One Pagers

Indonesia 2050 Pathway Calculator

Cooperation of Ministry of Energy and Mineral Resources and Department of Energy & Climate Change United Kingdom

http://calculator2050.esdm.go.id/pathways

TRANSPORTATION SECTOR

Modal Shift of Freight Transportation

Freight distribution pattern is still highly dominated by road transportation amounting 93.5%, followed by 6% of marine transportation and rail transportation of 0.23%. Transportation mode included in the one pager are truck, train and ship. Government encourages freight transportation modal shifts from road transportation to a more efficient transport modes, namely train and ship through infrastructure capacity improvement, such as double track development and expansion of the rail network. Government and private sectors apply the concept of Sea Tol for marine transportation .

Level 1

Level 1 assumes that in 2050, the freight transportation will still be dominated by truck compare to train and ship. Train capacity increases following the double track in Java Island and the construction of railway network system in 5 main islands that has been 20% completed. GDP share of freight transportation in 2050 is similar to that of base year, with 2,39% share of train and 30.13% share of marine transportation.

Level 2

Level 2 assumes that in 2050, capacity of railway system increases following the 40% completion of railway system construction on 5 main islands. Improvement of ports has been done in the Western part of Indonesia. It leads to an increase in GDP share of freight transportation, with 5% share of train and 35% share of marine transportation by 2050.

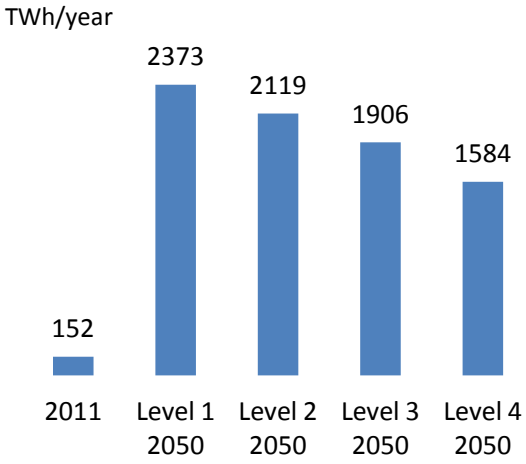
Level 3

Level 3 assumes that in 2050, capacity of railway system increases following the 60% completion of railway system construction on 5 main islands. Improvement of ports has been done in the Western and Central parts of Indonesia, thereby Marine Terminal program could be implemented effectively in Western and Central parts of Indonesia. It leads to an increase in GDP share of freight transportation, with 19% share of train and 38% share of marine transportation by 2050.

Level 4

Level 4 assumes that the Eastern part of Indonesia by 2050 has developed significantly, thus load factor of ship from this area increases and the Marine Terminal program could be implemented effectively. Share of road transportation becomes lower and the railway system construction has completed 100%. This situation leads to an increase in GDP share of freight transportation, with 15% share of train and 42.5% share of marine transportation by 2050.

Source: www.hotfrog.co.id



Mode	Year 2011	Level 1 2050	Level 2 2050	Level 3 2050	Level 4 2050
Truck	68.29%	67.48%	60%	53%	42.5%
Train	1.22%	2.39%	5%	19%	15%
Ship	30.49%	3.13%	35%	15%	42.5%

Fuel Mix Of Freight Transportation

Currently, freight transportation still relies on fossil-fuelled vehicles. To improve the efficiency of energy use and reducing greenhouse gas emission from freight transportation sector, currently trials for the use of CNG for ships has been conducted. Simultaneously, the use of fuel for transportation can be reduced through using nowadays engine technology

Level 1

Level 1 assumes that in 2050, the share of pure biodiesel use in freight transportation is still similar to the base year, that is 2.42% for truck. Alternative fuel has not been tapped for freight train. Meanwhile, natural gas has been used for marine transportation with 2% share.

Level 2

Level 2 assumes that in 2050 the use of natural gas is marine transportation will reach 5% share following the construction of natural gas distribution infrastructure in the main ports. Share of biofuel increases to 30% for road transportation following the mandate in the Minister of Energy and Mineral Resources No.20 of 2014. Share of biofuel for train will get to 10% by 2050.

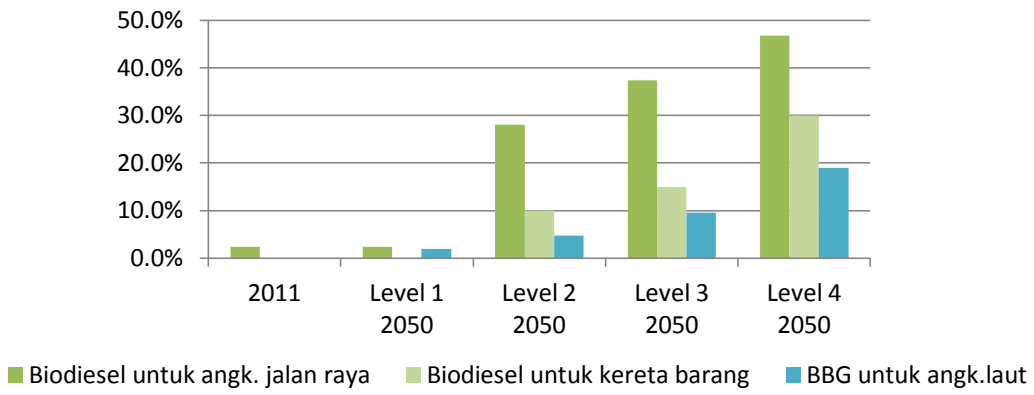
Level 3

Level 3 assumes that biofuel share reaches 40% for road transportation with the adoption of flexible fuel vehicle technology. Biofuel share for train will be 15% by 2050. And natural gas share for marine transportation will reach 10% due to the government policy on ship obligation to use natural gas

Level 4

Level 4 assumes that marine transportation in 2050 would have used natural gas in the amount of 20% of total fuel mix due the expansion of natural gas distribution infrastructure. Biofuel accounts for 50% of total fuel mix for road transportation following the introduction of machine technology for vehicle that uses pure biodiesel. Biofuel for freight train will account for 30% share of fuel mix by 2050.

Source: http://carrynetwork.com/link_in_frame.php?link=589



Mode	Technology	Year 2011	Level 1 2050	Level 2 2050	Level 3 2050	Level 4 2050
Truck	Biodiesel *)	2.42%	2.42%	30%	40%	50%
Train	Biodiesel *)	0%	0%	10%	15%	30%
Ship	BBG	0%	2%	5%	10%	20%

*) from total diiesel oil needs

Modal Shift Of Passenger Transportation

Passenger transportation described by one pager includes road transportation and electric technology-rail. Currently the passengers transportation by motor vehicle is still dominated by the use of passengers cars and motorcycle. The use of public transport including a small bus (microbus, KWK), taxis, large buses and trains is still limited. The focus of the current government policies is encouraging modal shifts from private vehicles to public transport to improve energy efficiency and reduce greenhouse gases.

In urban area, *Bus Rapid Transit* (BRT) and *Mass Rapid Transit* (MRT) system become the short term solution to reduce the energy intensity in transportation sector.

Level 1

Level 1 assumes that in 2050, the urban transportation is still dominated by private vehicle. Development of public transportation infrastructure is still low. The use of private vehicle in urban area has not been significantly shifted to BRT and railway based transportation (commuter line, monorail, MRT [Mass Rapid Transit], and etc.).

Level 2

Level 2 assumes that in 2050, the modal shift in 2050 from private vehicle to railway based transportation increases 20% owing the provision of infrastructures for public transportation, particularly BRT and railway based transportation.

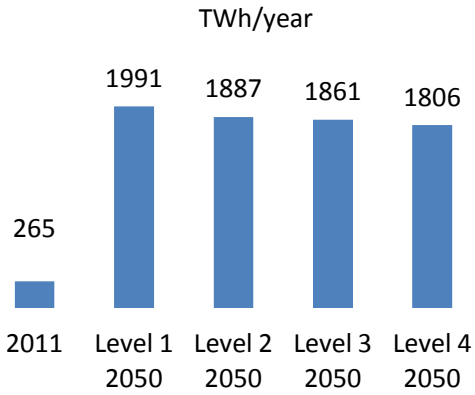
Level 3

Level 3 assumes that in 2050, the modal shift from private vehicle to bus and railway-based transportation increases 25% following the infrastructure provision for public transportation.

Level 4

Level 4 assumes that the growth of integrated railway based passenger transportation that is integrated with the bus system is able to shift 30% private vehicle users to public transportation in 2050. The most optimistic scenario of modal shift to MRT is assumed in 20 cities of Indonesia that has a system like commuter line that currently exists in Jabodetabek. In addition, with the provision of a reliable MRT, 5% of private vehicle users shift to non-motorized transportation such as walking and cycling. Modal shift to NMT is assumed to be triggered by the urban planning that locates residential close to commercial area and also the work from home lifestyle as the impact of a more modern communication technology.

Source: http://www.sutip.org/about/fact-sheet



Modal shift of Transportation	**Level 1 2050**	**Level 2 2050**	**Level 3 2050**	**Level 4 2050**
Urban BRT & MRT	0%	20%	25%	30%
Non-motorized system	0%	0%	0%	5%

Urban Passenger Transportation Technology

Passenger transport defined in the *one pager* include road transport and rail electric technology. Currently passenger vehicle technology is still highly dominated by ICT (*internal combustion technology*) using conventional fuel. Government encourages the use of CNG and Biofuel to reduce greenhouse gases. The current policy, Ministerial Regulation of MEMR No. 20/2014 stated the obligation to use Biofuel. Other alternative technologies which are available is low emission passenger vehicle which includes hybrid and electric vehicle. The market share for hybrid and electric vehicle will be discussed in separated one pager.

Level 1

Level 1 assumes that in 2050 private vehicle technology is still based on ICT and dominated by the use of conventional fossil fuels. The use of pure biofuel has been adopted in land transportation sub-sector like the situation nowadays; therefore the share of biofuel in 2050 is still similar to that in 2011. Natural gas share for passenger transportation including public bus in 2050 is still similar to the condition of baseline year. In 2050, the share of vehicle with low emission technology is 0.1% out of total private vehicles..

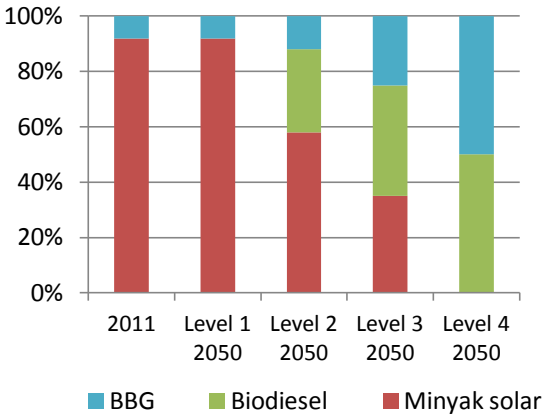
Level 2

Level assumes that the share of pure biofuel increases to 30% out of total demand of ADO in 2020 and bioethanol share is 20% pursuant to the Minister of Energy and Mineral Resources Regulation No. 20 of 2014. Share of natural gas for urban bus reaches 12% in 2050. The growth of transportation sector is supported by the transportation infrastructure including fuel station and provision of natural gas and biofuel. Share of vehicle with low emission technology reaches 1% out of total private vehicles.

Level 3

Level 3 assumes that in 2050, the share of vehicle that uses biofuel has increased to 40% out of total diesel cars. Bioethanol share is 25%. This circumstance is achieved by flexible fuel vehicle technology, which refers to the machine that could use pure biofuel with higher mix level. Share of natural gas for bus reaches 25% in 2050 following the increasing number of fuel station and the policy to support the provision of biofuel. In 2050, share of vehicle with low emission technology will be12% and electric motorcycle will be 30%.

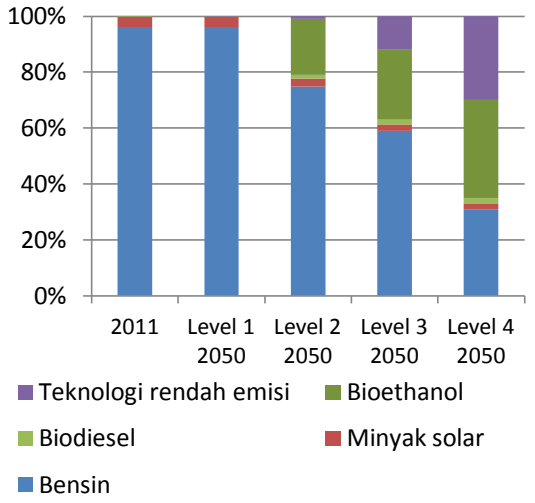
Bauran bahan bakar untuk BRT Perkotaan



Level 4

Level 4 assumes that in 2050, the share of biofuel use for road transportation reaches 50% and bioethanol reaches 35% for private vehicle following incentive policy and domestic production of flexible fuel technology. Share of natural gas for bus will be 50%. In 2050, share of vehicle with low emission technology reaches 30% and electric motorcycle reaches 65%.

Bauran bahan bakar untuk mobil pribadi



Sumber: http://www.bismania.com/trialvb5/articles/755120-curitiba-memesan-60-bus-hybrid

Passenger Vehicle with Low Emission Technology

Passenger vehicle with low emission technology includes vehicle with hybrid and electric technology which have been commercialized in developed countries. It is assumed that vehicle hybrid and electric technology will start to be used by 2020 and become part of the effort to reduce greenhouse gases from the use of private vehicle.

Opsi A

Option A assumes that in 2050, all passenger cars with low emission technology will be fully hybrid while motorcycle with low emission technology will be fully electric.

Opsi B

Option B assumed that in 2050, 70% of passenger car with low emission technology will be hybrid and 30% will be electric. Meanwhile, motorcycle with low emission technology will be fully electric.

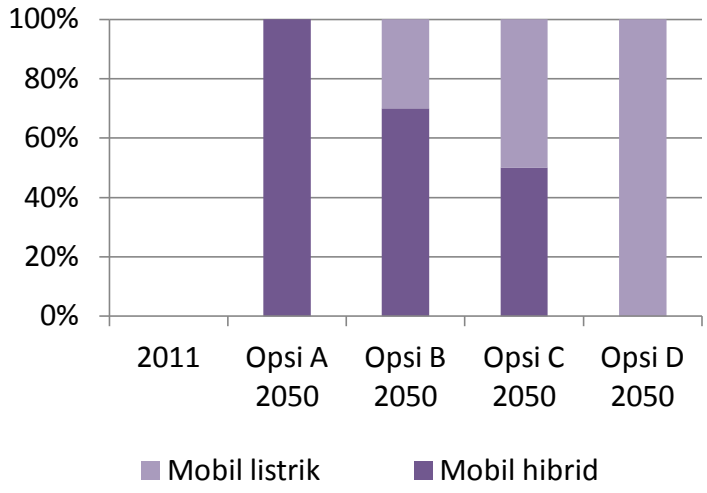
Opsi C

Option C assumes that in 2050, 50% of passenger car with low emission technology will be hybrid and 50% will be electric. Meanwhile, motorcycle with low emission technology will be fully electric.

Opsi D

Option D assumes that in 2050, all passenger vehicles with low emission technology will be electric.

Sumber: http://otoneters.com/showthread.php?8478-Test-Drive-Mobil-Listrik-Dan-Mobil-Hybrid-Karya-LIPI/page2



Fuel Mix for Inter-city Passenger Vehicle

Vehicle transportation defined in this one pager includes inter-city transportation consisted of bus, train and ship mode. Currently the vehicle technology is still highly dominated by ICT (*internal combustion technology*) and still uses conventional fuel. Government encourages the use of CNG and Biofuel to reduce the greenhouse gases. Current policy through Ministerial Regulation of MEMR No. 20/2014 obligates the use of biofuel.

Level 1

Level 1 assumes that in 2050, inter-city transportation is still dominated by ICT-based technology and fossil fuels. The use of pure biofuel for inter-city transportation has not been in place yet until 2050. Meanwhile, the test on natural gas use for marine transportation is succeeded, thus the share is 2% in 2050.

Level 2

Level 2 assumes that the use of biofuel for inter-city transportation has been implemented pursuant to Minister of Energy and Mineral Resources No.20/2014. Share of biofuel in ADO is 30% for inter-city bus. Diesel train has used 10% pure natural gas in 2050. Growth of transportation sector is supported by the development of transportation infrastructure including the construction of fuel station that provides natural gas and biofuel. Meanwhile, share of natural gas for marine transportation has reached 5% in 2050.

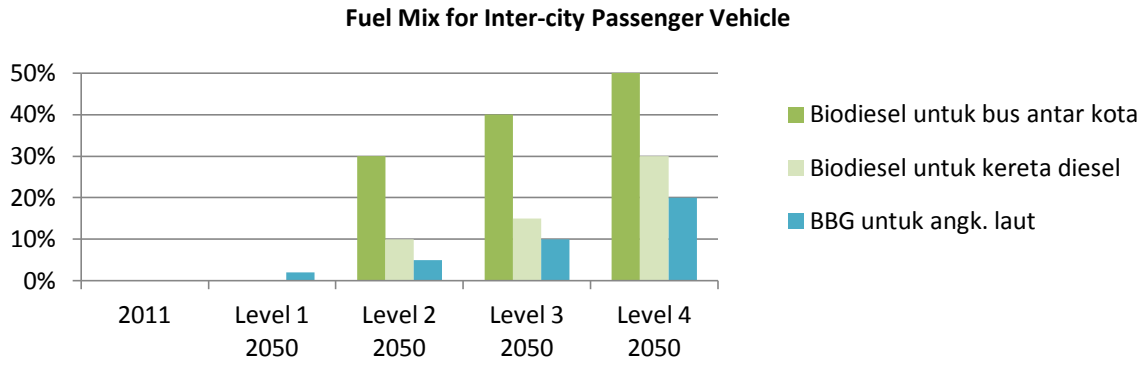
Level 3

Level 3 assumes that in 2050, the share of public transportation that uses biofuel has reached 40% for inter-city bus and 15% for train. Share of natural gas for bus and marine transportation will be 10% by 2050 with a lot of fuel stations and other policies that support the provision of natural gas.

Level 4

Level 4 assumes that in 2050, the share of road transportation that uses biofuel will be 50% by 2050 following the incentive policy and the domestic production of flexible fuel vehicle. Share of natural gas for marine transportation will be 20%

Sumber: http://perkebunan.litbang.pertanian.go.id/wp-content/uploads/2014/01/web-BBN.jpg



Mode	Technology	Level 1 2050	Level 2 2050	Level 3 2050	Level 4 2050
Bus	Biodiesel	0%	30%	40%	50%
Train	Biodiesel	0%	10%	15%	30%
Ship	BBG	2%	5%	10%	20%

Aviation Operational Efficiency

The improvement of aviation operational efficiency is implemented to reduce the greenhouse gases emission in aircraft transportation. In 2010, the greenhouse gases emission produced from transportation sector reached 105 million tons CO_2e, where the aircraft sub-sector of transportation contributed 9% of the emission. The aviation operational efficiency was improved through the improvement of air-traffic management effectiveness, improvement on airport operational management, additional airfield runways and aircraft fleet revitalisation.

Level 1

Level 1 assumes that the efficiency improvement program of aviation operational is adopted slowly; thereby the energy intensity is 2% lower in 2050. Aircraft fleet revitalisation has been implemented that 10% operated aircrafts are under 5 years. This measure increases the energy intensity of aviation sub-sector by 3.25% in 2050.

Level 2

Level 2 assumes that the efficiency improvement program of aviation operational is adopted; thereby the energy intensity is 5% lower in 2050. Aircraft fleet revitalisation has been implemented that 25% operated aircrafts are under 5 years. This measure reduces the energy intensity of aviation sub-sector by 3.1% in 2050.

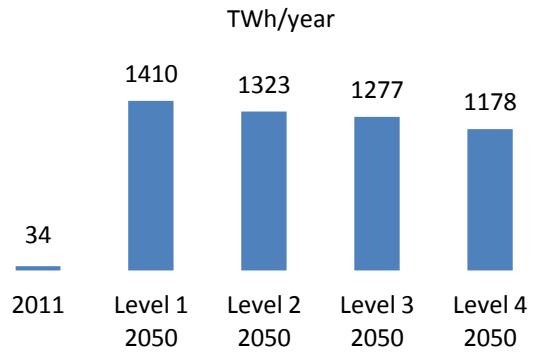
Level 3

Level 3 assumes that the efficiency improvement program of aviation operational is adopted; thereby the energy intensity is 5% lower in 2050. Aircraft fleet revitalisation has been implemented that 40% operated aircrafts are under 5 years. This measure reduces the energy intensity of aviation sub-sector by 6.5% in 2050.

Level 4

Level 4 assumes that the efficiency improvement program of aviation operational is adopted in all airports in Indonesia; thereby the energy intensity is 10% lower in 2050. Aircraft fleet revitalisation has been implemented that 50% operated aircrafts are under 5 years. This measure reduces the energy intensity of aviation sub-sector by 13.75% in 2050.

Source: Hubud, Meeting of *Stakeholder Consultation* 2014



Aviation Operational Efficiency	Level 1 2050	Level 2 2050	Level 3 2050	Level 4 2050
• Aircraft fleet revitalization	10%	25%	40%	50%
• Energy intensity change of fleet revitalization	5%	2%	-1%	-4%
• Energy intensity decline from aviation operational efficiency and air-traffic management	-2%	-5%	-5%	-10%
• Energy intensity of 2050 compared to base year (2011)	103%	97%	94%	86%

The use of Bioavtur

The use of *aviation biofuel* or bioavtur from pure biofuel for airfreight is expected to reduce the greenhouse gases from aircraft transportation. The use of biofuel is regulated in Ministerial Regulation of MEMR No 20/2014 which also part of the National Mitigation Action Plan for Reducing Greenhouse Gases Emissions (RAN-GRK).

Level 1

Level 1 assumes that the use of biofuel for aviation in 2018 reaches 3% share pursuant to the RAN GRK target of the Ministry of Transportation.

Level 2

Level 1 assumes that the use of biofuel for aviation in 2025 reaches 25% share pursuant to the Minister of Energy and Mineral Resources Regulation No. 20 of 2014.

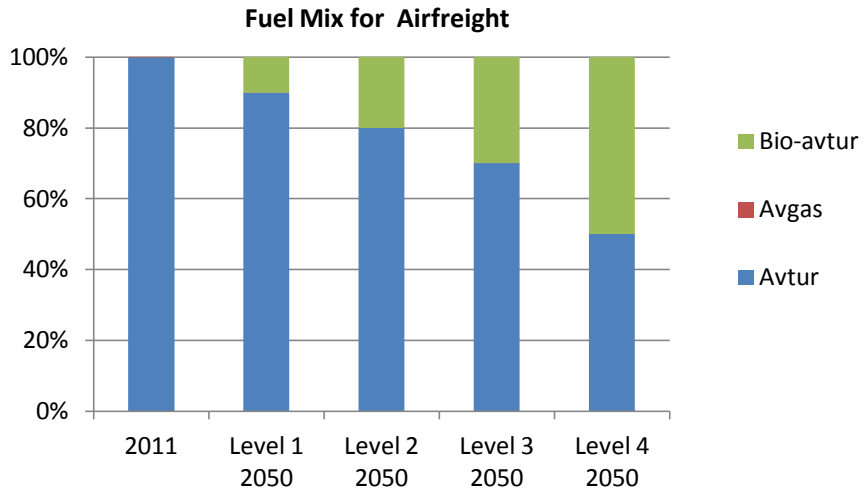
Level 3

Level 3 assumes that the government has a strong policy support towards biofuel supply; the share of pure biofuel in transportation sub-sector (bioavtur) in 2050 will be 30%.

Level 4

Level 4 assumes that the machine technology of an aircraft has been able to use pure biofuel, thus pure biofuel share in aviation sub-sector in 2050 reaches 50%.

Sumber: Hubud, Pertemuan *Stakeholder Consultation* 2014



Bahan bakar alternatif	Level 1 2050	Level 2 2050	Level 3 2050	Level 4 2050
Bio-avtur market share	10%	20%	30%	50%

AGRICULTURAL, CONSTRUCTION AND MINING SECTOR

Economic Growth of Agricultural, Construction and Mining Sector

Agricultural, construction and mining sector includes agricultural, fisheries, plantation and livestock, construction, mining, non-oil and gas and quarrying subsector. Oil and gas mining also forestry sub-sector are not included in this sector. Agricultural, construction and mining experiencing growth at 5.2% based on historical data in 2004. Projection in this sector is considerably unrelated with plantation activity to produce biofuel.

Level 1

Level 1 assumes agricultural, construction and mining, growing at an average growth of 4.15% until 2050. This growth rate is lower than historical data due to market share of agricultural sector is increasingly declined compared to other two sectors. The decline in market share occurred due to the increasingly uncompetitive harvest resources price.

Level 2

Level 2 assumes the growth rate of agriculture sector, construction and mining at 4.75% is supported by the growth of plantation subsector especially oil palm for food and other plantation crops; also by construction sector which increasingly grows along with the economic growth.

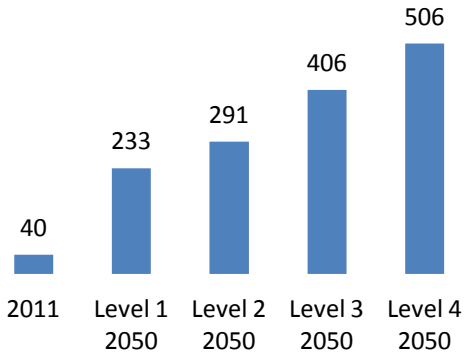
Level 3

Level 3 assumes the growth of agricultural sector, construction and mining at 5.65% is supported by the growth of construction and mining subsector which is increasingly higher than agricultural sector of Level 2.

Level 4

Level 4 assumes sector of agricultural, construction and mining grew at 6.25% due to the economic growth on all sector with the increasingly higher growth of market share of construction and mining sector.

TWh/year with assumption Level 1 for 'Energy Intensity of Agricultural, Construction and Mining Sector'



Sumber http://bisnis.liputan6.com/read/656271/sektor-tambang-loyo-ekonomi-ri-kuartal-ii-tumbuh-di-bawah-6; http://www.karanganyarkab.go.id/20101227/potensi-pertanian/

Energy Intensity of Agricultural, Construction and Mining

In final energy mix, other energy sector consumption (agricultural, construction and mining) only reach less than 4% portion. Energy efficiency could be improved especially through the application of research result on the use of more sophisticated technology on agricultural subsector. Energy intensity of agricultural sector, construction and mining are the comparison (ratio) of final energy consumption of agricultural, construction and mining sector with the Gross Domestic Product (GDP) of those sector.

Level 1

Level 1 assumes the energy consumption of agricultural, construction and mining is stable with the growth of energy intensity at 7.5% by 2050 compared to base year.

Level 2

Level 2 assumes by 2050 the energy intensity growth of agricultural, construction and mining sector is at 6% compared to base year.

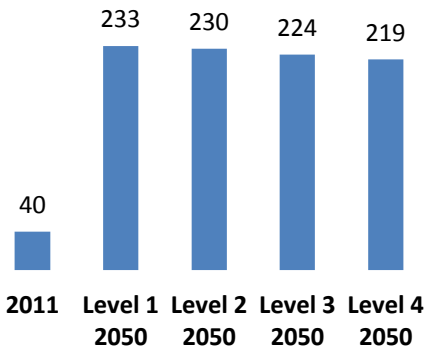
Level 3

Level 3 assumes by 2050 the efficiency of the energy use on agricultural, construction and mining increase so that the increase of energy intensity only at 3.5% compared to the base year.

Level 4

Level 4 assumes by 2050 the efficiency of energy use on agricultural, construction and mining increase so that the increase of energy intensity only at 1% compared to the base year due to the greener technology innovation applied in mining and construction sector.

TWh/year with assumption Level 1 for 'Economic Growth in Agricultural, Construction and Mining Sector'



Sumber: http://bpkonstruksi.pu.go.id/

Fuel Mix of Agricultural, Construction and Mining Sector

Fuel mix of agricultural, construction and mining sector in base year consist of 74.63% of ADO, 17.86% of gasoline, 5.26% of MFO, 1.85% of kerosene and 0.39% of IDO.

Level 1

Level 1 assumes fuel mix on agricultural, construction and mining by 2050 is equal to base year.

Level 2

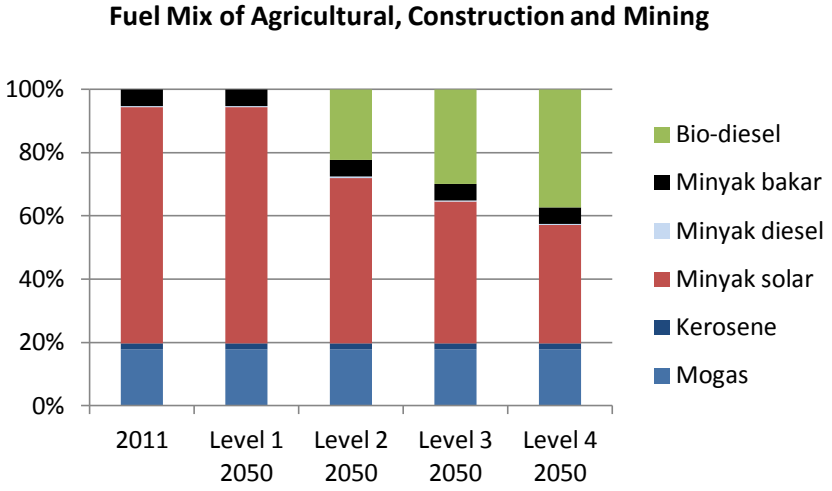
Level 2 assumes by 2050 biodiesel market share has replaced 30% demand of ADO accordingly with the Ministerial Regulation of MEMR No. 20/2014.

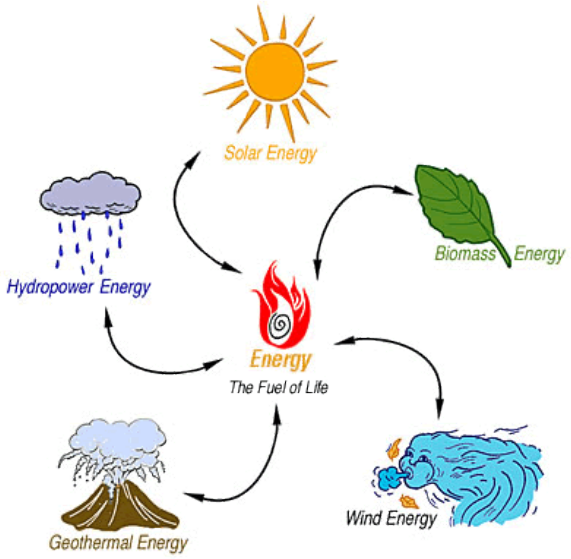
Level 3

Level 3 assumes by 2050 pure biodiesel market share has replaced the demand of ADO at 40%.

Level 4

Level 4 assumes in 2050 market share of pure biodiesel has replaced 50% the demand of ADO by assuming the application of technological innovation on machine capabilities which is able to harness biofuel with high degree of mixing.





Sumber http://www.jambura-online.com/kategori/lingkungan/target-bauran-energi-terbarukan-sulit-tercapai.html#.VH3G3DGUcVI