Executive Summary

Coal is an optimum power generation fuel for ASEAN countries in terms of both cost and energy security. However, coal combustion emits air pollutants that are harmful to both human health and the environment. As a consequence, residents have started campaigns against coal-fired power plants (CPPs), which have forced some new CPP projects to be suspended or cancelled. For ASEAN countries, minimizing the emission of air pollutants is a precondition for the future use of CPPs. But the problem is regulating the emission of air pollutants from CPPs. In order to reduce the emission of air pollutants, creating regulations and properly managing and operating CPPs are required. Based on this awareness, regulations on the emission of air pollutants (including emission standards and implementation of the regulations) are surveyed in this study.

This survey revealed that ASEAN countries have enacted environmental laws to identify air pollutants to be regulated and to set emission standards. Compared to the Organisation of Economic Co-operation and Development (OECD) countries, however, the emission standards are low in many ASEAN countries. Thus, it is important to raise the current emission standards of air pollutants from CPPs to the equivalent levels in OECD countries. This is because more stringent levels are essential for delivering a proper response to campaigns against CPPs and can reduce the emission of hazardous air pollutants and reduce the health hazards to residents. On the other hand, raising the level of emission standards leads to either an increase in environmental expenses or an increase in electricity tariffs. In consideration of national and government financial capabilities, a gradual tightening of emission standards may be required.

Installing expensive environmental facilities in CPPs imposes a heavy burden, especially on low-income countries. The most desirable method of sharing the cost burden is to increase electricity prices. Passing on increased costs would place a temporary subsidy burden on the government. This is not sustainable in the long term; therefore, it is recommended to stop providing subsidies to electricity consumers as early as possible.

Ways of financing capital expenditure include borrowing from financial institutions and using private funds. For borrowing, there are two options: one is from domestic financial institutions, the other is from international financial institutions. Domestic financial institutions are free from exchange risks; however, they may not have the practical knowledge of large-scale financing for energy. For international financial institutions, long-term borrowings can be made at low-interest rates; however, there are exchange rate risks and loan procedures take time due to strict loan terms. Generally, the installation of environmental facilities can be a good funding destination; however, some financial institutions put restrictions on loans for new CPP construction. Private funding can include funding from independent power producers and private finance initiatives. Using private funds has the advantage of being able to construct new CPPs without increasing public debt, resulting in the promotion of technology transfer through the operation of companies from developed countries.

With emission standards of air pollutants from CPPs raised to the equivalent level in OECD countries, ASEAN countries are required to install environmental facilities in CPPs and to perform the following steps:

1. maintain and/or manage installed facilities for appropriate operation;
2. constantly monitor and/or record the air pollutants concentration level to keep it below the standard; and
3. disclose the measurement results to local governments and residents to inform them of the proper operation of the CPP.

With regard to the first step, continued proper operation of environmental facilities serves as the base to gain support from residents. Regarding the second and third steps, the CPPs need to show evidence of complying with the laws and regulations to gain the trust of residents. Without information disclosure, residents living near a CPP could still raise concerns about the plant even if it is run properly. CPPs are requested to make themselves more open by continually providing transparent data to protect themselves.

Under these circumstances, a highly transparent system is required to monitor the air pollutant concentration levels both for CPPs and local regions. This can be a challenge for countries that have never created such a system. It is recommended to create a system that will monitor the air pollution situation and to establish an international cooperative framework for the proper operation and information disclosure, and to provide training to central and local governments and CPP operators. Cooperation will bring mutual benefits to both ASEAN countries and cooperating countries, which encourages them to build win–win relationships.

Table A shows the emission standards of sulphur oxides (SOx), nitrogen oxides (NOx), and particulate matter (PM) for new CPPs in selected countries. In case they differ depending on the plant scale, the large-scale case was adopted. In case they differ depending on the period, the daily basis (or 24 hours) was adopted. SOx and NOx have different units from one country to another. In the countries where parts per million (ppm) measurement is used, accordingly, it is converted into milligrams per cubic metre (mg/m^3), regarding them as SO_2 and NO_2, respectively.

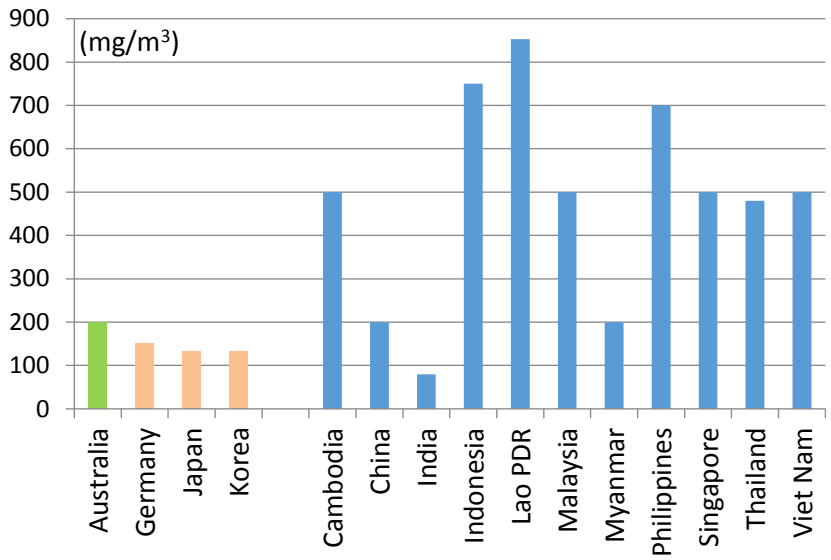
Table A: Emission standards for new CPPs in selected countries

Country	SOx	NOx	PM
Australia	SO_3: 200 mg/m^3	NO_2: 800 mg/m^3	80 mg/m^3
Germany	SOx: 150 mg/m^3	NOx: 150 mg/m^3	10 mg/m^3
Japan	SOx: 50 ppm* (SO_2: 133 mg/m^3)	NOx: 200 ppm (NO_2: 383 mg/m^3)	100 mg/m^3
Republic of Korea	SOx: 50 ppm (SO_2: 133 mg/m^3)	NOx: 50 ppm (NO_2: 96 mg/m^3)	10 mg/m^3
United States**	SO_2: 130 ng/J	NOx: 88 ng/J	11 ng/J
Cambodia	SO_2: 500 mg/m^3	NO_2: 1000 mg/m^3	400 mg/m^3
China	SO_2: 200 mg/m^3	NO_2: 200 mg/m^3	30 mg/m^3
India	SO_2: 80 mg/m^3	NO_2: 80 mg/m^3	100 mg/m^3
Indonesia	SO_2: 750 mg/m^3	NO_2: 750 mg/m^3	100 mg/m^3
Lao PDR	SO_2: 320 ppm (SO_2: 853 mg/m^3)	NOx: 350 ppm (NO_2: 670 mg/m^3)	120 mg/m^3
Malaysia	SOx: 500 mg/m^3	NOx: 500 mg/m^3	50 mg/m^3
Myanmar	SOx: 200 mg/m^3	NOx: 400 mg/m^3	50 mg/m^3
Philippines	SO_2: 700 mg/m^3	NO_2: 1000 mg/m^3	150 mg/m^3
Singapore	SO_2: 500 mg/m^3	NO_2: 700 mg/m^3	100 mg/m^3
Thailand	SO_2: 180 ppm (SO_2: 480 mg/m^3)	NOx: 200 ppm (NO_2: 383 mg/m^3)	80 mg/m^3
Viet Nam	SO_2: 500 mg/m^3	NO_2: 650 mg/m^3 ***	200 mg/m^3

CPP = coal-fired power plant, mg/m^3 = milligram per cubic metre, PM = particulate matter, ppm = parts per million, NO_2 = nitrogen dioxide, NOx = nitrogen oxides, SO_2 = sulphur dioxide, SOx = sulphur oxides.
Notes: * Based on the CPP's location, sulphur content of fuel, stack height, etc. the emission standard varies by CPP. The value is an example of specific CPP based on agreement between CPP and local government.
** gross output.
*** coal volatile content >10%.
Source: Authors.

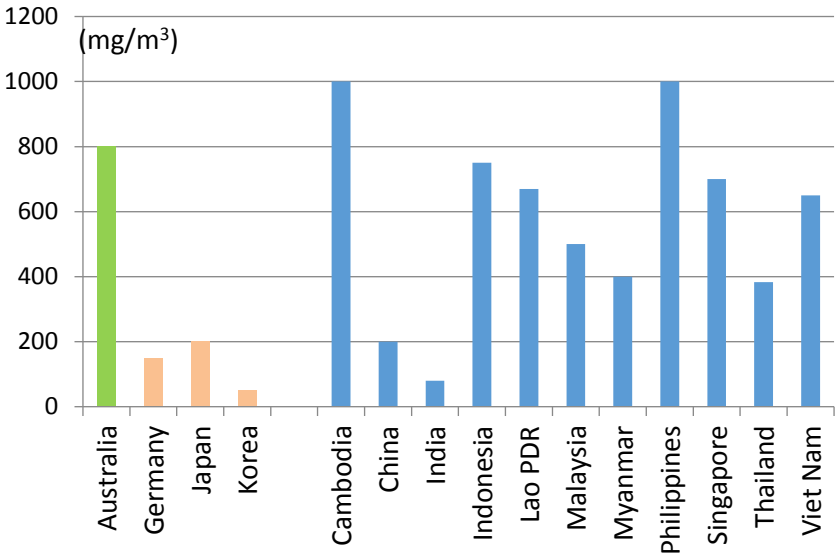
Figures A, B, and C show the comparison of the emission standards of SOx, NOx, and PM for new CPPs in selected countries.

Figure A: Emission standards for new PPs in selected countries (SOx)



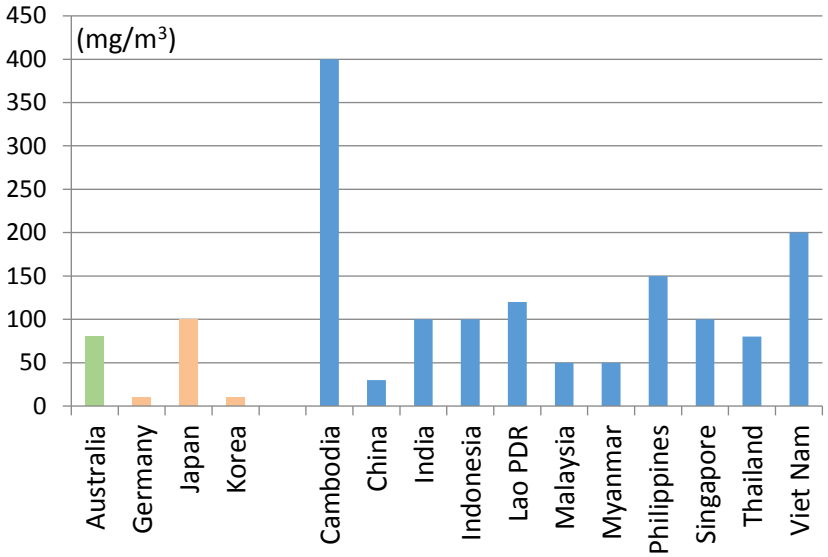
CPP = coal-fired power plant, mg/m^3 = milligram per cubic metre, SOx – sulphur oxides.
Source: Authors.

Figure B: Emission standards for new CPPs in selected countries (NOx)



CPP = coal-fired power plant, mg/m^3 = milligram per cubic metre, NOx—nitrous oxides.
Source: Authors.

Figure C: Emission standards for new CPPs in selected countries (PM)



CPP = coal-fired power plant, mg/m^3 = milligram per cubic metre, PM = particulate matter.
Source: Authors.