

Executive Summary

Association of Southeast Asian Nations (ASEAN) countries are promoting energy efficiency policies to cope with the increase in energy consumption associated with economic development. However, over the 20-year period from 2000 to 2020, countries with large populations and economies, such as Indonesia, Malaysia, the Philippines, and Viet Nam, steadily increased their energy efficiency while their carbon intensity worsened.

Four countries, i.e. Indonesia, Malaysia, the Philippines, and Viet Nam, which account for about 90% of Total Energy Supply (TES) and CO₂ emissions in ASEAN, and whose carbon intensity is worsening while energy efficiency is improving, were selected for study in this report.

The primary factor contributing to the worsening carbon intensity in these four countries is coal. Coal TES increased from 2000 to 2020, as did coal-fired power generation. On the other hand, the efficiency of coal-fired power generation is low and CO₂ emissions from the electricity and heat production sector are increasing, making coal-fired power generation with low generation efficiency a cause of worsening carbon intensity.

Next, coal consumption in the manufacturing industries, especially in the iron and steel sector, has increased, and CO₂ emissions in this sector have also increased. This is especially true in Indonesia and Viet Nam.

In the Philippines and Malaysia, energy consumption in the transport sector, especially in the road sector, is increasing, as are CO₂ emissions. The increase in the number of vehicles that use fossil fuels as their energy source along with the development of motorisation has contributed to the worsening of carbon intensity.

The four countries studied commonly decided on policies such as phasing out coal-fired power generation in the future and halting the construction of new coal-fired power plants. Measures to bridge the gap between the current situation and future targets include early shutdown of aging coal-fired power plants, conversion to high-efficiency gas-fired power plants, co-firing or single fuel combustion of ammonia and hydrogen, and introduction of carbon capture and storage (CCS) and renewable energy.

The increase in CO₂ emissions in the iron and steel sector is the result of industrial policies such as the decision to own blast furnaces. However, there is a shift from the blast furnace method to the electric furnace method or the direct reduction method as a result of climate action, and the region may consider following this trend.

The road sector should also promote the spread of zero-emissions vehicles such as electric vehicles. In doing so, it is desirable not just to introduce electric vehicles, but to combine decarbonisation and industrial development through electrification and zero-emissions in vehicle production, with the goal of becoming an electric vehicle hub in the ASEAN region, while ensuring critical mineral security.

Energy efficiency is steadily improving in the four countries studied. Energy service companies

and energy audits, which are common energy efficiency policies in the four countries, can visualise various energy situations, contribute to performance improvements, achieve systematic energy management, and support energy conservation and decarbonisation activities. It is also useful to promote energy conservation outside of the studied countries.

To promote the upgrading of coal-fired power generation in ASEAN, decarbonisation of steel, production of electric vehicles and zero-emissions vehicles, and further energy conservation, it is necessary to promote energy efficiency policies from a broad perspective, including energy transition financing, technology development, industrial structure transformation, housing performance improvement, and implementation of systematic energy management such as energy service companies and energy audits.

Except for the Philippines, the three countries studied have declared a goal of being carbon-neutral by 2050 or 2060. Carbon neutrality must be maintained after it is achieved. These broad policies can help achieve long-term sustainable carbon neutrality. For ASEAN to realise a low-carbon society at an early stage, international cooperation in technology and finance will then be necessary.

Items	Unit	20 Years Transition(2000~2020)				
		Indonesia	Malaysia	Philippines	Viet Nam	
Energy Consumption Index	Population	Times	1.3	1.4	1.4	1.2
	GDP	Times	2.6	2.3	2.5	3.5
	GDP per Capita	Times	2.0	1.7	1.8	2.9
	TES	Times	1.5	1.9	1.5	3.4
	of which, amount of fossil fuel	Times	1.8	1.9	1.8	6.2
	of which, fossil fuel dependency	%	11 ↑	0	11 ↑	39 ↑
	of which, coal	Times	5.7	9.4	3.6	11.6
	Electricity Output	Times	3.1	2.6	2.2	9.0
	of which, coal-fire electricity output	Times	5.3	11.2	3.5	38.0
	Final Energy Consumption	Times	1.3	2.1	1.4	2.7
	of which, final energy consumption(Industry)	Times	1.9	1.6	1.4	4.6
	of which, final energy consumption(Iron and Steel)	Times	10.0	NA	1.5	*10.0
	of which, final energy consumption(Non-metallic minerals)	Times	43.0	NA	0.0	*2.5
	of which, final energy consumption(Transport)	Times	2.3	1.9	1.2	3.5
	of which, final energy consumption(Residential)	Times	0.6	1.7	1.3	0.8
Final energy consumption of Coal by Iron and Steel Sector	Times	489.0	NA	NA	15.8	
Energy Efficiency Index	TES per GDP	Point	0.17 ↓	0.05 ↓	0.11 ↓	0.01 ↓
	CO ₂ per TES	Point	0.64 ↑	0.1 ↑	0.44 ↑	1.48 ↑
	EE&C Indicator of Iron and Steel Sector	Point	0.38 ↑	NA	0.37 ↓	*0.22 ↑
	EE&C Indicator of Non-metallic minerals Sector	Point	0.04 ↓	NA	NA	*0.03 ↑
	EE&C Indicator of Road Sector	Point	0.35 ↓	0.34 ↓	1.00 ↓	9.08 ↓
	EE&C Indicator of Residential Sector	Point	0.03 ↑	0.15 ↑	0	0.18 ↑
	Thermal Efficiency fossil fuel-fired	Point	0.03 ↓	0	0.01 ↓	0.05 ↑
Thermal Efficiency coal-fired	Point	0.02 ↓	0.1 ↓	0.06 ↓	0.08 ↑	
CO ₂ Emission Index	CO ₂ Emission	Times	2.1	2.0	1.9	6.6
	of which, CO ₂ emission by Electricity and Heat Production sector	Times	3.6	3.2	3.2	13.1
	CO ₂ emission by Iron and steel sector	Times	10.7	NA	1.3	*14.5

EE&C = energy efficiency and conservation, TES = total energy supply, GDP = gross domestic product.

* Data duration is from 2010 to 2020.

Source: Author.