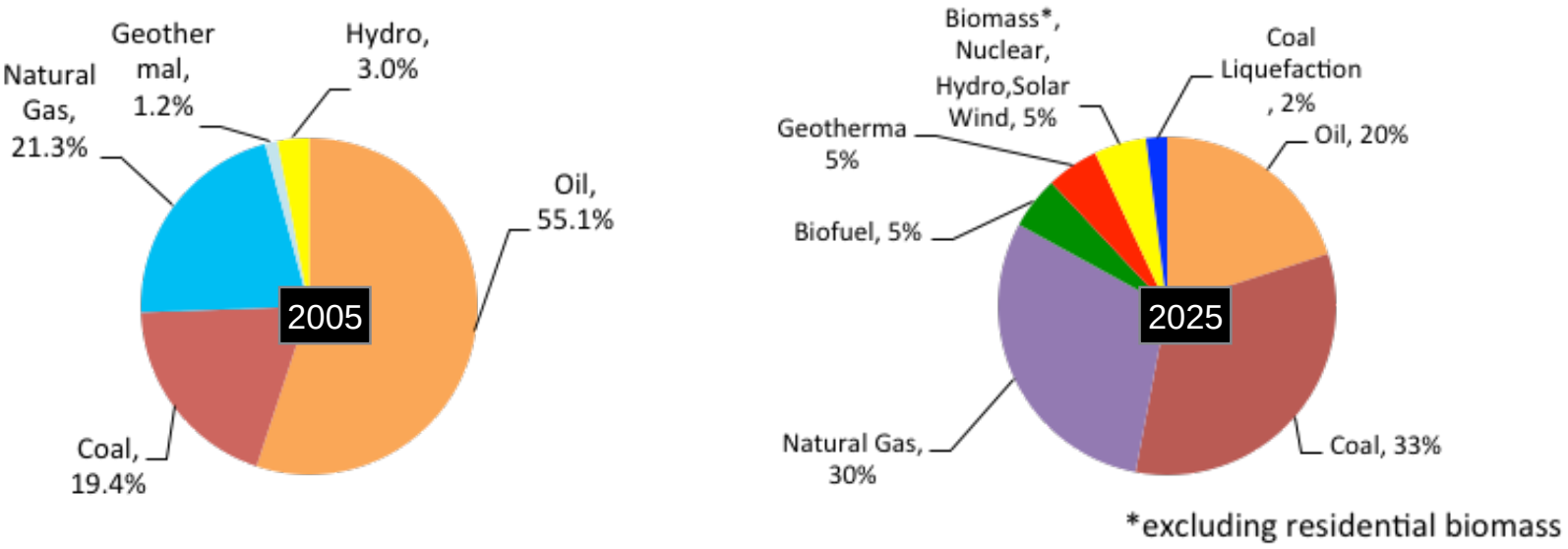
Implicating to trend of increase in demand on energy, noticing that GoI is planning to transform their energy mix in increasing energy security and achieving climate targets.

GOVERNMENT ENERGY MIX PLAN (2025)

In 2005-2025 period, National Energy Policy shows significant energy switch from OIL (red. to 0.36x) to COAL (inc. to 1.7x) and GAS (inc. to 1.41x).

In addition, NREs introduction to the energy mix (4.2% to 17% or 4.05x in 2025 compared to 2005).

PRIMARY ENERGY MIX (2005 & 2025*plan)



*shift of energy mix during the period has resulted to significant change for the baseline emissions compared to AIM, IDN base scenario data.

INDONESIA

INDC

The 29% GHG emissions reduction target are planned to be achieved with three different focus-sectors. The following figures are represented in “Dokumen Pendukung Penyusunan INDC Indonesia (Draft 11.08.15) “

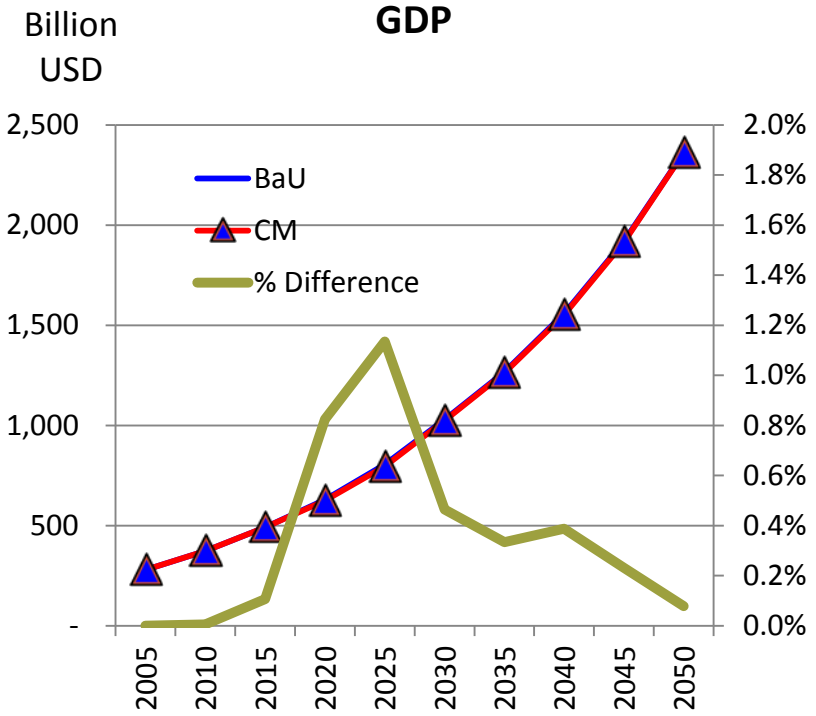
Actions	*Emission Reduction Target 2020-2030*		
	Ambitious	Optimistic	Fair
Land-use based policies scenario	750 MtonCO2 in 2030	627 MtonCO2 in 2030	596 MtonCO2 in 2030
Energy sector policies scenario	393 MtonCO2 in 2030	258 MtonCO2 in 2030	222 MtonCO2 in 2030
Waste sector policies scenario	45 MtonCO2 in 2030	36 MtonCO2 in 2030	30 MtonCO2 in 2030

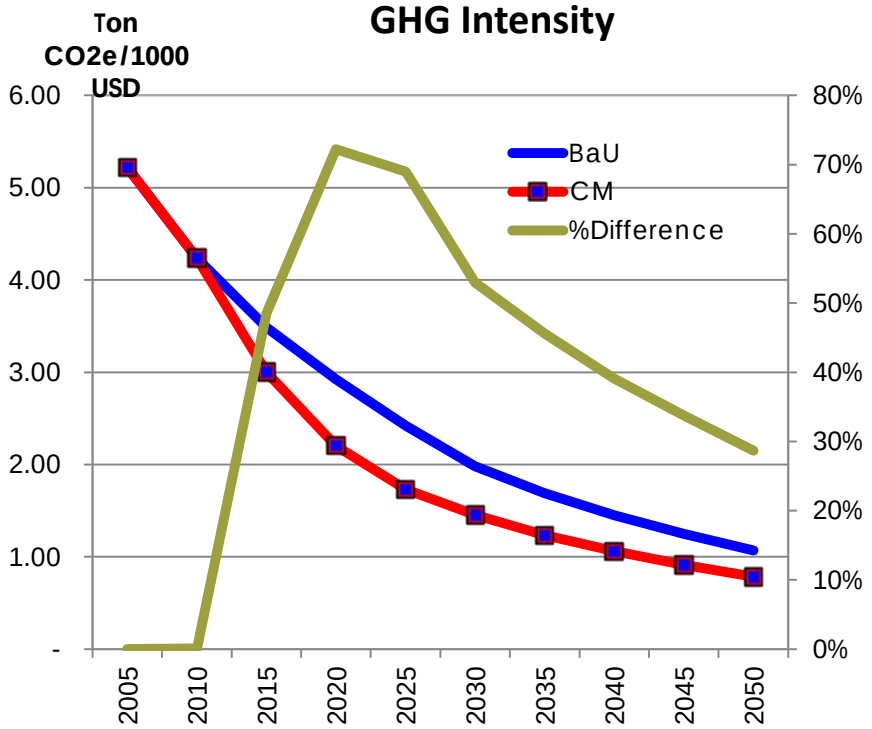
*the reduction targets are then adjusted into the model, since the model base data are not re-calibrated with Indonesia current conditions and development plans.

SCENARIO SETTINGS

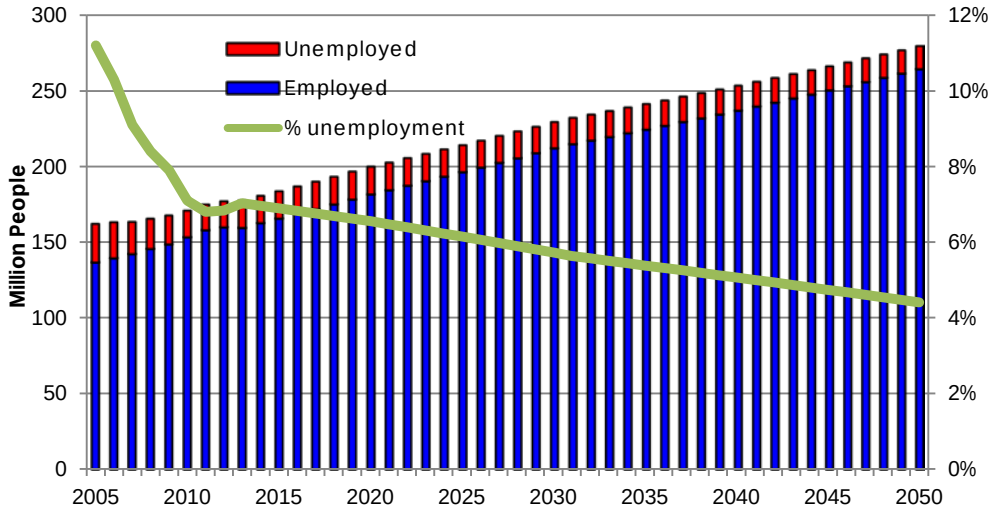
2005 Base year analysis with projection years until 2050. There are 3 different mitigation scenarios with the following socio-economic assumptions.

	BaU	*CM*
		INDC–KEN
Energy Supply	2005-2010 switch from OIL to COAL and GAS (Power, Industry, Residential).	
Infrastructure		Infrastructure readiness for GAS and ELECTRICITY for Industry, Buildings, and Transport Sectors. *(CM2&3) Higher rate of advanced technology dissemination.
New & Renewables		High rate of new & renewables introduction, starting 2020. *(CM2&3) Higher rate of introduction, starting 2030.
Nuclear		Available in 2030 onwards.
CCS technology		Available in 2025 onwards.
GHG Emission Target		2030 afterwards, 29% below baseline.



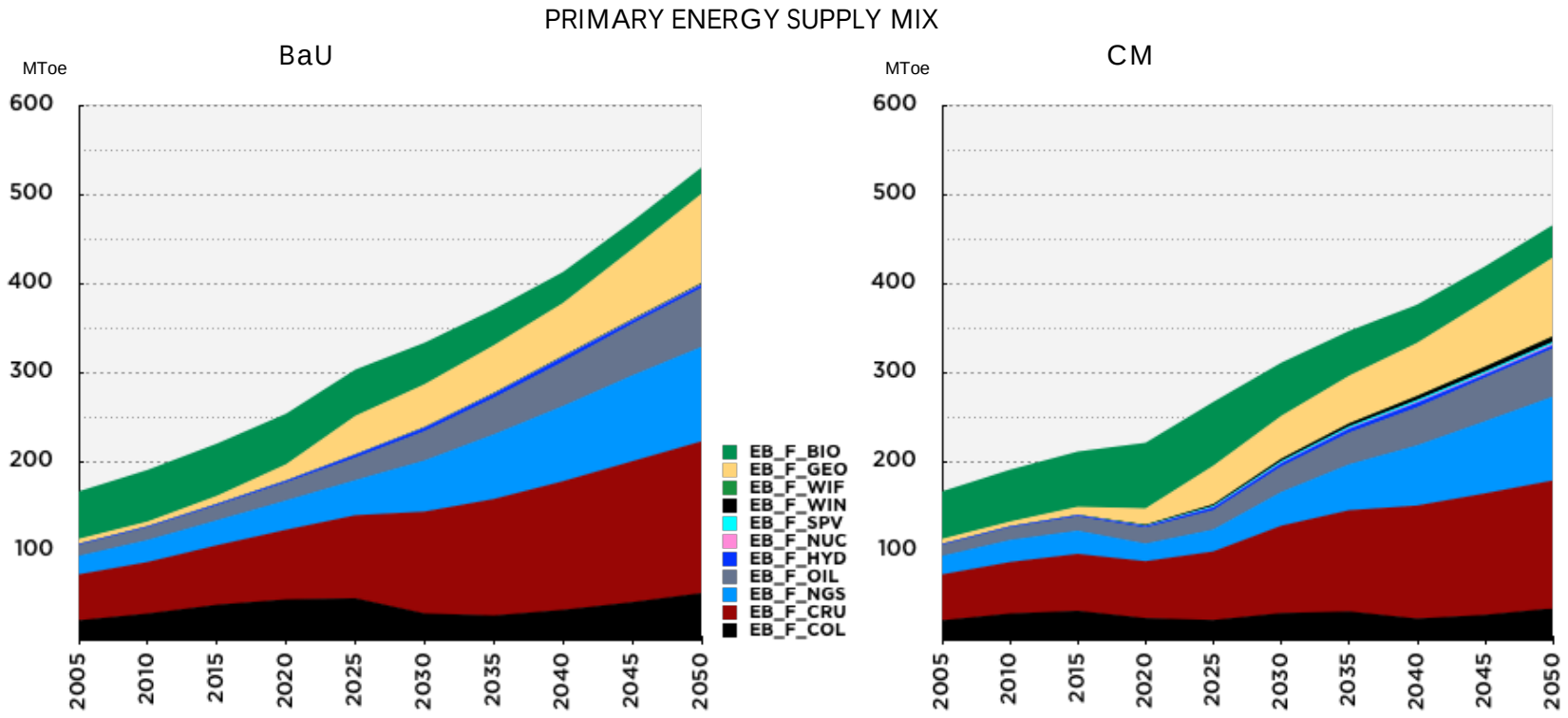


Workforce and employment (counter measure)



PRIMARY ENERGY MIX

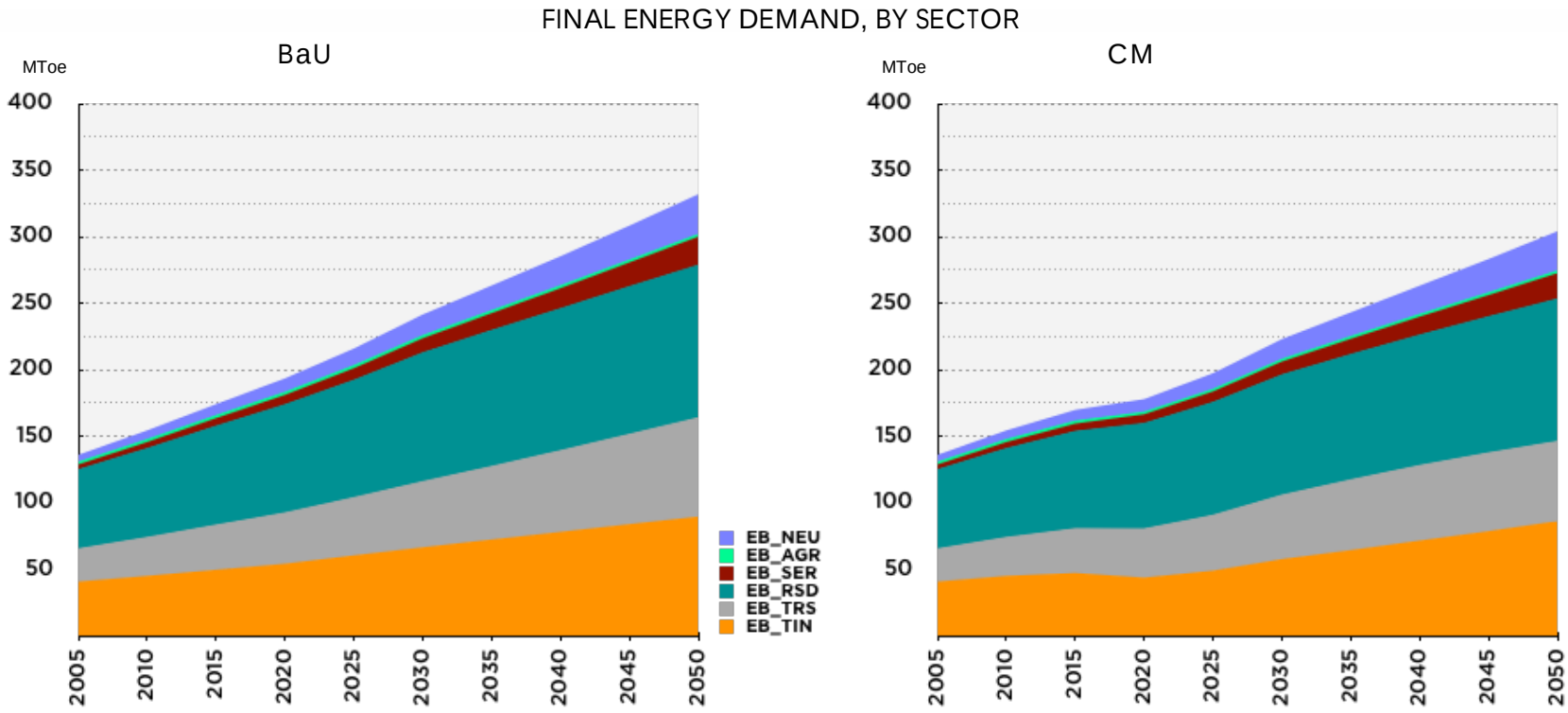
Primary energy mix in BaU has shown higher growth rate of Coal and Gas for fulfilling the high growth of energy demand in Power Generation and Industrial sectors.



CM Scenario shows increase in Renewables in the energy mix with most of the development is contributed by Biofuel for transport and other NREs in Power Generation Sector.

FINAL ENERGY CONSUMPTION

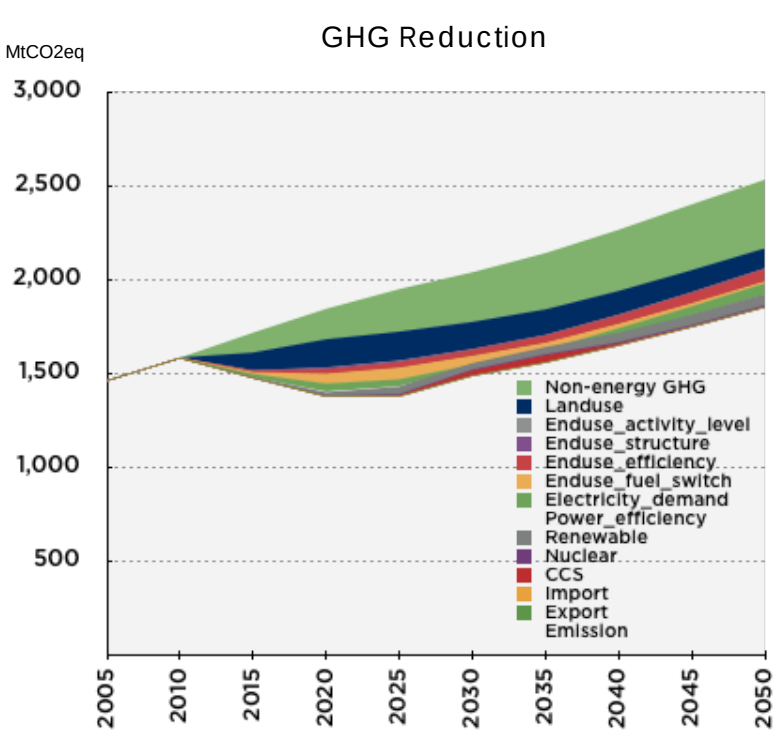
BaU: The highest growing energy demand sector are Residential (4.5%p.a) followed by Non-Energy Use (4.43%), Transportation (2.72%), and Industrial (1.9%) sectors.

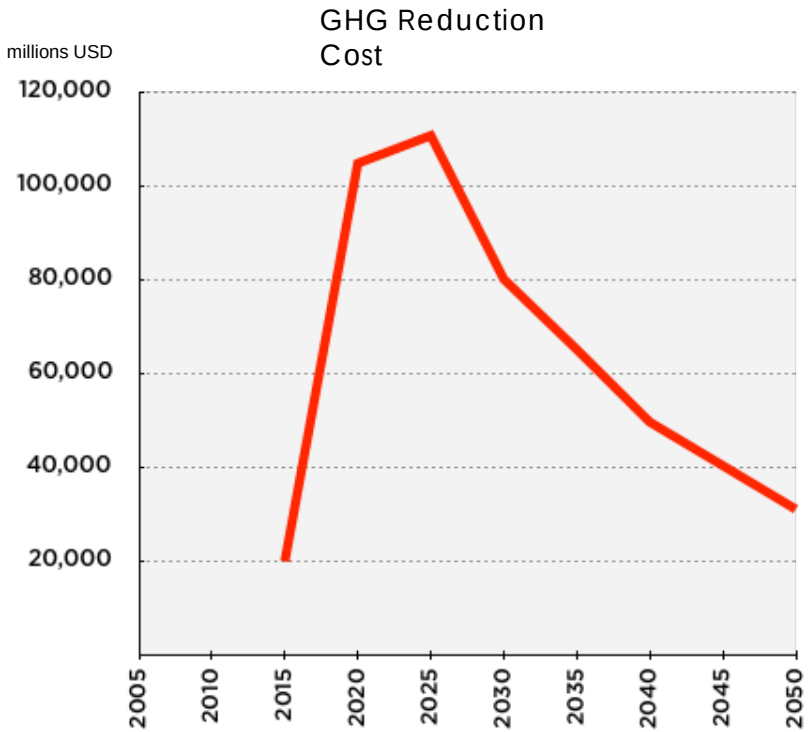


CM: With energy conservation, reduces energy demand by 0.92x relative to BaU.
*The energy conservation measures includes end-use technological devices efficiency improvement.

GHG REDUCTIONS AND COSTS

The highest contributor is Non-Energy GHG and Land-use mitigation actions (20.06%, 2030BaU). Whilst Energy sector has reduced by (6.99%, 2030BaU, 142.3 MtCO2eq).



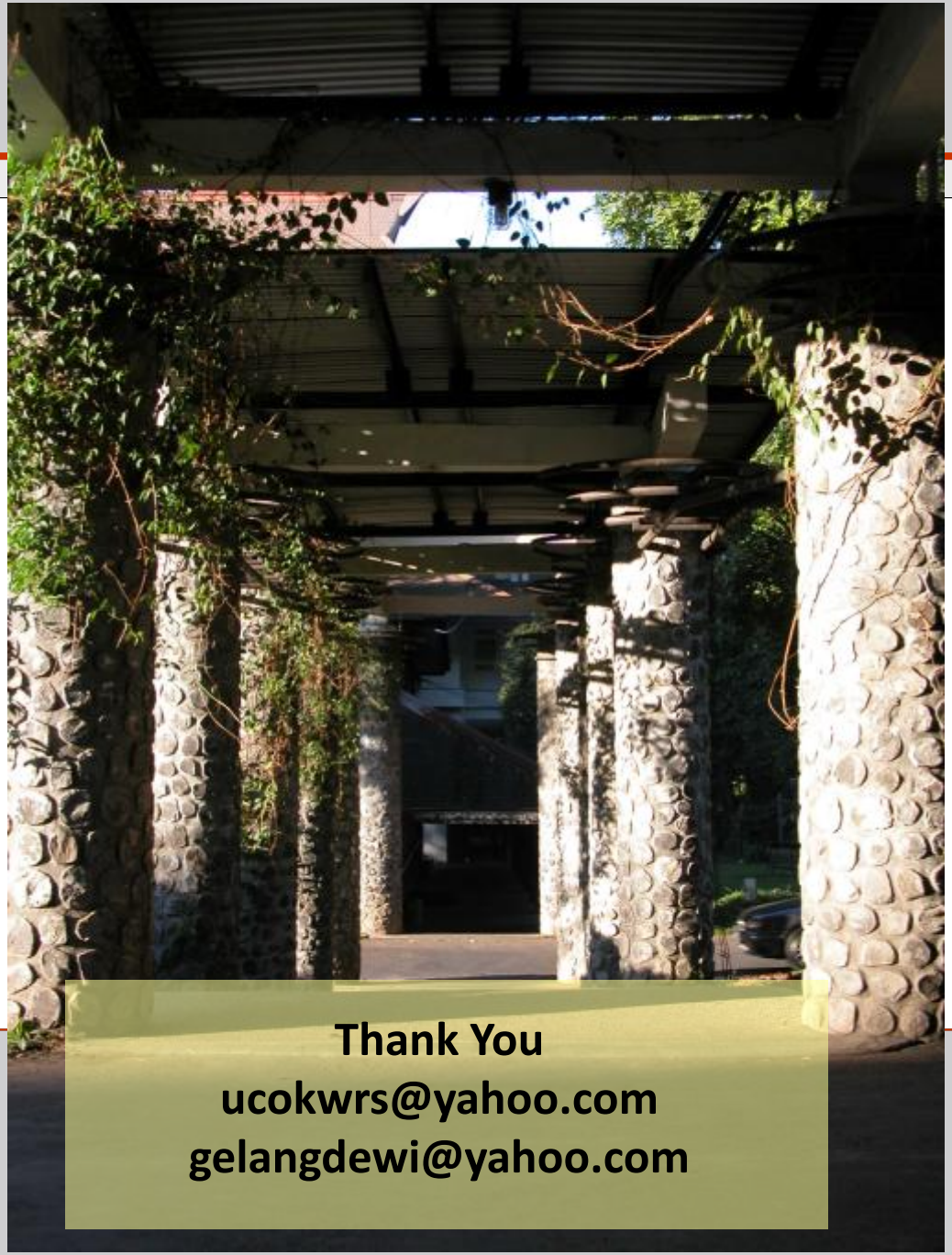


The cost of GHG reductions peaks on 2020-2025 period mostly for fuel-switch to higher priced cleaner-energy source, in addition to NREs and CCS technology dissemination.

Science-Based Energy Climate Change Policy Recommendations

Indonesia AIM energy team plans

- In the coming months, Indonesia climate change authority will prepare assessment and plans for Third National Communication and delineation of INDC.
- In addition, the energy authority will prepare the Master Plan of Indonesia Energy Development (derived from National Energy Policy Council Scenario).
- Indonesia energy research team plans to contribute to those activities (through policy dialogues, focus group discussions) by using AIM approaches.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