LoCARNet, 9th Annual Meeting

New development-Scenario Development and Science-Policy Dialogue

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LONG-TERM STRATEGY: West Java's Low Carbon Society 2050

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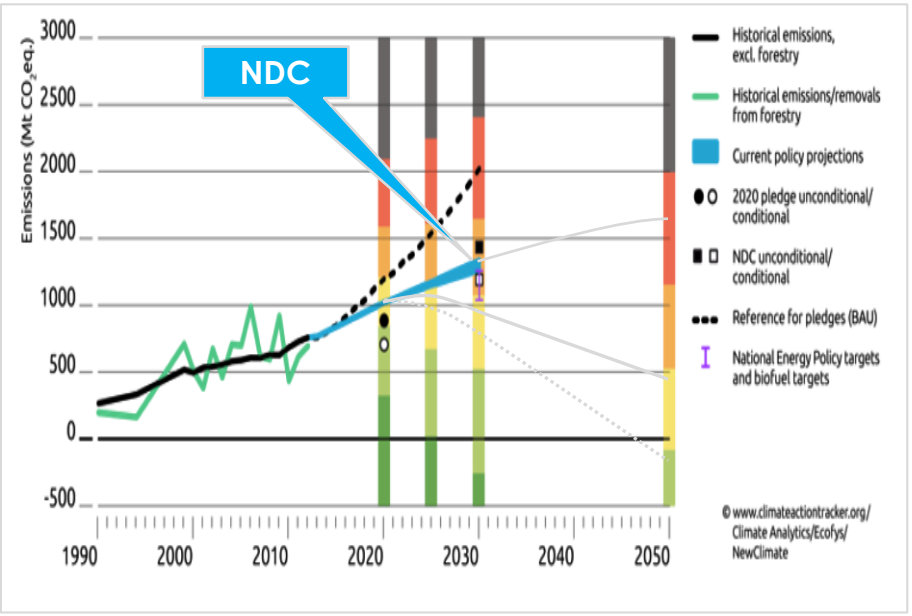
OUTLINE

- The Importance of Low Carbon Development for West Java
- GHGs emission Profile and Energy Demand Profile of West Java
- Modeling to Estimate GHGs Emission Reduction Potential
- Projection on Energy Demand and the Associated GHGs Emission
- Breakdown of GHGs Emission Reduction Target in 2030 and 2050

The Importance of Low Carbon Development for West Java

Sub-National Action Plan on Climate Change Mitigation (RAD), Contribute to Indonesia NDC, and Low Carbon Development



Critically insufficient

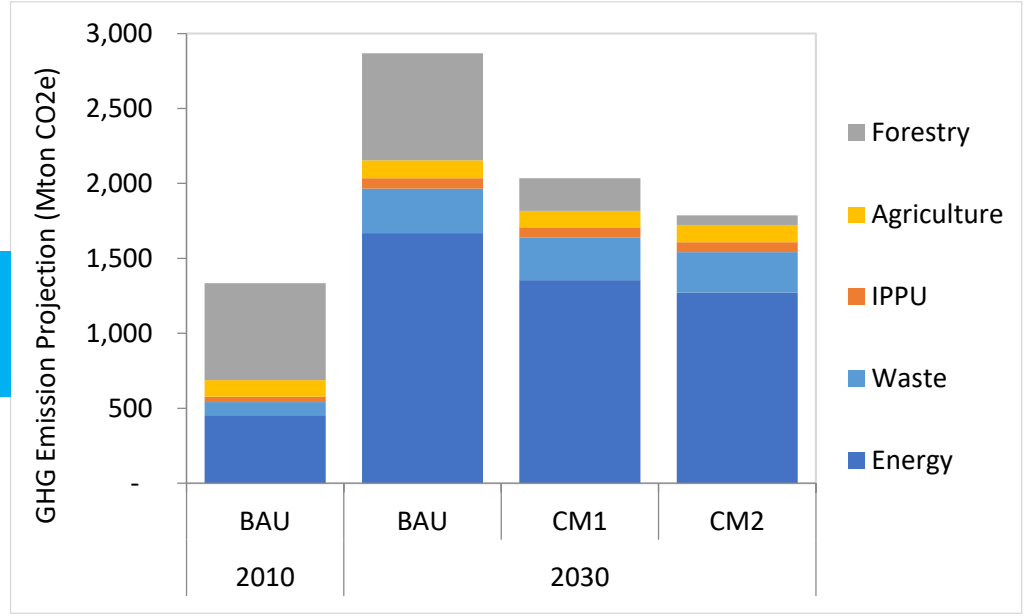
Highly insufficient

Insufficient

2°C compatible

1.5°C Paris Agreement compatible

NDC Target



West Java

- High economic activity, Economic annual growth 5.1%/year
- Very dense city's population of 1.365 persons/1 km^2 (with 1.1% population growth
- More than 48.3 million population living in 35,377 km^2 of land area
- Limited public transport infrastructure

In supporting National GHGs emission reduction to achieve the target of Indonesia NDC and Indonesia Long Term Strategy of Low Carbon Development

The Government of Indonesia (GOI) is committed to reduce the national GHGs emission level by:

CM1 : 29% below its baseline emission in 2030 (unconditional)

CM2: 41% below its baseline emission in 2030 (conditional), if there are international supports.

GHGs Emission Reduction Target and Its Achievement

2020 and 2030

RAN GRK
Presidential Decree
No. 61/2011.

Nationally Determined
Contribution
(NDC)

RAD-GRK of West Java
Governor Regulation No. 56/2012.

The Government of West Java Province has set a GHG emission reduction target in energy, industry and transport sectors of about **11.48 MTon CO2e** below the GHG emissions of BaU level in 2020

LCD of West Java 2030

2050

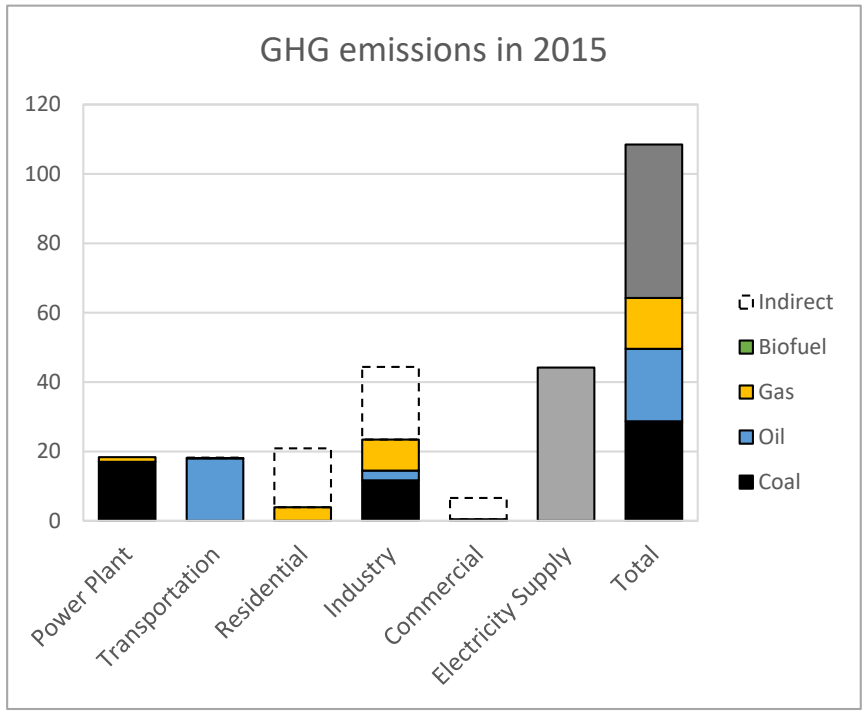
Long-term Strategy
(LTS)

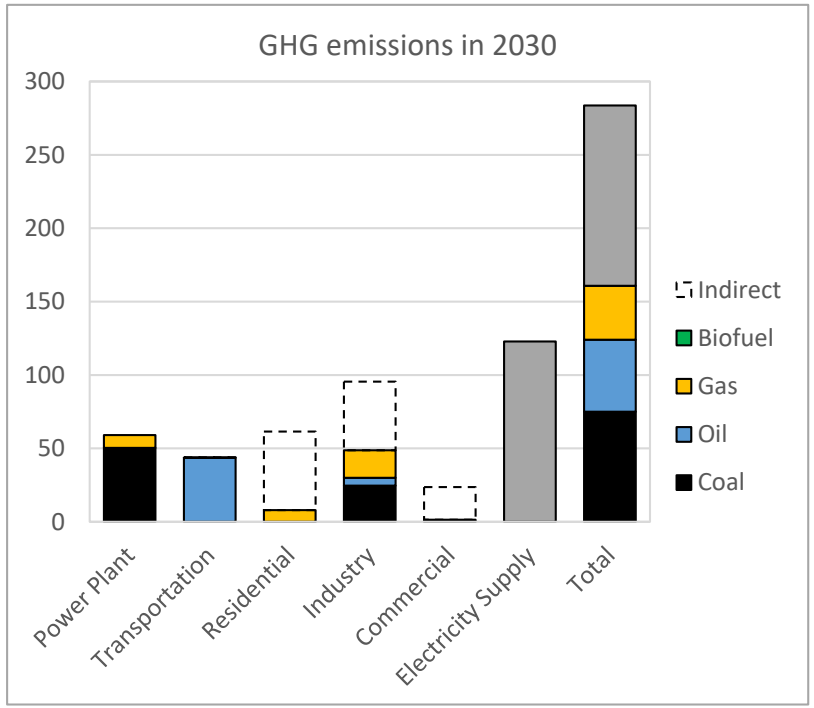
- West Java is now preparing its Provincial Low Carbon Development Strategy (LCDS)

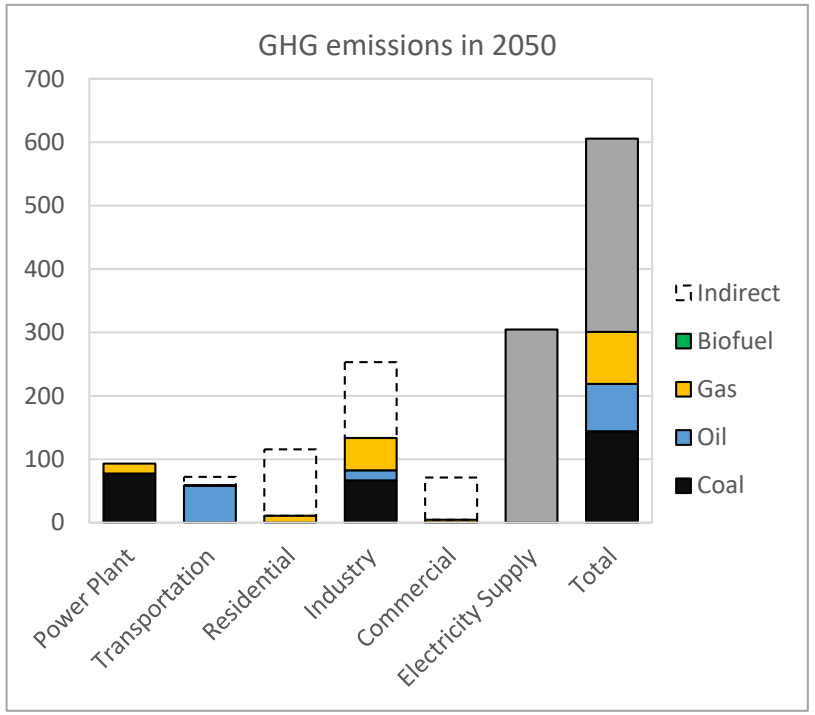
National Low Carbon Society (LCS)

GHGs Emission Profiles

Historical GHG Inventory ← → Projections, BaU







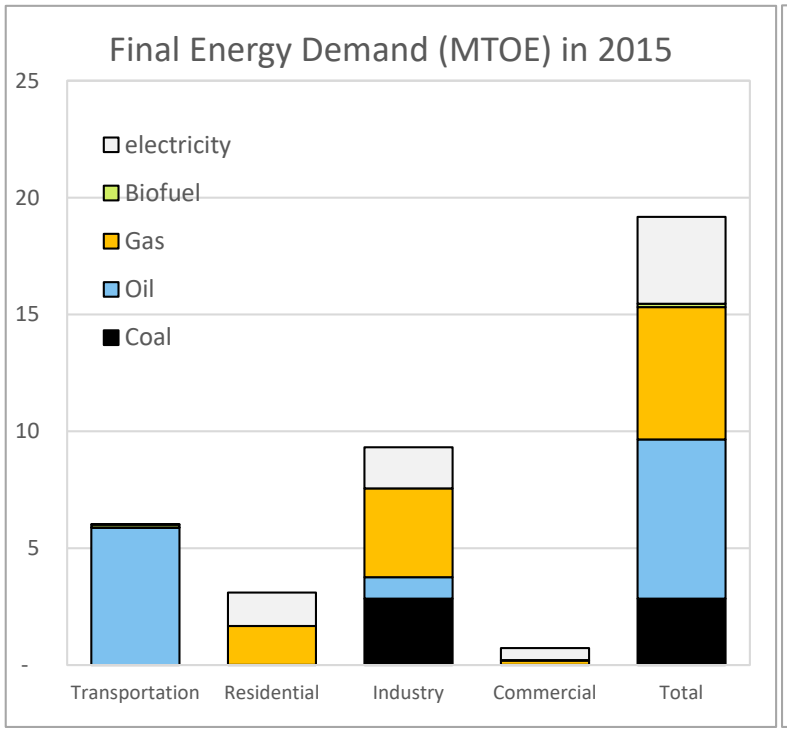
- West Java's electricity supply from :
  1. The authority of PLN (national electricity company) as these plants are grid-connected (JAMALI grid).
  2. Local power plant in West Java that generated GHGs emission from fuel burning
- Indirect GHGs emission from JAMALI grid (Allocation by end-use sector i.e., transportation, residential, industry, and commercial)

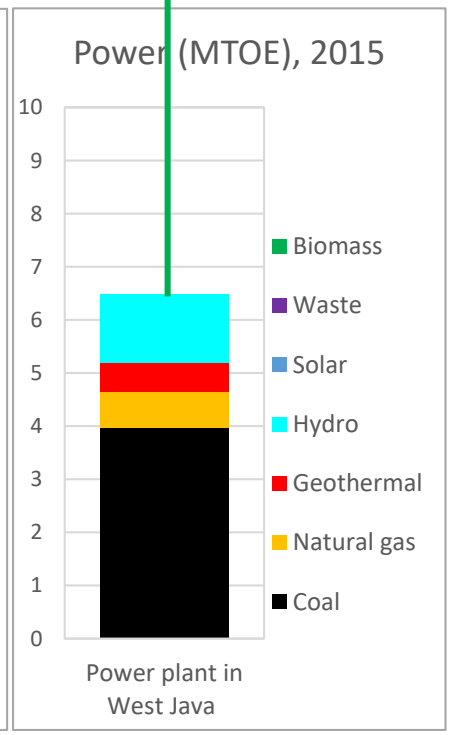
- End-use sector: more than half of direct combustion emissions are from fuel consumption in industry
- Emissions from indirect (electricity supply) in base year (2015) are accounted by transportation (0.3%), residential (38.4%), industry (47.4%), commercial (13.9%). The projection showed that transportation and commercial sector increase (4.6% and 21.9%) in 2050
- Industry sector is the largest sources of GHG emissions from energy category, followed by residential and transportation.

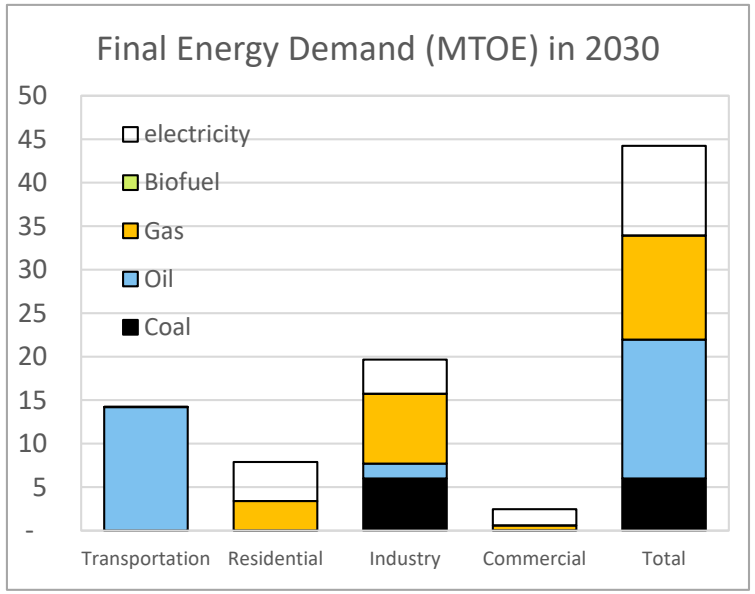
Final Energy Demand and Power Plants Profiles

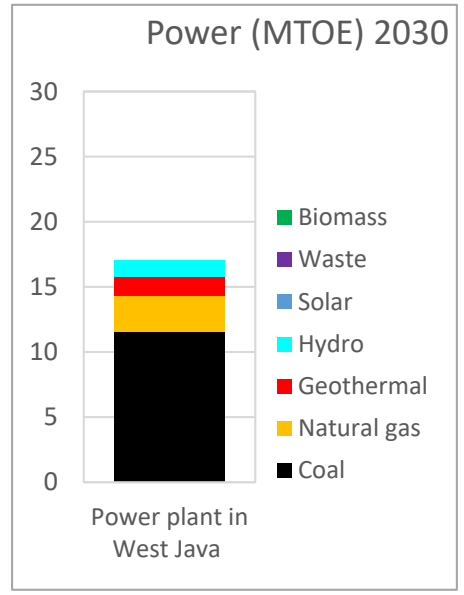
Historical Inventory ← → Projections, BaU

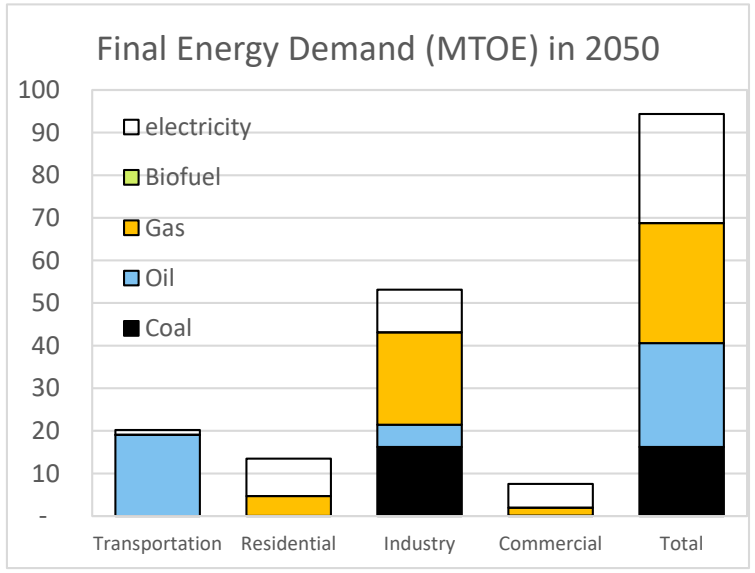
In 2015, share of Renewable Energy in power generation is 28,2% of total power generation.

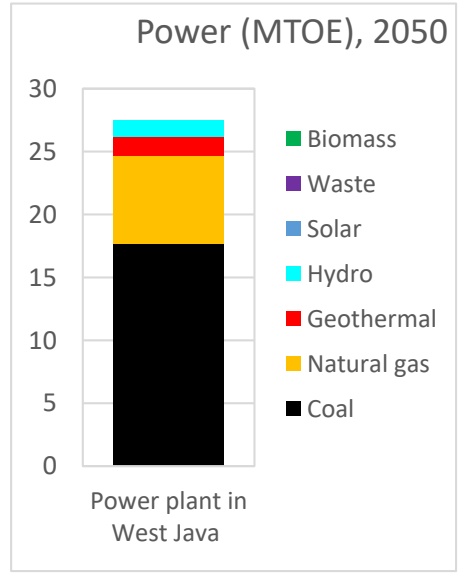


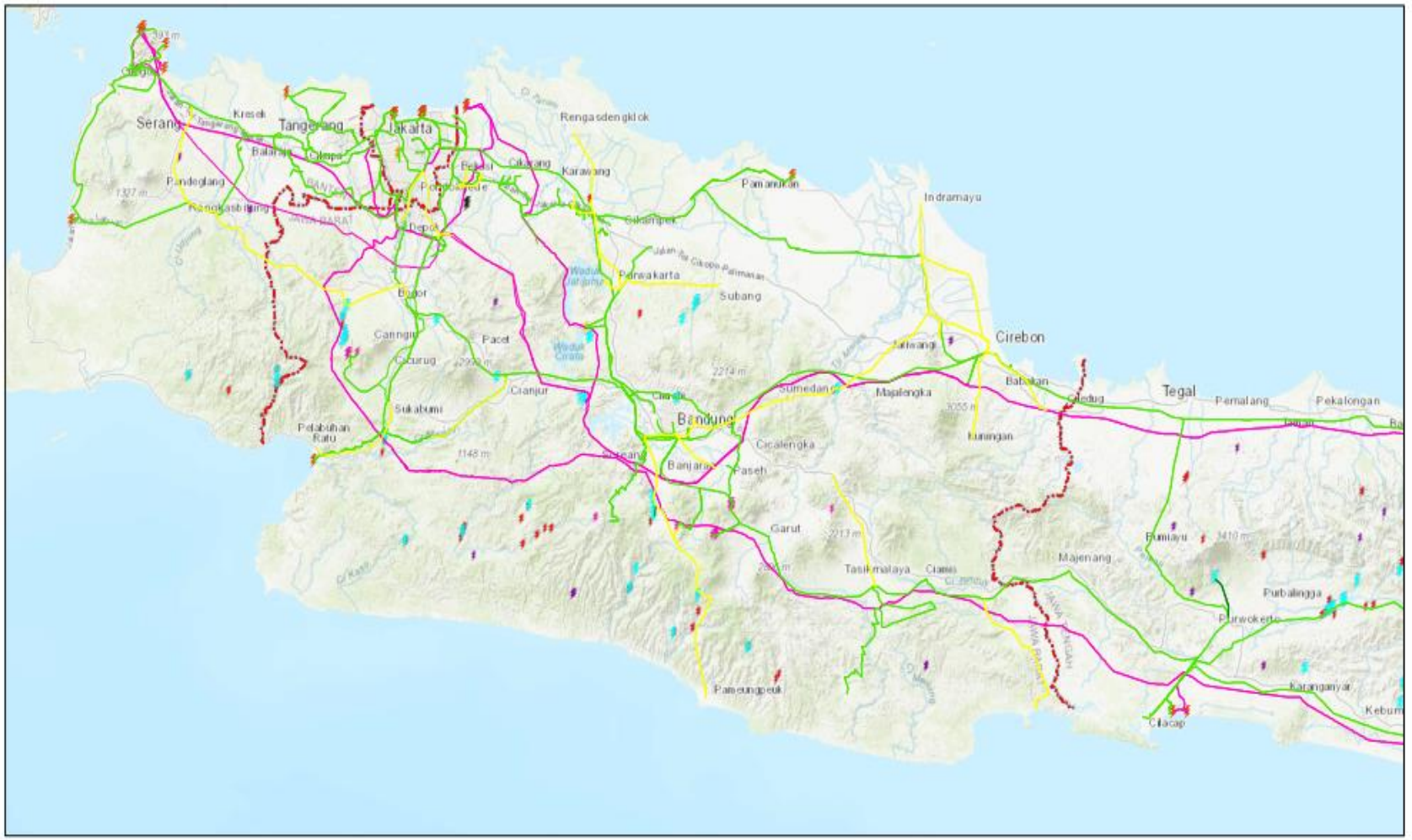












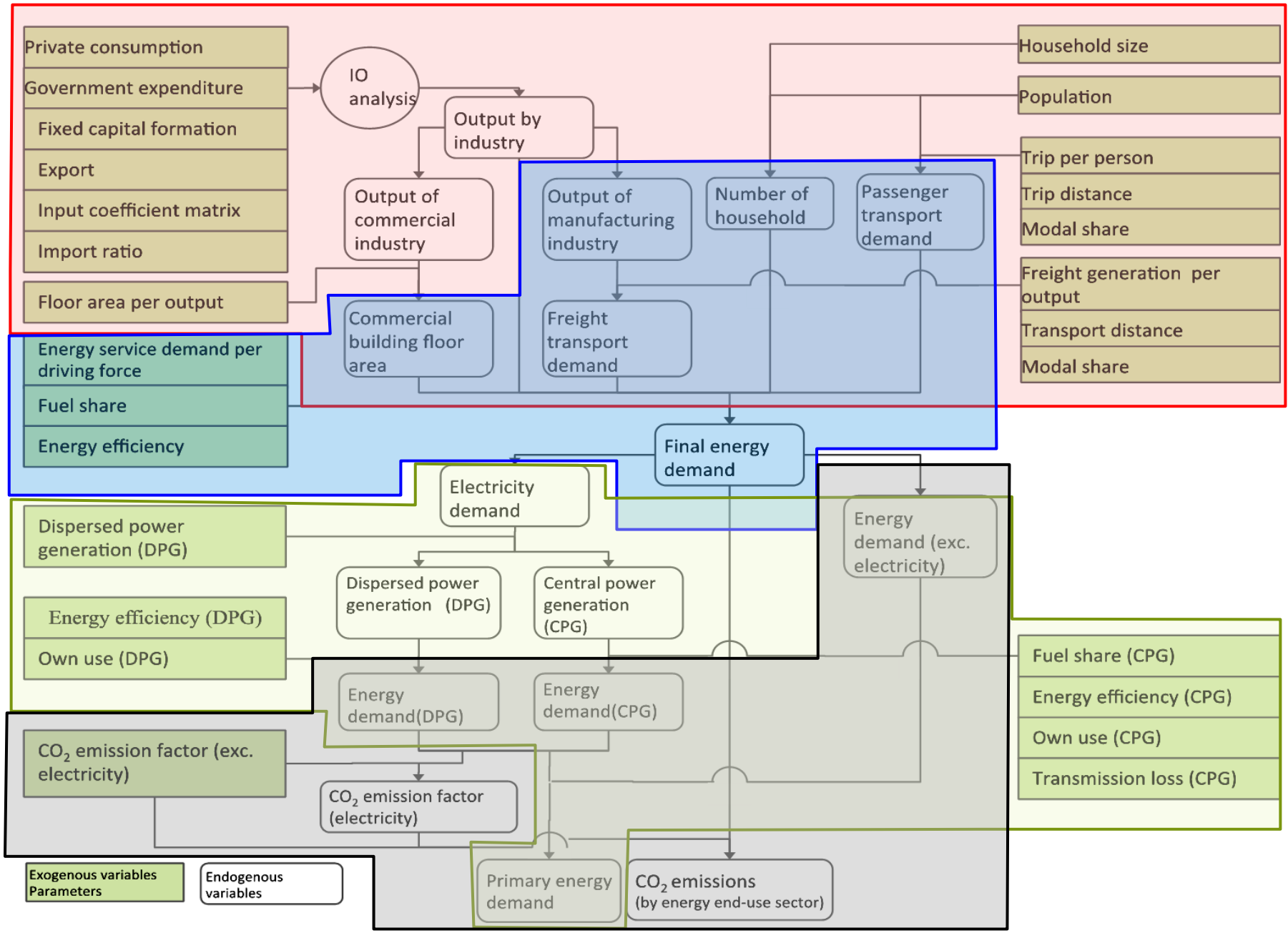
Existing Power Generations in West java, 2015

Fuel	Power Plant	Capacity, MW
Coal	PLTU Indramayu	870
	PLTU Sukabumi	969
	PLTU Cirebon	660
Gas	PLTGU Muara Tawar	829
	PLTG Muara Tawar	1,114
	PLTG Cikarang Listrikindo	300
	PLTGU Bekasi Power	119
Geothermal	PLTP (Salak, Kamojang, Drajat, W. Windu)	1,015
Hydro	PLTA Ubrug, Kracak, Plangan,Lamajan, Cikalong, Bengkok, Dago, Saguling, Cirata, Jatiluhur	1,015

Modeling to estimate GHG emissions reduction potential

Methodology: ExSS

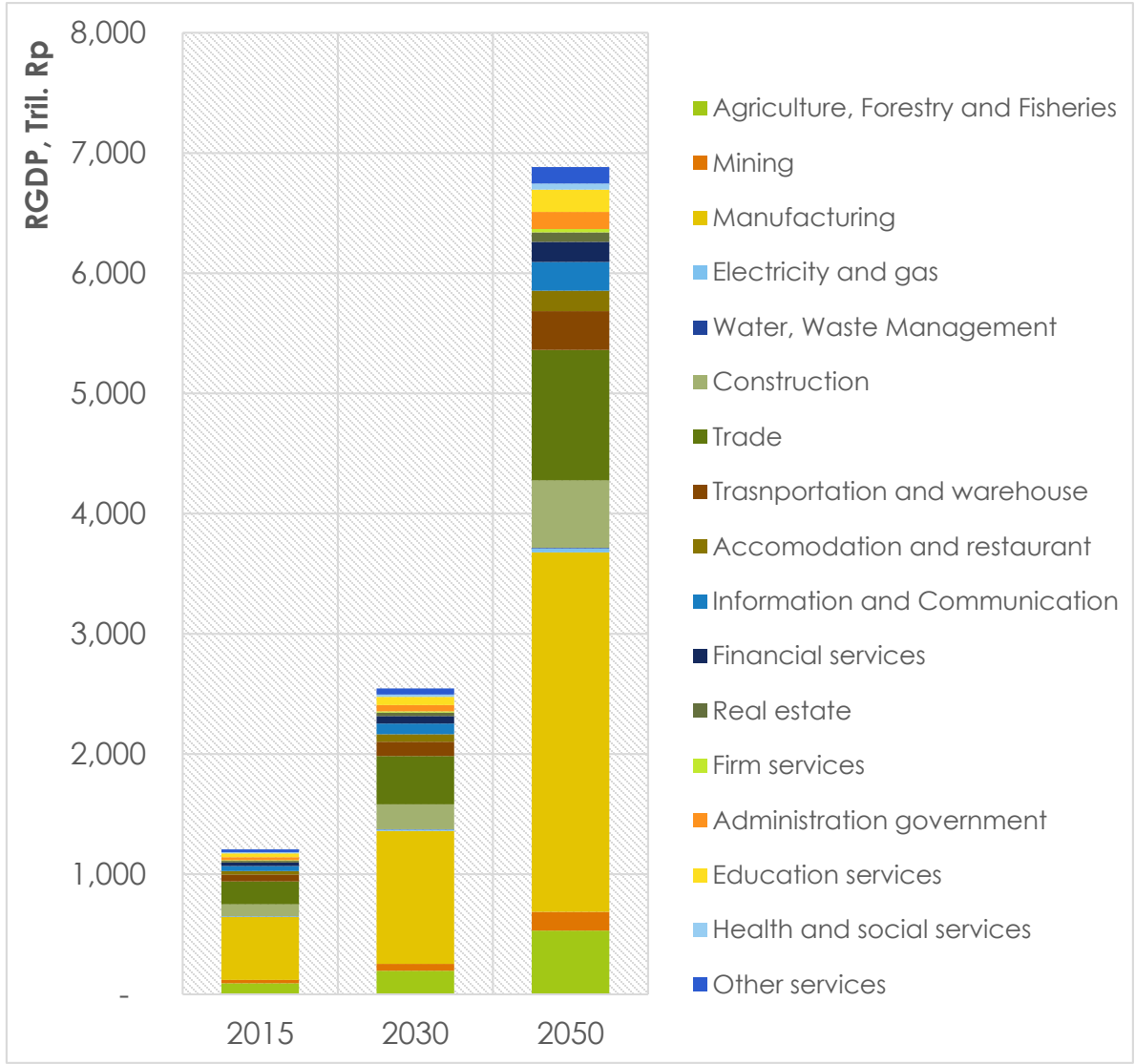
1. Setting Framework
2. Collection of the base year information
3. Collection of LC Measures Information
4. Estimation of Snapshots WITHOUT LC Measures
5. Estimation of Snapshots WITH LC Measures



1. ***Driving Force Settings***
2. ***Final Energy Demand***
3. ***Primary Energy Demand***
4. ***GHGs emission***

Assumption of Modelling

	Unit	2015	2030	2050	2030/2015	2050/2015
Population	Persons	46,709,600	55,193,800	62,647,136	1.18	1.34
No. of households	Households	12,415,357	14,670,447	16,651,536	1.18	1.34
GDRP	Tril. Rp	1,207	2,545	6,883	2.11	5.70
Passenger transport	mil. Pass - km	242,258	286,261	324,918	1.18	1.34

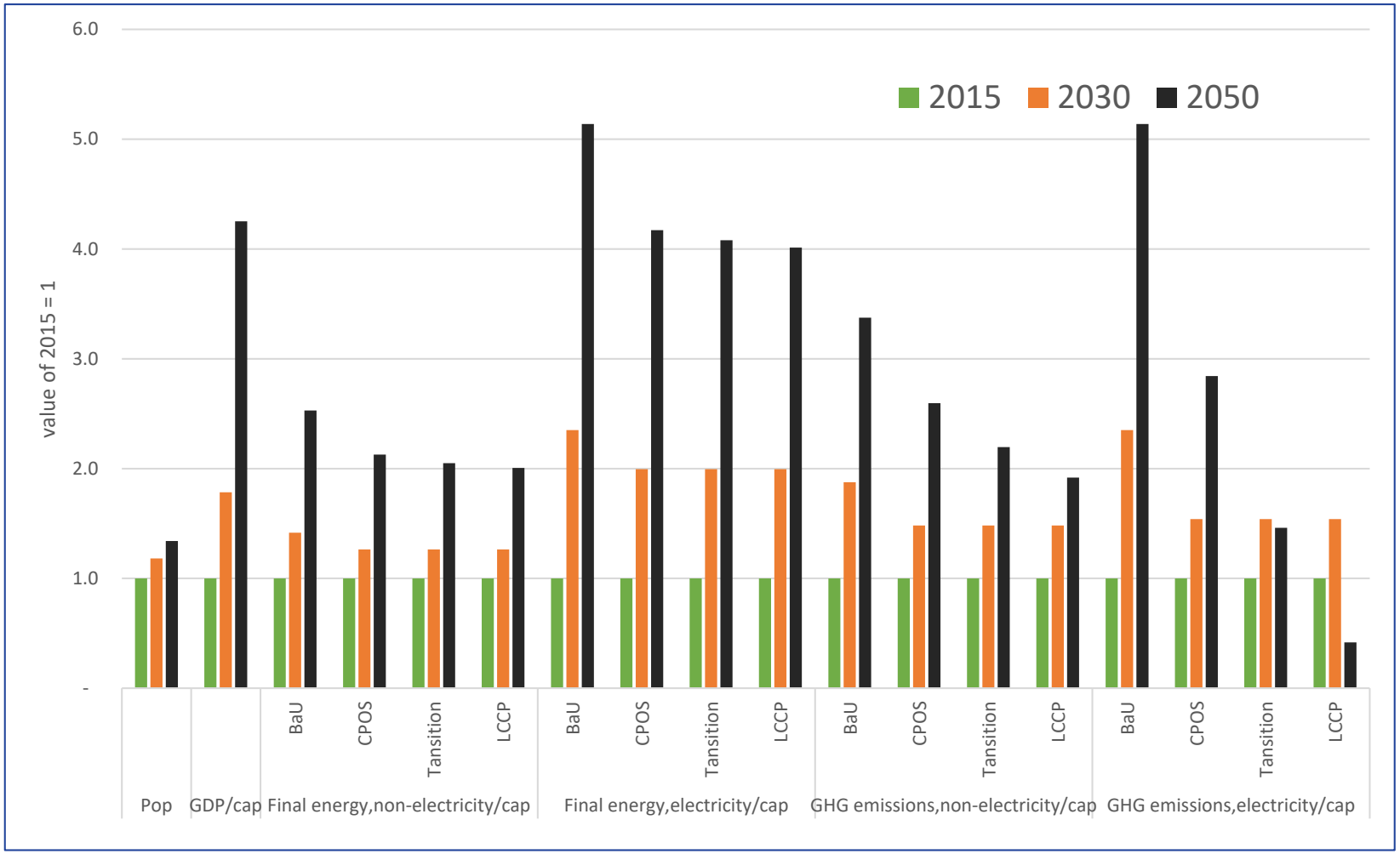


1USD = Rp. 14500

Projections on Energy Demand and The Associated GHG Emissions

To estimate GHG emission reduction potential from West Java

West Java Circumstances & Development Trends



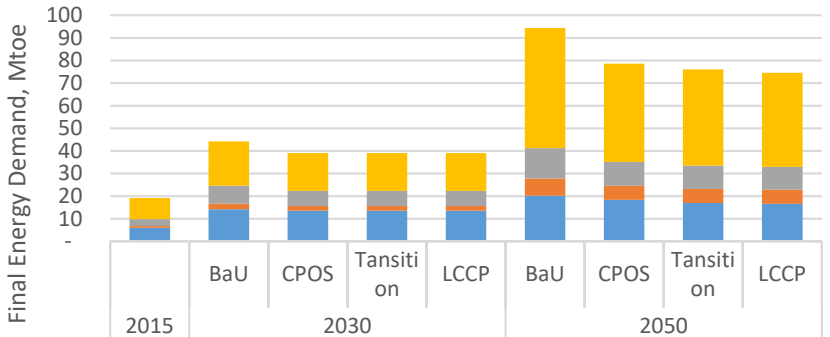
Projections on population, GDP, final energy, GHGs emission for base year (2015), 2030, and 2050

The results show:

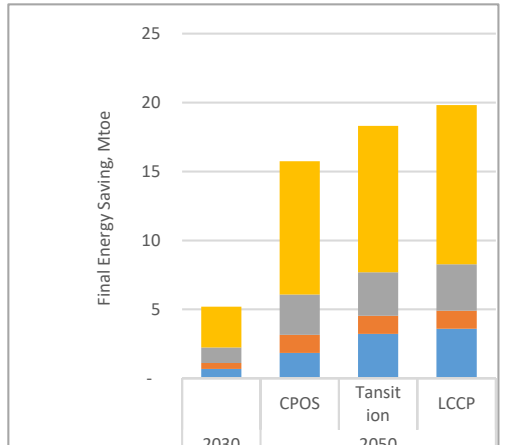
- Economic Growth Means Greater Access for Energy, considering the use of baseline technologies, this could lead to a climb in future energy related emissions.
- Main driver of GHG emissions over the past decade has been economic activity, which increased at a rate of 5.1% per year.
- Decreasing energy use per GDP in CM scenario (compared to BaU scenario) indicated that the results are from (i) improvement of efficiency, (ii) fuel switching (diesel oil to gas), iii) renewable energy use (bio-fuel), iv) mode shift transportation; v) implementation of clean coal technology (Ultra super critical); biomass co-firing in existing coal fired plant; promotion of solar PV, increase renewable energy share (mainly geothermal, hydro, solar, biomass and waste)

Energy Demand of West Java

Final Energy Demand by Sector

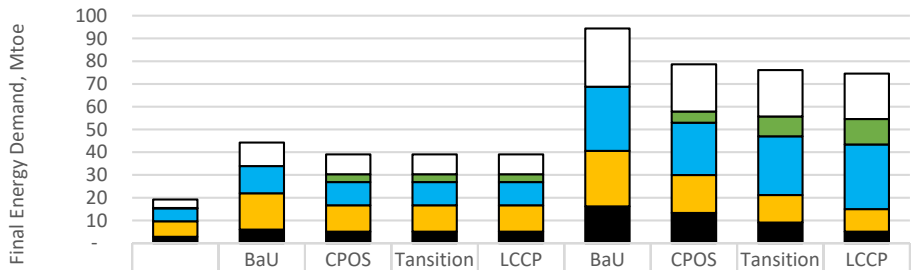


	2015	2030 BaU	2030 CPOS	2030 Tansition	2030 LCCP	2050 BaU	2050 CPOS	2050 Tansition	2050 LCCP
Industry	9,320	19,654	16,688	16,688	16,688	53,151	43,487	42,521	41,596
Residential	3,100	7,891	6,763	6,763	6,763	13,469	10,541	10,317	10,102
Commercial	730	2,459	2,031	2,031	2,031	7,557	6,242	6,242	6,242
Transportation	6,027	14,243	13,565	13,565	13,565	20,208	18,371	16,987	16,617



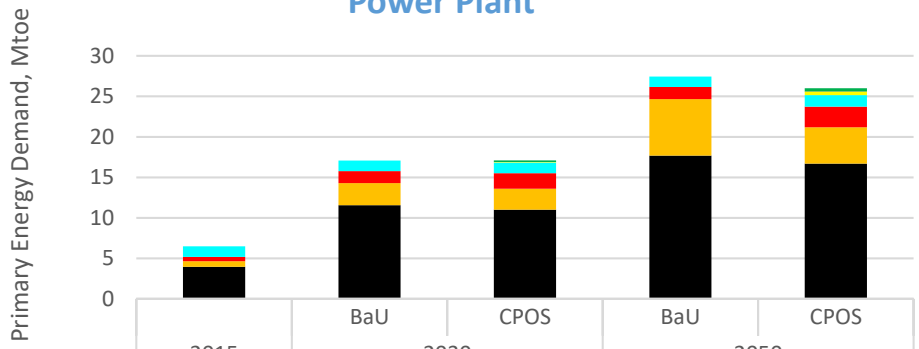
	2030 CPOS	2050 Tansition	2050 LCCP
Industry	2,967	9,664	10,630	11,555
Residential	1,127	2,928	3,152	3,367
Commercial	428	1,314	1,314	1,314
Transportation	678	1,837	3,221	3,590

Final Energy Demand by Sector



	2015	2030 BaU	2030 CPOS	2030 Tansition	2030 LCCP	2050 BaU	2050 CPOS	2050 Tansition	2050 LCCP
electricity	3,717	10,325	8,763	8,763	8,763	25,614	20,795	20,337	20,001
biofuel	146	-	3,425	3,425	3,425	-	4,897	8,727	11,148
gas	5,658	11,965	10,211	10,211	10,211	28,189	23,022	25,809	28,456
oil	6,815	15,964	11,561	11,561	11,561	24,377	16,670	12,119	9,880
coal	2,841	5,992	5,088	5,088	5,088	16,204	13,258	9,074	5,073

Primary Energy Demand by type of energy in Power Plant

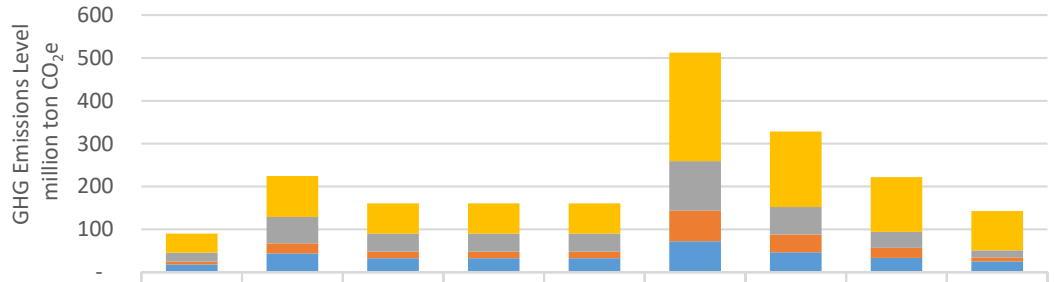


	2015	2030 BaU	2030 CPOS	2050 BaU	2050 CPOS
Biomass	0.00	0.00	0.20	0.00	0.40
Waste	0.00	0.00	0.01	0.00	0.01
Solar	0.00	0.00	0.05	0.00	0.46
Hydro	1.29	1.29	1.33	1.29	1.42
Geothermal	0.54	1.49	1.91	1.49	2.55
Natural Gas	0.68	2.72	2.58	6.98	4.48
Coal	3.97	11.56	11.02	17.69	16.71

- The primary energy used to supply electricity demand in local power generation is still dominated by coal and natural gas
- **In mitigation scenario:**
  2030: the implementation of 4.5 GW renewable energy power plant provide the increasing of RE (3.5 Mtoe)
- 2050: the implementation of 11.0 GW renewable energy power plant provide the increasing of RE (4.82 Mtoe)

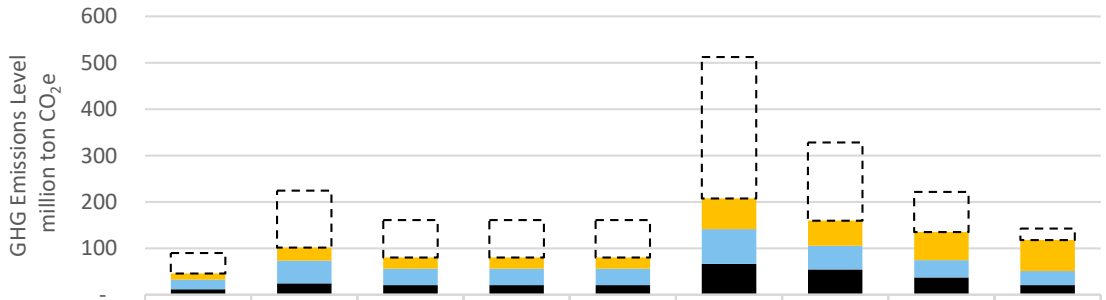
GHGs Emission of West Java

GHGs emission from energy by sub-sector



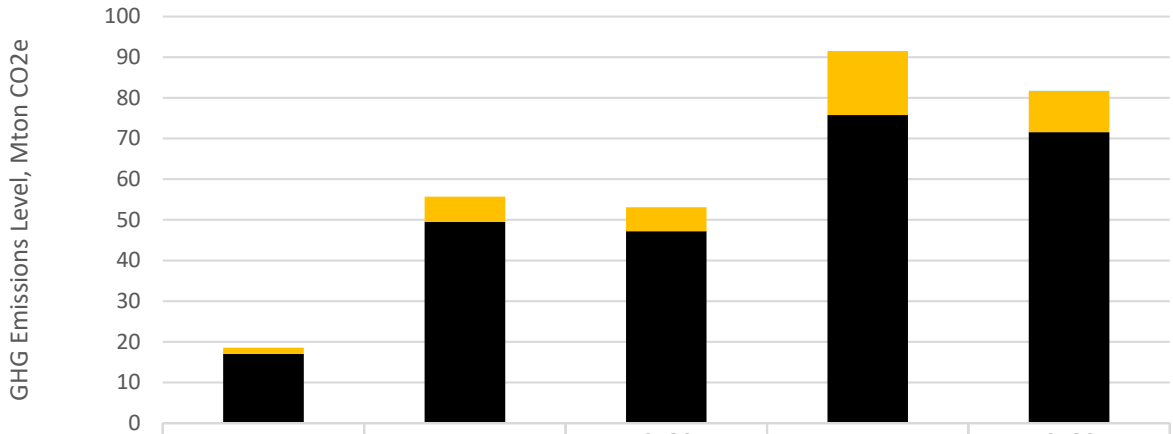
	2015	2030 BaU	2030 CPOS	2030 Tansition	2030 LCCP	2050 BaU	2050 CPOS	2050 Tansition	2050 LCCP
Industry	44,392	95,489	70,674	70,674	70,674	253,162	175,967	127,613	91,620
Residential	20,904	61,477	42,228	42,228	42,228	115,547	64,363	37,103	16,415
Commercial	6,595	23,634	15,317	15,317	15,317	71,279	41,293	23,504	9,530
Transportation	18,217	43,965	32,631	32,631	32,631	72,347	46,709	33,569	25,265

GHGs emission from energy by type of energy



	2015	2030 BaU	2030 CPOS	2030 Tansition	2030 LCCP	2050 BaU	2050 CPOS	2050 Tansition	2050 LCCP
electricity	44,213	122,811	80,452	80,452	80,452	304,653	168,563	86,637	24,779
biofuel	-	-	-	-	-	-	-	-	-
gas	13,296	28,118	23,996	23,996	23,996	66,245	54,102	60,650	66,873
oil	20,922	49,011	35,491	35,491	35,491	74,838	51,176	37,205	30,330
coal	11,678	24,627	20,910	20,910	20,910	66,599	54,490	37,295	20,848

GHGs emission from Power Generation



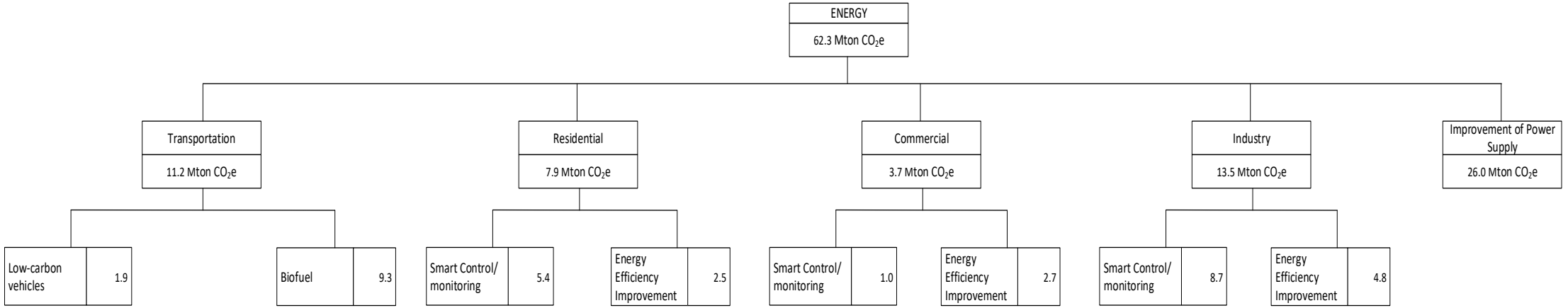
	2015	2030 BaU	2030 CPOS	2050 BaU	2050 CPOS
Biomass	-	-	0.01	-	0.03
Natural Gas	1.54	6.15	5.83	15.74	10.11
Coal	17.01	49.54	47.21	75.78	71.56

GHGs emission Mitigation Action

Low Carbon Development Pathway of West Java

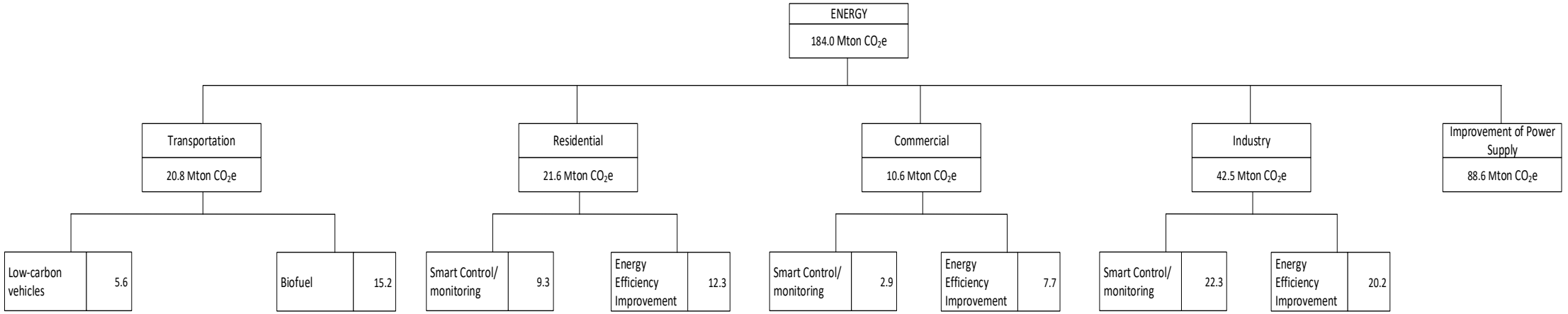
GHG Emissions Reduction Target in Energy Sector

2030



2050

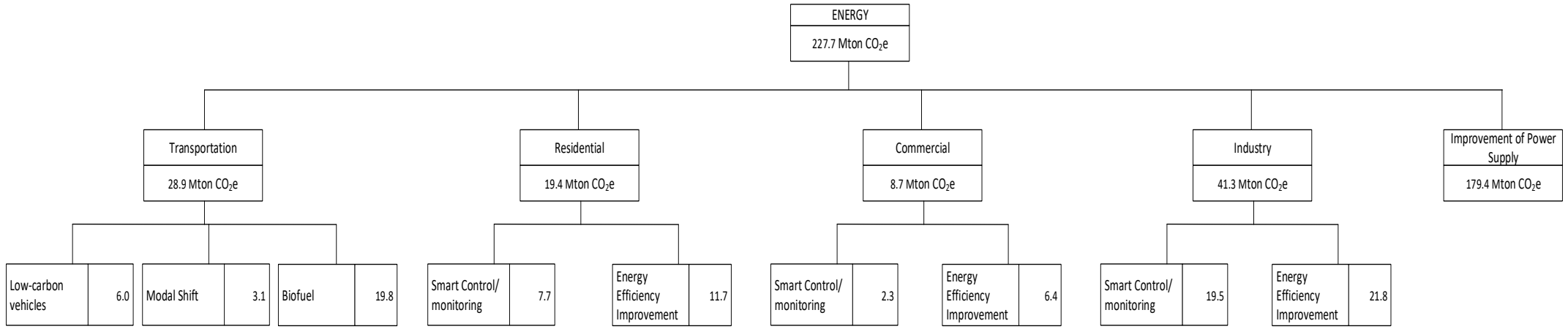
CPOS



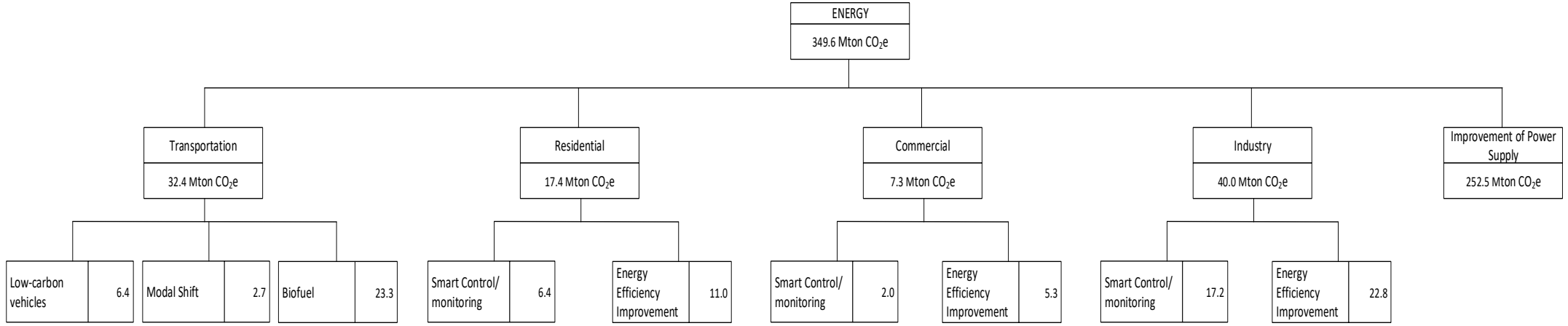
GHG Emissions Reduction Target in Energy Sector

2050

Transition



LCCP



Roadmap for Mitigation Action in 2030 and 2050

Mitigation	Sub-sector	Action		Implementation	
				2030	2050
Energy efficiency	Transportation	Low-carbon vehicles	%	18	75
	Industry	Energy efficiency	%	18	75
		Smart control/ monitoring	%	20	75
	Commercial	Energy efficiency	%	18	75
		Smart control/ monitoring	%	20	75
	Residential	Energy efficiency	%	18	75
		Smart control/ monitoring	%	20	75
	Power supply	Improvement of power supply	%	18	75
Biofuel	Transportation	The use of bio-fuel	-	B100	B100

Roadmap for Mitigation Action in 2030 and 2050

❑ Coal Fired Power Plant (Co-firing)

	Power plant		Unit	2030	2050
	PLTU Indramayu	Coal	TJ	54.985	52.091
		Biomass	TJ	2.894	5.788
		Energy input	TJ	57.879	57.879
		Electricity Production	MWh	6.431	6.431
		Capacity	MW	870	870
	PLTU Sukabumi	Coal	TJ	61.242	58.019
		Biomass (1% 2020; 3% 2025; 5% 2030; 10% 2050)	TJ	3.223	6.447
		Energy input	TJ	64.466	64.466
		Electricity Production	MWh	7.163	7.163
		Capacity	MW	969	969
	PLTU Cirebon	Coal	TJ	41.713	39.518
		Biomass (1% 2020; 3% 2025; 5% 2030; 10% 2050)	TJ	2.195	4.391
		Energy input	TJ	43.469	43.469
		Electricity Production	MWh	4.879	4.879
		Intensitas energi	MJ/kWh	9	9
		Capacity	MW	660	660
New Development (USC Technology)	**PLTU Indramayu II**	Coal	TJ	123.773	247.546
		Energy input	TJ	123.773	247.546
		Electricity Production	MWh	14.784	29.568
		Capacity	MW	2.000	4.000
	PLTU Jawa 1	Coal	TJ	57.183	57.183
		Energy input	TJ	57.183	57.183
		Electricity Production	MWh	6.830	6.830
		Capacity	MW	924	924
	PLTU Jawa 3/Cirebon II	Coal	TJ	122.535	245.070
		Energy input	TJ	122.535	245.070
		Electricity Production	MWh	14.636	29.272
		Capacity	MW	1.980	3.960

❑ Gas Fired Power Generation

	Power plant		Unit	2030	2050
	PLTGU Muara Tawar	Natural gas	TJ	25.034	25.034
		Energy input	TJ	25.034	25.034
		Production	MWh	2.980	2.980
		Capacity	MW	829	829
New (Development Combined Cycle Power Generation)	**PLTGU Jawa 1**	Natural gas	TJ	79.458	158.916
		Energy input	TJ	79.458	158.916
		Production	MWh	9.491	18.982
		Capacity	MW	2.640	5.280
	PLTG Muara Tawar	Natural gas	TJ	10	10
		Energy input	TJ	10	10
		Electricity Production	MWh	1	1
		Capacity	MW	1.114,0	1.114,0
	PLTG Cikarang Listrikindo	Natural gas	TJ	0	0
		Energy input	TJ	0	0
		Electricity Production	MWh	0	0
		Capacity	MW	300	300
	PLTGU Bekasi Power	Natural gas	TJ	3.586	3.586
		Energy input	TJ	3.586	3.586
		Electricity Production	MWh	427	427
		Capacity	MW	119	119

Roadmap for Mitigation Action in 2030 and 2050

❑ Renewable Power Generation

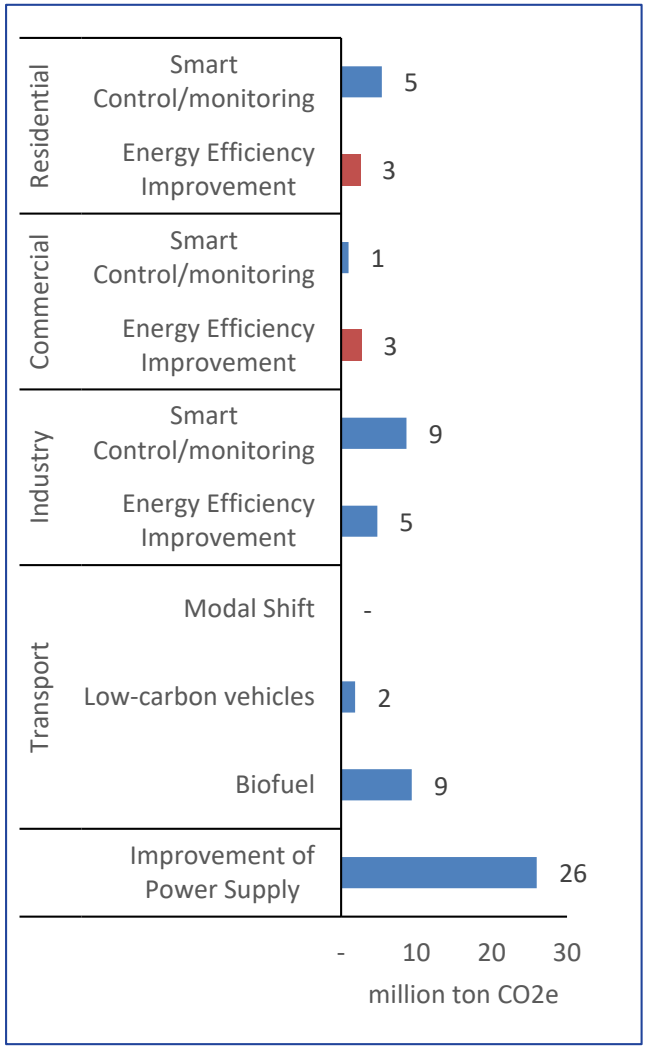
	Power plant		Unit	2030	2050
	PLTP Salak, Kamojang, Drajat, W. Windu	Geothermal	TJ	62.344	62.344
		Energy input	TJ	62.344	62.344
		Electricity Production	MWh	7.422	7.422
		Capacity	MW	1015	1015
New Development	**PLTP**	Geothermal	TJ	17.613	44.239
		Energy input	TJ	17.613	44.239
		Electricity Production	MWh	5.812	14.599
		Capacity	MW	795	1.997
	PLTA Ubrug, Kracak, Plangan,Lamajan,Cikalong, Bengkok, Dago, Saguling, Cirata, Jatiluhur	Hydro	TJ	54.132	54.132
		Energy input	TJ	54.132	54.132
		Production	MWh	6.444	6.444
		Capacity	MW	1923	1923
New Development	**PLTA**	Hydro	TJ	1.625	5166
		Energy input	TJ	1.625	5166
		Production	MWh	536	1705
		Capacity	MW	160	509
New Development	**PLTS**	Solar	TJ	2.074	19.130
		Energy input	TJ	2.074	19.130
		Production	MWh	519	4.782
		Capacity	MW	592	5.459
New Development	**PLTSa**	Waste	TJ	335	335
		Energy input	TJ	335	335
		Production	MWh	84	84
		Capacity	MW	29	57

Mitigation in Power Generation:

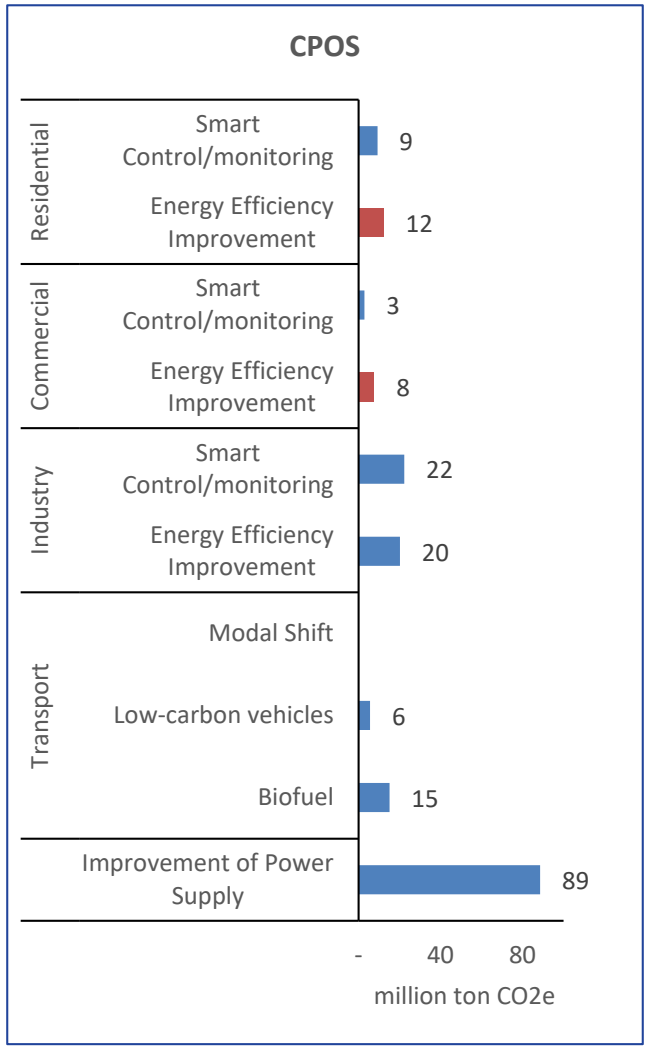
1. Power plant's development refer to RUPTL 2019-2028 , RUKN (2019-2038) and increase share of renewables (based on the availabilityof renewable energy constraint)
2. Implementation of clean coal technology, such as Ultra Super Critical
3. Efforts to increase Renewable energy (RE) through biomass cofiring in existing coal fired power plant (asumption= biomass share of 1% 2020; 3% 2025; 5% 2030; 10% 2050)
4. Increase renewable energy share (mainly geothermal, hydro, solar (Promotion of solar PV) and waste)

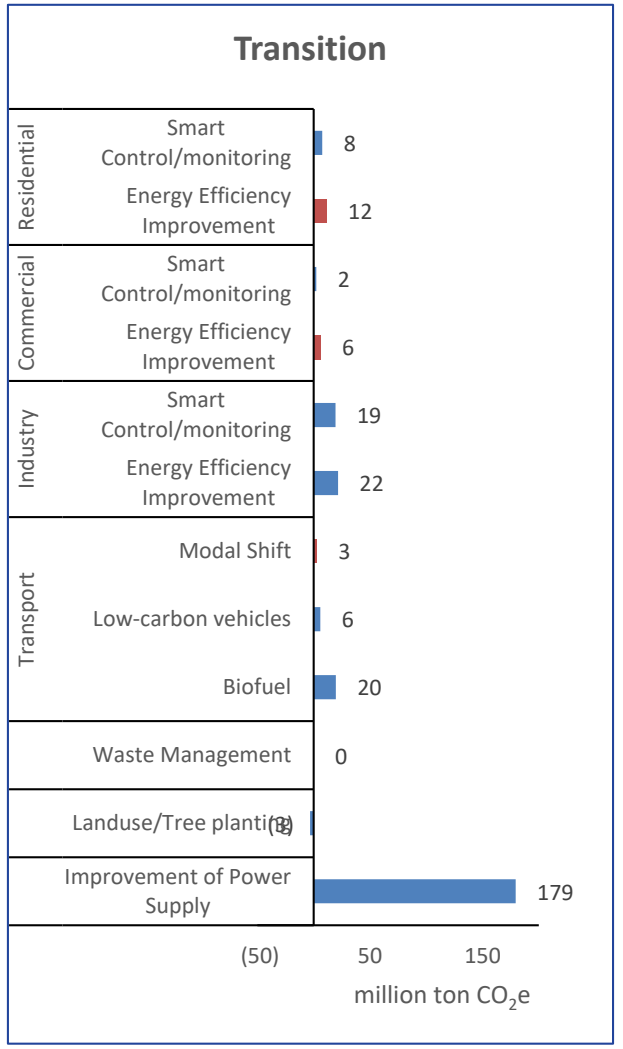
Breakdown of GHGs Emission Reduction Target

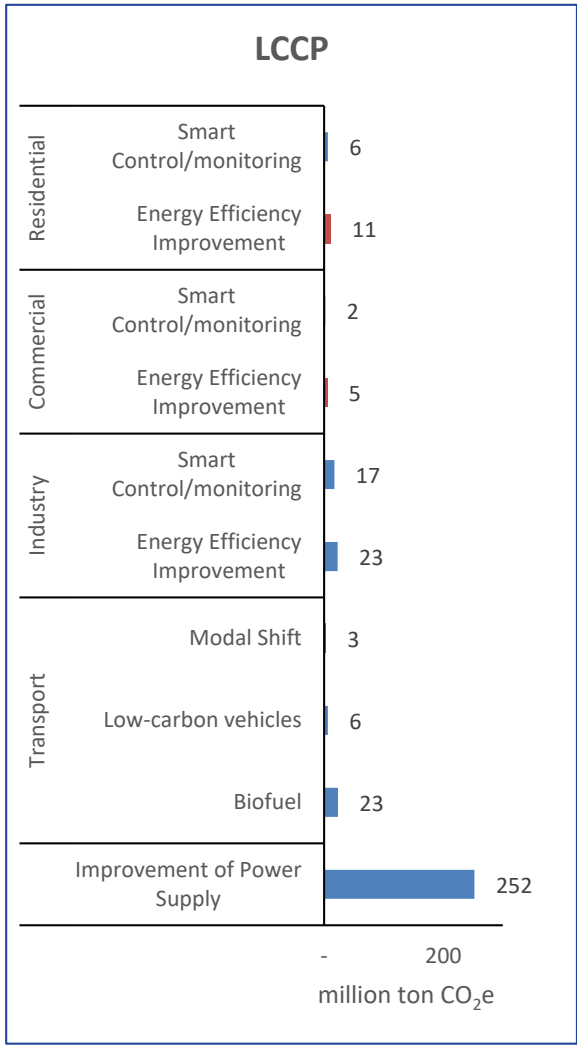
2030



2050

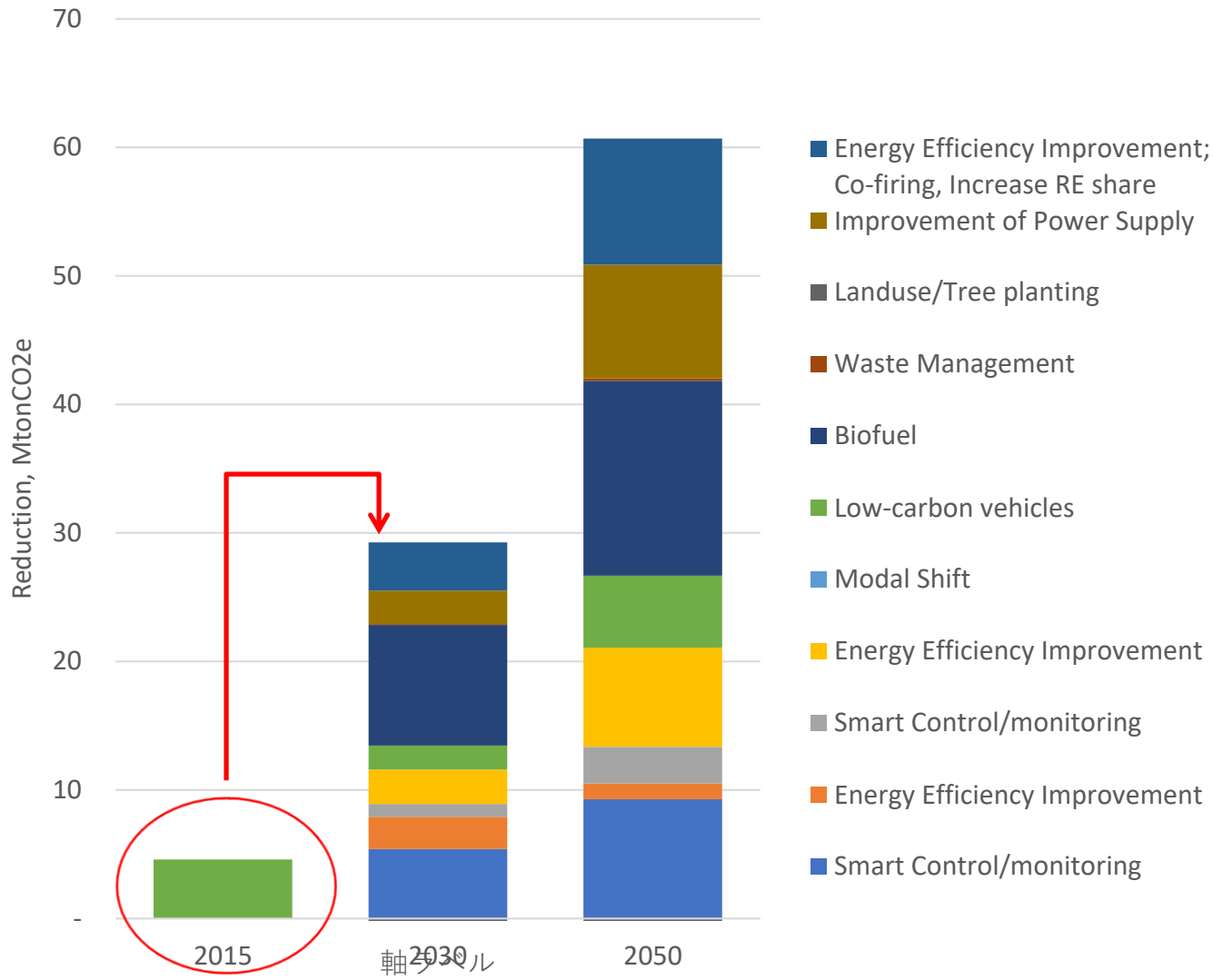






Emission reduction achieved (2019) vs emission reduction target in Energy Sector (Include Power Sub-sector)

Emission reduction achieved in 2019 is **6.7%** of reduction target in 2030



Source: GHG reduction in 2019 derived from Measurement, Reporting, and Verification of West Java

Conclusion and Remarks

The Projections on GHGs emission and its reduction potential

		2015	2030			2050			% Reduction	
									2030	2050
			BaU	CM	Reduction	BaU	CPOS	Reduction	CM	CPOS
CO_2 emissions (Mton CO_2e) by sector	a) Energy (final)	90.1	224.6	160,8	63.8	512.3	327.3	**185**	**28.4%**	**36.1%**
	b) Power	18.55	55.68	51.92	3.76	91.52	81.7	**9.82**	**6.7%**	**10.7%**
Total CO_2 emissions (Mton CO_2e)		108.7	280.3	211.8	68.5	603.9	409.0	**194.9**	**24.4%**	**32.2%**
CO_2 emissions per GDP (tCO_2e/mil. Rp)		0.09	0.11	0.08		0.09	0.06			
CO_2 emissions per capita (tCO_2e/person)		2.33	5.08	3.88		9.64	6.53			
C emissions per capita (tC/person)		0.05	0.12	0.09		0.22	0.15			

- GHGs emission reduction target from energy sector (include power sub-sector) is 68.5 Mton CO_2e or equivalent with 24.4% reduction in 2030; and 194.9 Mton CO_2e or equivalent with 32.2% reduction in 2050
- GHGs emission reduction achieved in 2019 is 4.596 Mton CO_2e that derived from transportation sub-sector or equivalent with 6.7% of GHGs emission reduction target in 2030.
- There are still rooms for improvement on mitigation action from energy sector and waste sector to achieve GHGs emission reduction target in 2030 and 2050.

THANK YOU

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