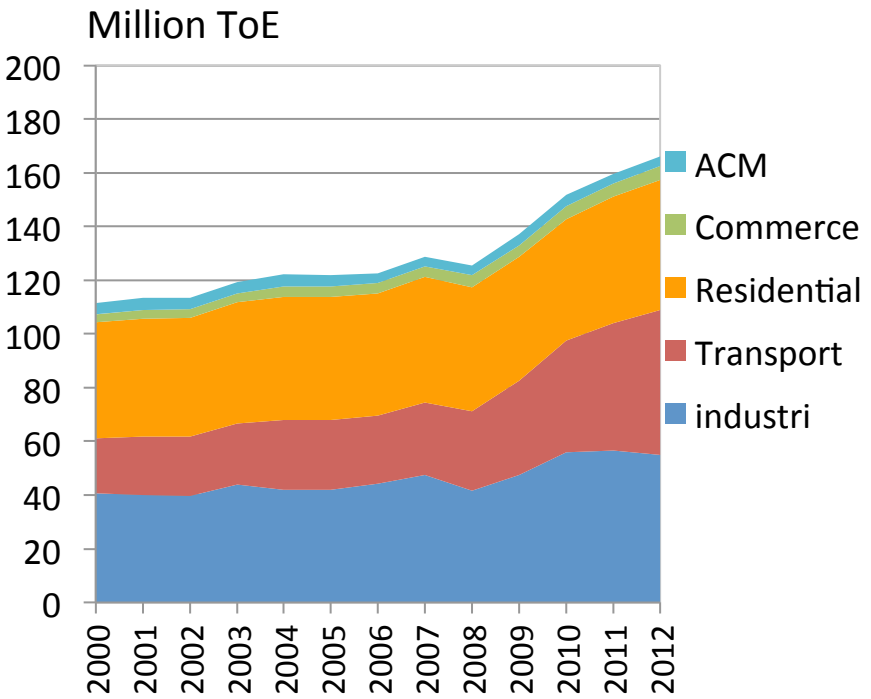
1. Introduction (Indonesia Commercial Building)
2. Current Energy Situation and GHG Emissions: Share of Energy Consumption in Building Sector
3. Low Carbon Development (LCD) Concept and De-carbonization
4. Pathways for Decarbonising Indonesia's Energy Sector: Electricity Generation and Building Sectors
5. Green Building Contribution Under NAMAs in Indonesia's De-carbonization Pathway

INDONESIA COMMERCIAL BUILDING

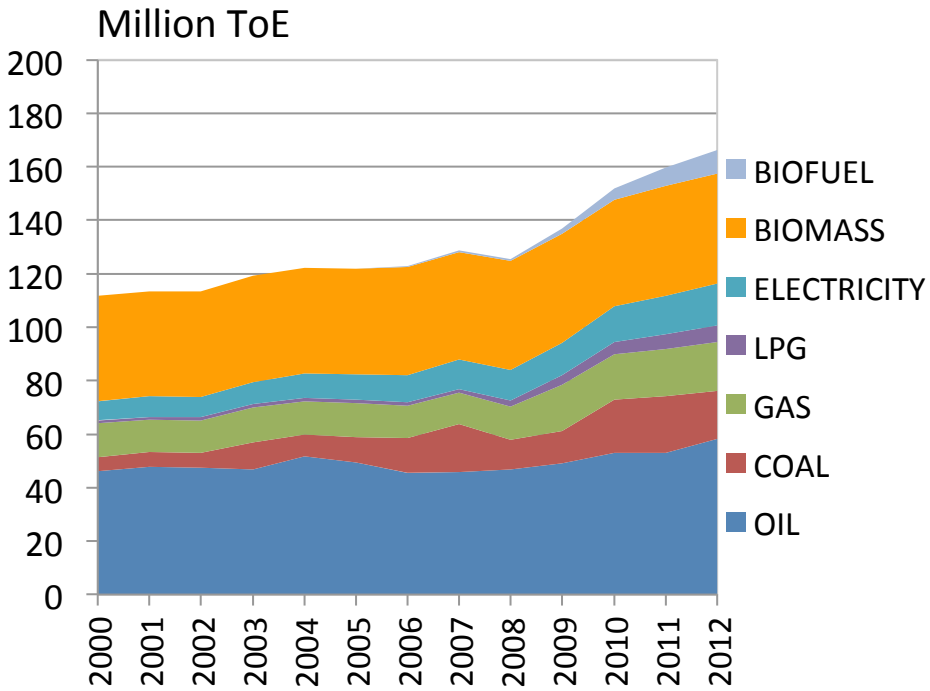
- The dynamics of building (residential & commercial) sector development are driven by population growth, economic development, per capita income, and commercial sector development.
- For residential sector, increasing per capita income will increase energy demand, but this will be balanced by more efficient appliances and the expectation that homes will remain relatively small.
- For commercial building, increasing size of service economy &modernization of building equipment will result in increase of energy consumption.
- De-carbonization in building would result from fuel switching, i.e. from oil fuels to gas/LPG and from oil fuels to electricity along with deployment of more energy-efficient electric appliances.
- Switching from on-site fuel combustion to electricity would reduce direct emissions from buildings, and with a decarbonized electricity generation sector, this switch would lead to emission reductions.

Current Energy Demand Development

Final ENERGY DEMAND By Sector



FINAL ENERGY DEMAND By Type of Fuel

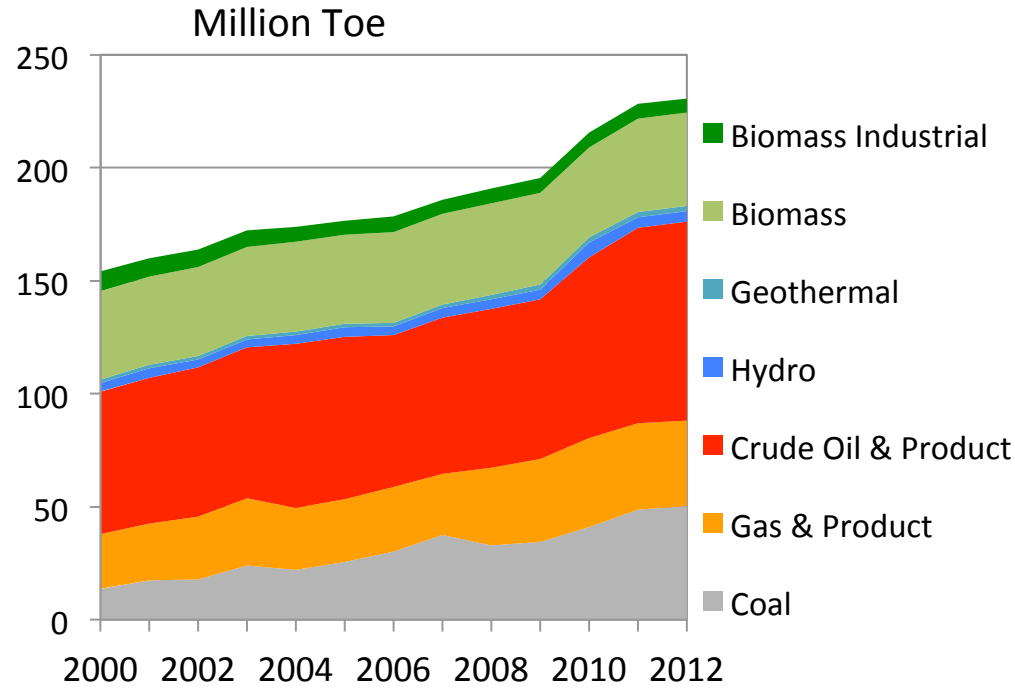


source: Pusdatin—MEMR

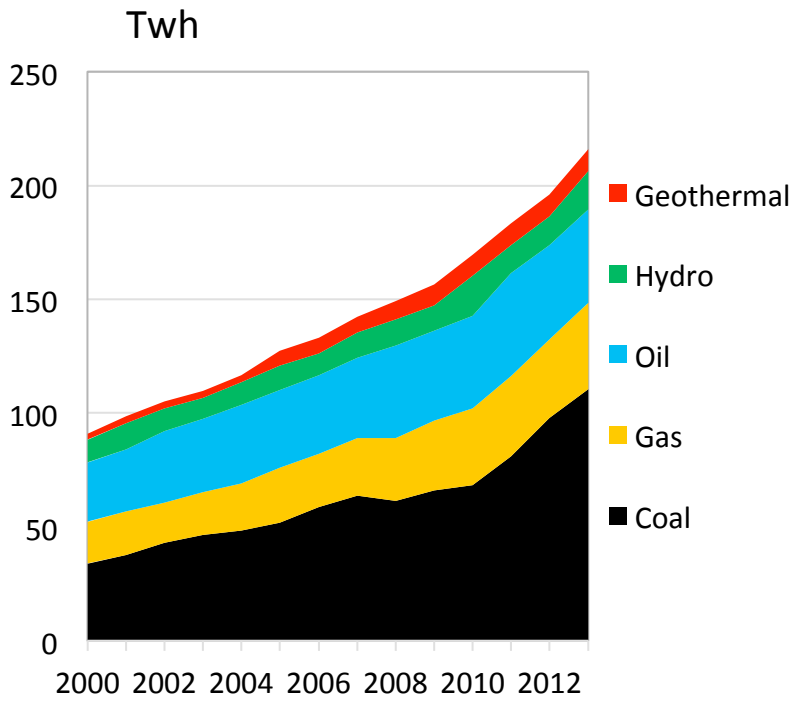
- By sector, demand is dominated by demand from industry, transport, and residential. Commercial sector demand is very small (4%)
- By type of fuels, demand is dominated by oil, Biomass is used primarily used in rural residential, Biofuel growth is significant in the past five years

Current Energy Supply Development

Primary Energy Supply Mix



Energy Supply Mix in Power Sector

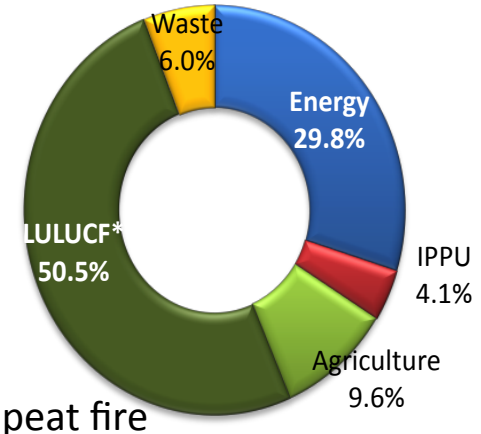


- Dominated by coal which grew steadily since 2000
- Oil is used in distributed diesel generators in remote areas. Installed in 80s and 90s for boosting electrification
- Renewable share is still low, 12% in 2013.

source: Pusdatin—MEMR

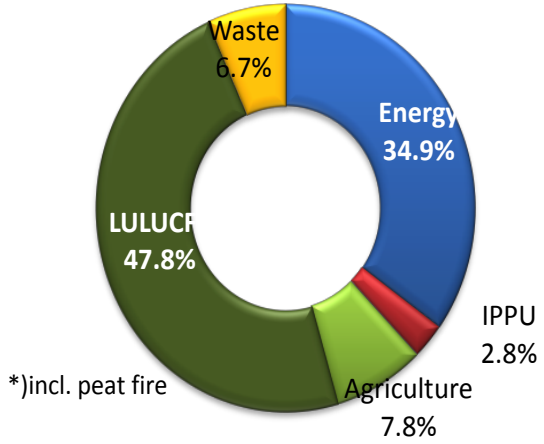
CURRENT ENERGY SITUATION AND GHG EMISSIONS

2000 - 1,001 million ton



*) incl. peat fire

2012 - 1,454 million ton



Source: Indonesia 1st BUR, MoEF 2015

Sectors	MTon CO2e		%		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%

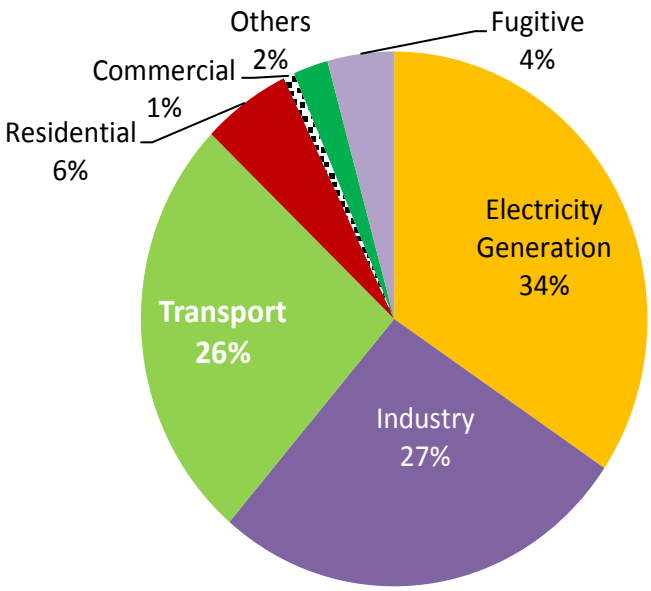
**) including peat fire*

2000-2012, energy emissions grew at 4.5%/year **faster than emissions growth** rate of LULUCF at 4.2%.

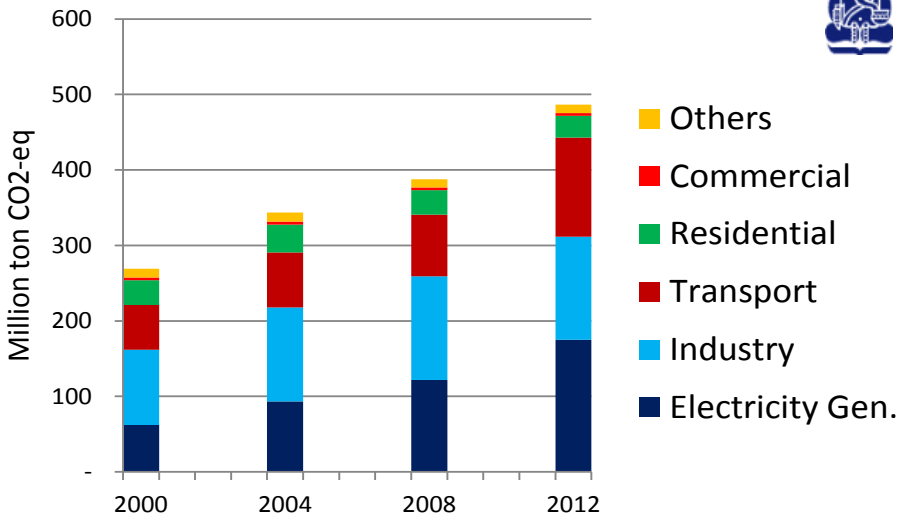
Share of energy emission is getting closer to share of LUCF. If peat fire is excluded, share of energy emission is about the same with LUCF emission.

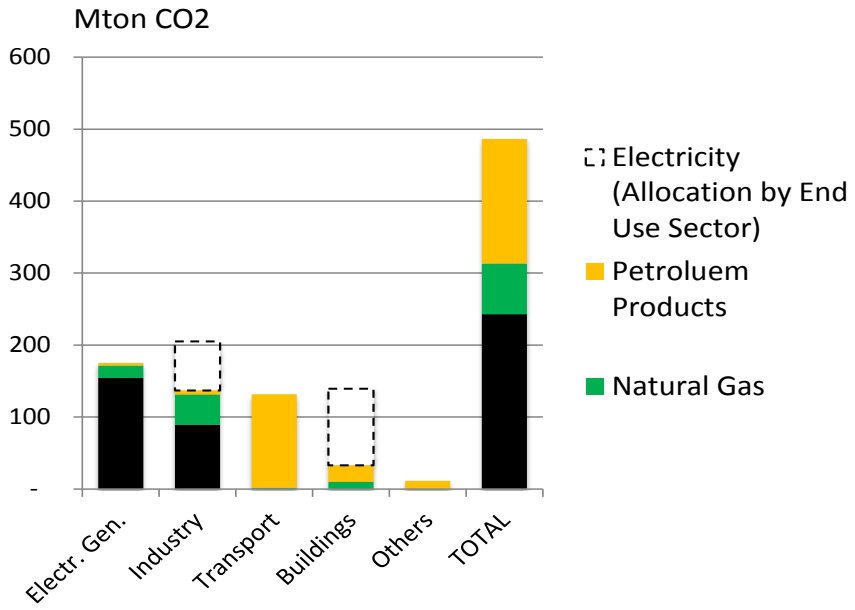
Rising energy consumption is a trend that will continue in Indonesia. GHG from energy will also continue to grow. De-carbonization of **energy sector is crucial.**

Breakdown Energy GHG Emissions



Energy 2012
508 mill ton





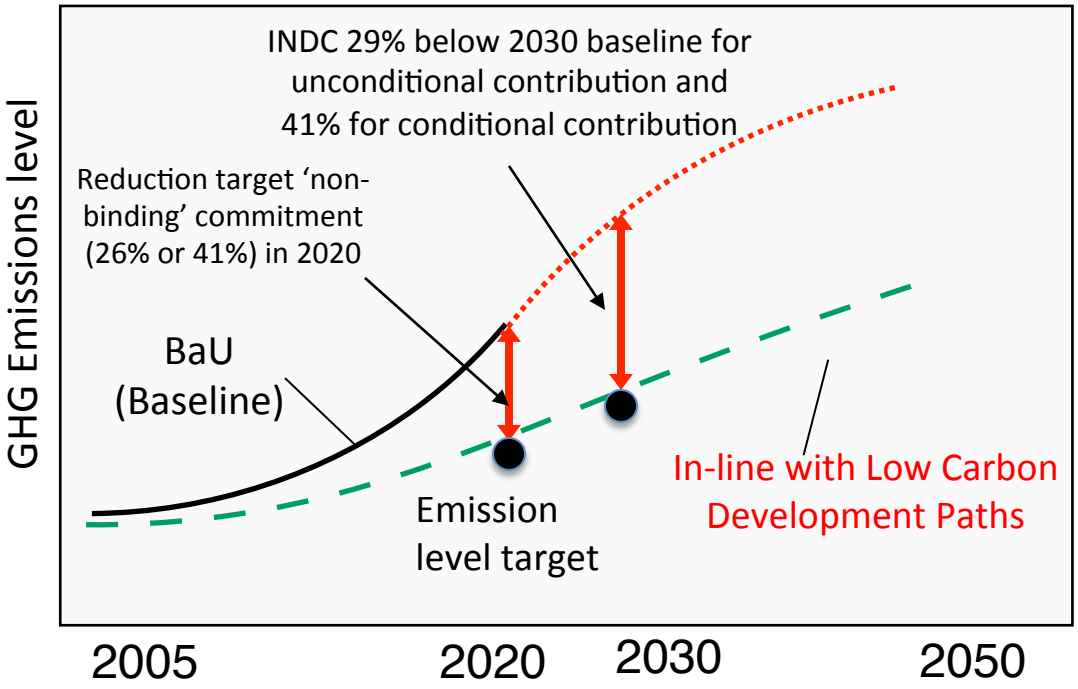
<u>Combustion Emissions</u>

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.

Indonesia Climate Change Mitigation Action Plan



Non-Binding Commitment (RAN-GRK) Target

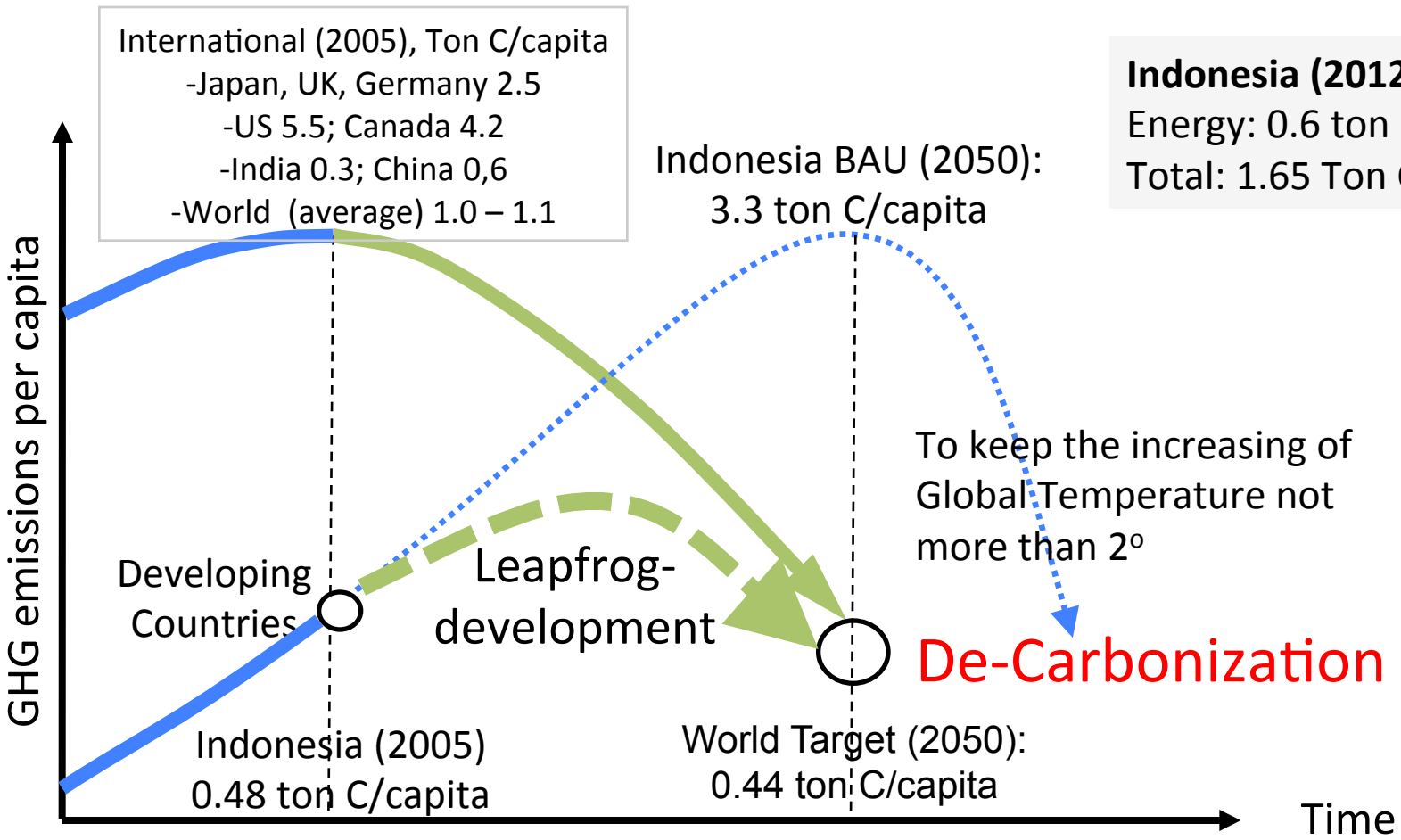
Sector	Emission Reduction*		Total (41 %)
	26%	15%	
Forestry & Peatland	0.672	0.367	1.039
Waste	0.048	0.030	0.078
Agriculture	0.008	0.003	0.011
Industry	0.001	0.004	0.005
Energy	0.038	0.018	0.056
Total	0.767	0.422	1.189

*Giga Ton CO2e

In response to climate change issues, GoI in 2009 announced "non binding commitment" to reduce GHG emissions 26% below the baseline by 2020 with domestic budget and further up to 41% with international support → National GHG Mitigation Action Plan (RAN-GRK).

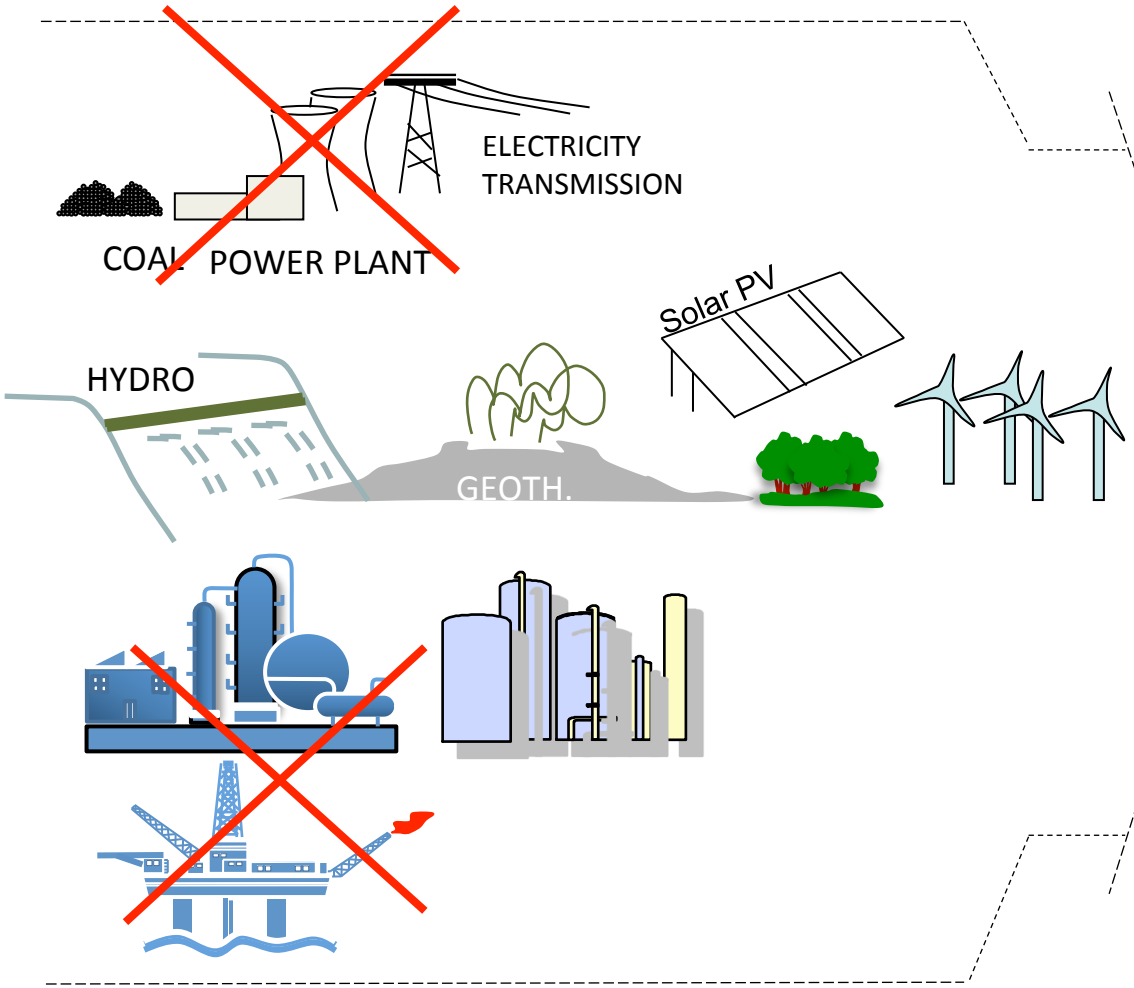
In 2015, GoI submitted Indonesia INDC (Intended Nationally Determined Contribution) to UNFCCC with unconditional contribution to reduce GHG emissions up to 29% below the baseline by 2030 and conditional contribution to reduce GHG emissions up to 29% (INDC 2030, De-Carbonization 2050)

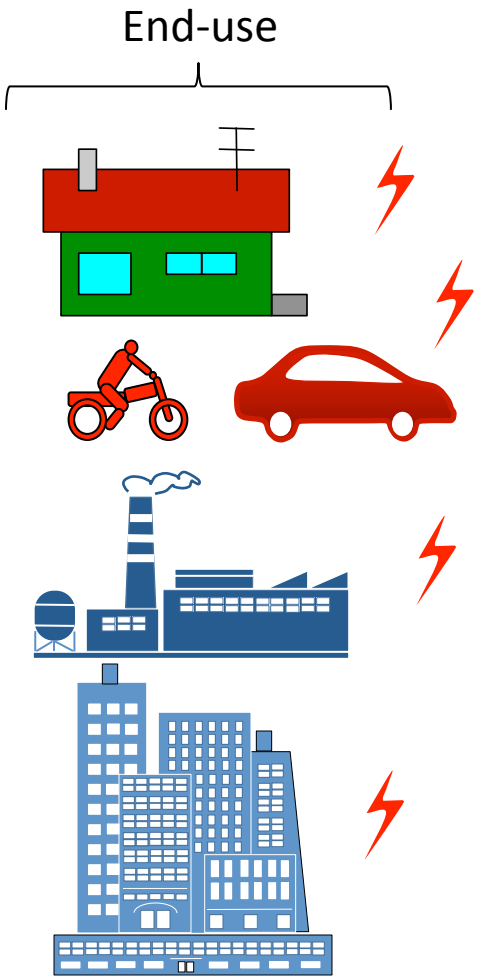
Low Carbon Development (LCD) Concept and De-carbonization



Indonesia (2012)
Energy: 0.6 ton C/capita
Total: 1.65 Ton C/capita

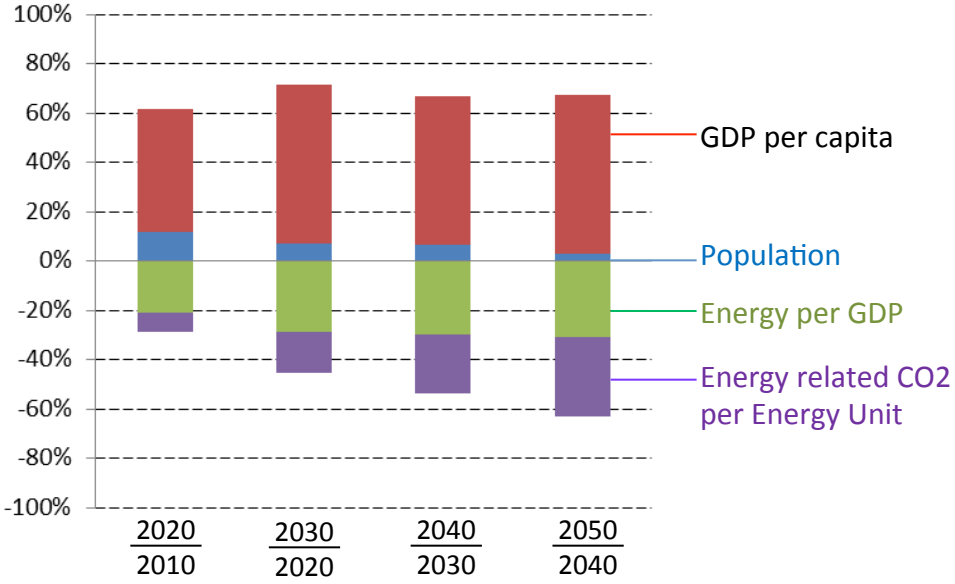
De-carbonization pathway

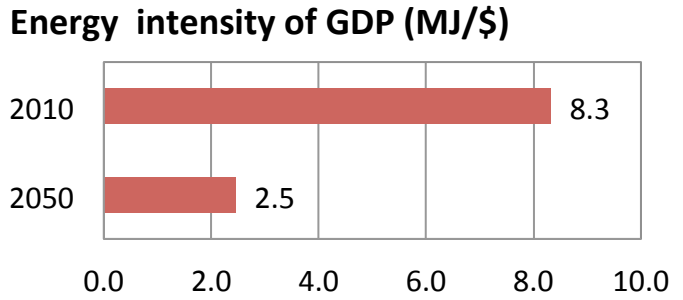


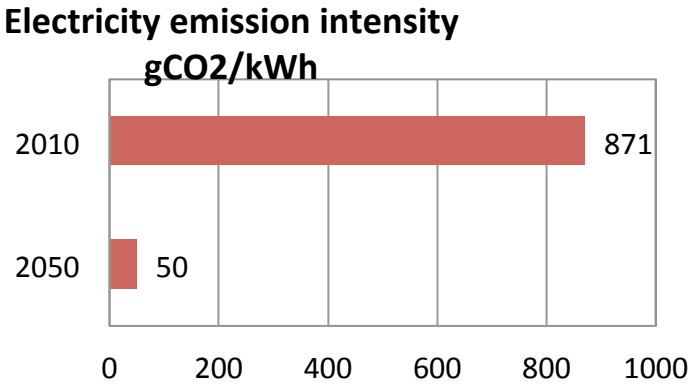


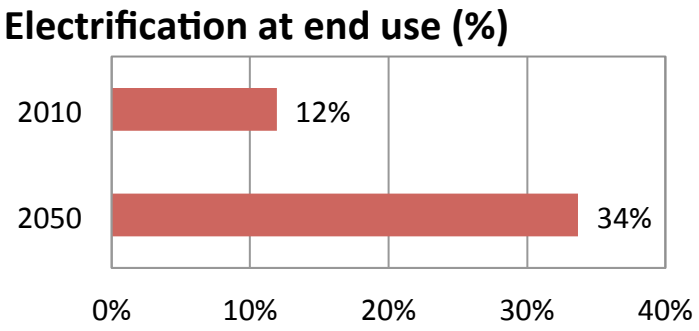
- Energy efficiency
- Electrification of end uses
- Decarbonize electricity

The Pillars of De-carbonization







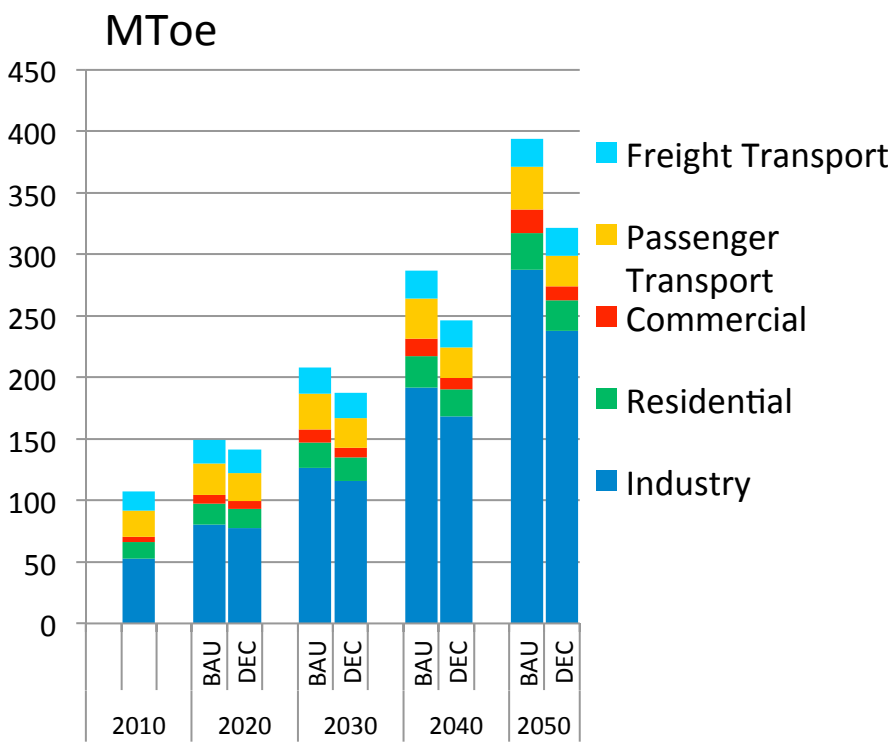


Drastic change of primary energy and final energy mix is resulted from several measures. De-carbonization is the combination of : energy efficiency, low/zero-carbon emitting technologies, economic structure change.

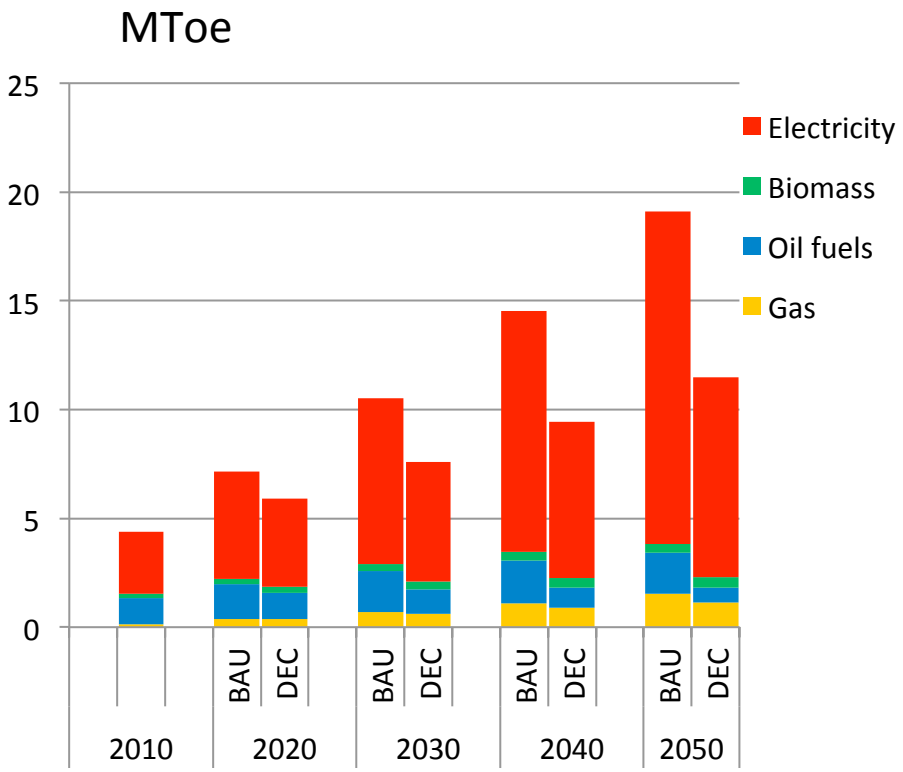
Key elements:

- Increase of energy efficiency in all sectors.
- Fuel switch to lower-carbon emitting energy sources
- Replace on-site fuel combustion by electricity.
- Decarbonize electricity generation (massive deployment of renewable for power)

Evolution of Final Energy Demand



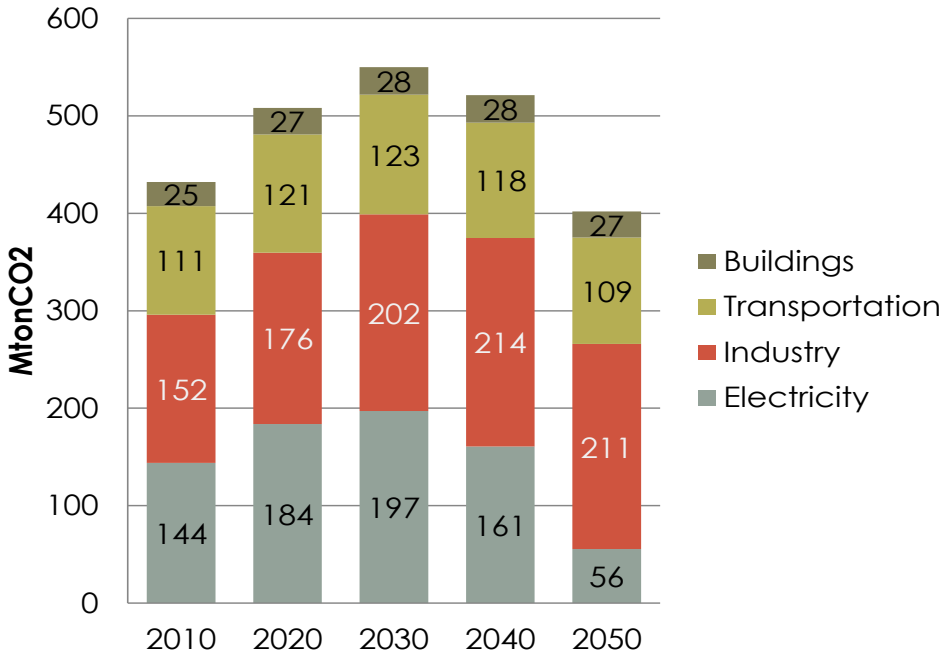
Evolution of Final Energy Demand in Commercial (Building) Sector

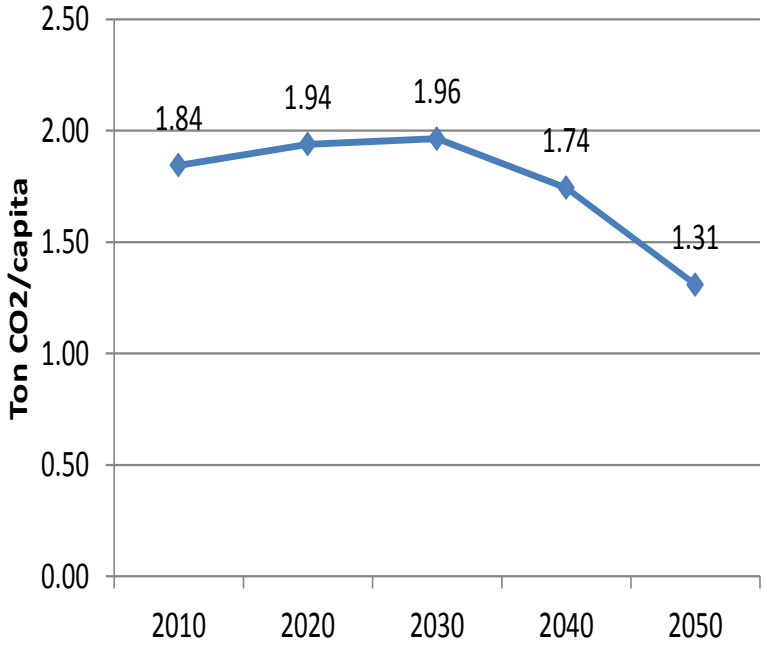


- Share of commercial sector demand is the smallest (4% total demand) among consuming sectors
- Remain dominated by electricity
- Significant demand reduction (40% in 2050) as the result from efficiency measures (compact, less floor space, efficient design, efficient devices, good management)

Results of Decarbonization

Emission by Sector

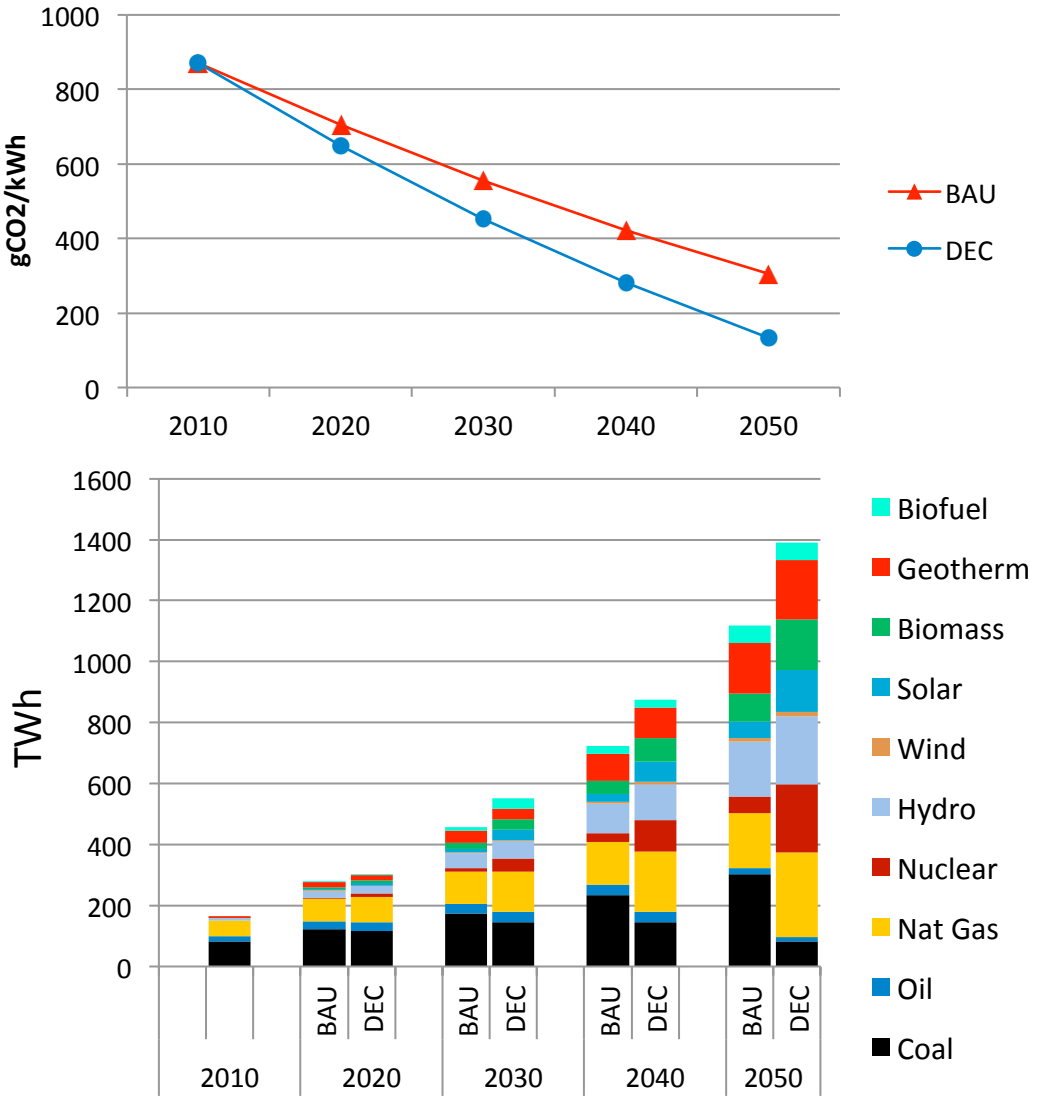




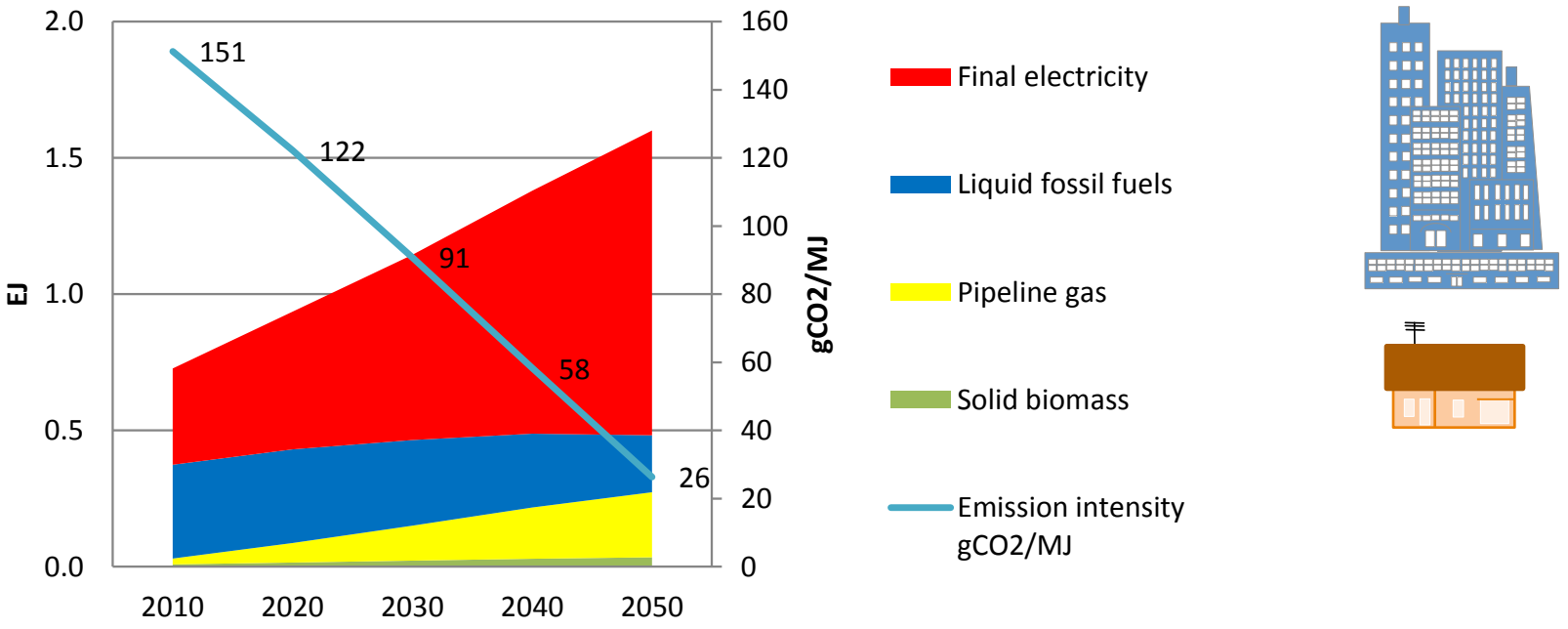
- Emission will first increase (economic development) and then decrease (results of de-carbonization)
- Industry and transport are the main emitter in 2050.
- Significant decarbonization in power generation, from 144 $MtCO_2$ (2010) to 56 $MtCO_2$ (2050).
- Emission from industry will remain to increase 152 $MtCO_2$ in 2010 to 211 $MtCO_2$ in 2050.
- Emission per capita will decrease from 1.84 ton CO2 to 1.31 ton CO2

Decarbonization of electricity generation

Decarbonization of electricity generation make carbon intensity of energy in commercial sector significantly reduced because energy use in commercial sector is dominated by electricity.



Building (Commerce and Residential)

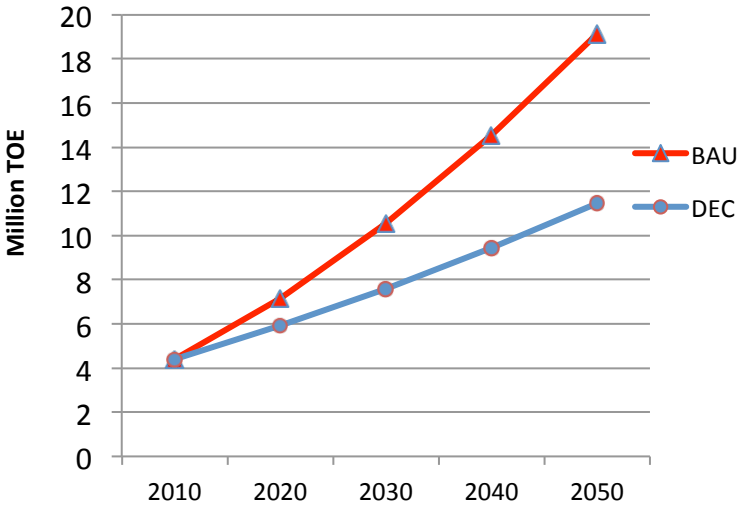


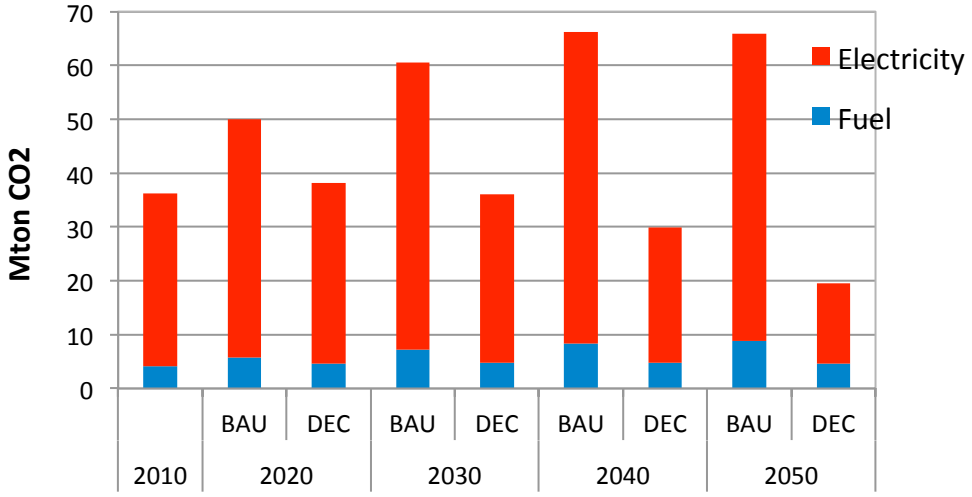
Decarbonization strategy:

- Fuel switching to gas/LPG and increase electrification in end use
- Use of super-efficient energy devices

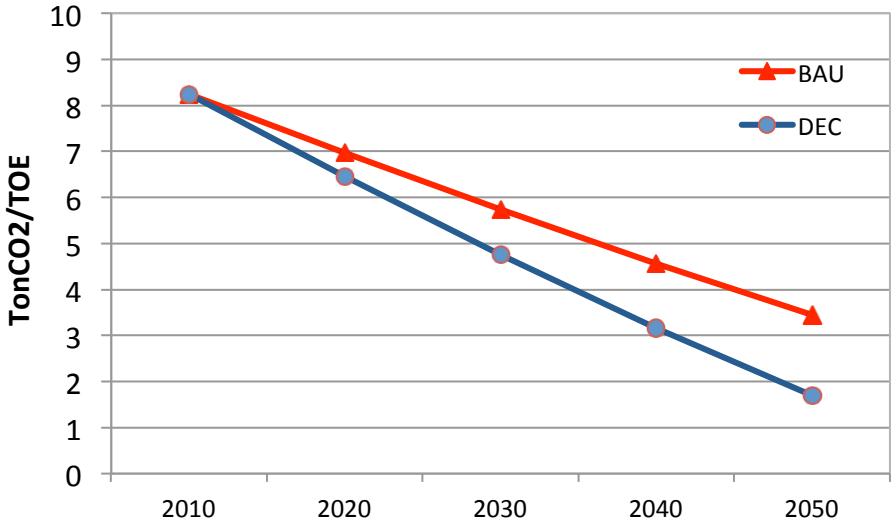
Residential sector: increase of per capita income will increase energy demand, however the increase is counterweighted by use of more efficient equipment

CO2 emission in Commercial Sector





Reduction up to 40% in 2050 due to lower energy demand (efficiency) and decreasing carbon intensity (decarbonization in power sector)



NAMAs Projects on Green Building in Indonesia

1. A NAMAs project has been developed for implementing EE in office building of City Hall/House of Representative of DKI Jakarta Toward Green Building (GB).
2. The building is designed to meet GB Certification Criteria of Indonesia GB Council, which is in lined with current GB Policies, i.e. Governor of DKI Jakarta Regulation No. 38/2012 (GB-code), MEMR regulation No. 13/2012 (EE Building with specific consumption 102-168 kWh/m^2/year) and MoEF regulation on Green Building.
3. GHG reduction potential associated to EE-measures under this NAMAs project is evaluated base on baseline level (265 kWH/m2/year) and the level associated with energy conservation efforts to achieve specific energy consumption of 168 kWh/m2/year. Building with 43,409 m^2 area will lead to the reduction of 4,207 MWh per year, with EF grid is 0.814 ton CO_2/MWh this NAMAs will lead to GHG reduction of ± 3.4 KTon CO_2/year.
4. As comparison, RAN GRK (Presidential Regulation No. 61/2011) has targeted EE in buildings and Industries will achieve 2,110 KTon CO2 in 2020.

Challenge / Opportunities

1. Preliminary insight can be drawn from de-carbonization study which shows that mitigation opportunity exist in the power sector (renewable), transport (mass transport) and industry and building sectors (energy efficiency measures).
2. There is still rooms to include energy efficiency measures in building sector in achieving National GHG emission target pre-2020 (RAN GRK) and post 2020 (INDC in 2030), de-carbonization beyond 2030 (Low Carbon Development Toward 2050;
3. JCM opportunity in buildings may also be identified from delineated INDC
4. To ensure that energy efficient building codes (including standards), government regulations on EE in building as well as Green Building, are widely implemented;
5. Prepare human resources needed to design and operate energy efficient building and to develop energy efficient appliances;
6. To develop information for data on mitigation activities and emissions reduction potential at the level of end use appliances.
7. To introduce carbon label to building energy performance

We welcome new ideas/initiatives in this research

References

1. Intended Nationally Determined Contribution (INDC) Republic of Indonesia, 2015
2. Ministry of Environment and Forestry, 2015, "Indonesia 1st BUR"
3. IDRII, et.al, 2015, "Pathways to Deep De-carbonization in Indonesia", http://deepdecarbonization.org/countries/#indonesia
4. Dewi, 2014, "Technology Options for Achieving Low Carbon Energy in Indonesia"
5. Dewi, et.al, 2013, Low Carbon City Scenario for DKI Jakarta Towards 2030
6. Dewi, et. al. "NAMAs of Bus Rapid Transit and Green Building, DKI Jakarta", poster presentation at COP 20, Lima, Peru, http://crep.itb.ac.id
7. Dewi, et.al., 2012, Indonesia Low Carbon Development Strategy Scenario 2050 in Energy Sector", Environmental Engineering Journal, Spc. Vol. January–April 2012, ISSN 1686- 2961
8. Dewi, et.al, 2010, Low Carbon Society Scenario of Indonesia Energy Sector Toward 2050

Thank You

gelang@che.itb.ac.id
gelangdewi@crep.itb.ac.id
http://crep.itb.ac.id