

Executive Summary

Thailand has long been actively participating in the global efforts to prevent or at least ameliorate the effects of climate change. Now its capital city, Bangkok, is starting to participate in these efforts since it is a significant source of greenhouse gases emitted into the atmosphere, and as the nation's economic hub it has a lot to lose.

This report attempts to explain why and how climate change is affecting Bangkok, while giving some idea of the likely trends that may be expected and what action will have to be taken in order to make the predicted outcomes less severe.

Bangkok contains close to 15 per cent of the entire population of Thailand, or close to 10 million people in real terms. Thailand's capital, communications hub, and administrative and business centre produced emissions of carbon dioxide totalling 43 million tons in 2005—a much greater volume than that of Toronto (24 million tons). Although they were lower than the total carbon dioxide emissions of New York City (58 million tons), they were about the same as those of London (44 million tons). Those data are enough to put Bangkok in the ranks of major sources of greenhouse gas emissions. In per capita terms, Bangkok was responsible for producing 7.1 tons of carbon dioxide per annum in 2007, that is, the same level of emissions as produced by New Yorkers (7.1 tons per capita), and considerably higher than the annual emissions of Londoners (5.9 tons per capita) but lower than the levels produced by residents of Toronto (9.6 tons per capita).

In 2007, the principal sources of greenhouse gas emissions in Bangkok were transportation (37.68 per cent) and electricity generation (33.37 per cent) (see table 3.2). The Department of Energy Business, Ministry of Energy, indicated that the transport sector in Bangkok emitted almost 23.07 million tons of carbon dioxide per annum from consuming 8,948,683 million litres of gasoline and diesel oil. Electricity used was as high as 29,180 GWh which caused the emission of 20.43 million tones of carbon dioxide, accounting for 33.37 per cent of total annual emissions. Solid waste and waste water emitted 12.16 million tones of carbon dioxide, equivalent to 19.86 per cent of total annual emissions. These three sources contribute 90.91 per cent of the total emissions of greenhouse gases annually. The remaining 9.09 per cent comes from other sources, such as agriculture.

The impacts of greenhouse gas emissions and the resulting climate change on Bangkok are likely to be quite severe. Bangkok is naturally prone to flooding and, owing to the rapid urbanization in recent decades, many long-existing watercourses, such as canals, ditches and ponds, were filled in and replaced by roads, buildings and other structures, thus exacerbating the effects of heavy rains. Although flood protection projects were established and improved after two particularly devastating floods, Bangkok is still at increasing risk of flooding. A case study of Bangkok provides a macro picture of likely flooding and its socio-economic impacts, using various scenarios of mean sea level rise in the twenty-first century. The simulated outcomes of the flood model used in the study indicate that almost 55 per cent of Bangkok would be affected by floods if the mean sea level were to rise by 50cm, and 72 per cent of the city would be affected if the mean sea level were to rise by 100cm.

Bangkok also suffers from the effects of land subsidence caused by over-pumping of groundwater and by the nature of the thick, soft clay on which the city is built. Other results of subsidence include ground water contamination with saline intrusion, nitrates, coliform bacteria and volatile organic compounds.

Since Bangkok is expected to continue to grow over the next 10 years, the problems of water supply and contamination of both surface and ground waters are also likely to be exacerbated. By the end of the current century, increasing temperatures are expected to boost the demand for water for agricultural purposes between 2 and 13 times in the lower and medium warming ranges, respectively, as well as the demand for water for household purposes owing to the continued urbanization of the city.

Climate change will also affect the health of Bangkok residents due to the increases in the frequency, duration and intensity of the conditions conducive to air pollution and oppressive heat. However, the primary concern is the projected increase in extreme conditions that are responsible for most serious health consequences. Climate change has the potential to influence the incidence and spread of infectious disease transmitted by mosquitoes, ticks, fleas, rodents and contaminated food. Based on projected increases in the temperature for the period from 1998 to 2050 under a climate change scenario, the number of cases of malaria infection would rise substantially. Besides the likely human impact, a preliminary estimate of the potential financial damage suggests it could be in the thousands of millions of Baht. Similar impacts would be caused by outbreaks of dengue fever and other health conditions.

Another adverse impact is that of increased atmospheric temperature on crop production, because it influences crop growth through its impact on photosynthesis and respiration, as well as the length of the growing season and the amount of water used. Rising temperatures may therefore have a significant impact on the crops and other plants grown in and around Bangkok, as well as the rest of the country, which is currently one of the world's important food exporters.

To deal with these threats, the Bangkok Metropolitan Administration has adopted the Action Plan on Global Warming Mitigation 2007-2012, which calls for it to: expand mass transit and improve traffic systems; promote the use of renewable energy; improve electricity consumption efficiency; improve solid waste management and wastewater treatment efficiency; and expand park areas. The Action Plan is aimed at bringing about a reduction in Bangkok's greenhouse gas emissions over a period of five years, that will be 15 percent below the levels currently projected for 2012.

Since this is all new to the city's population, continuous public awareness campaigns will be needed to increase the general public's understanding of the complex and dynamic issues involved, as well as of the potential benefits that these actions could produce, such as financial savings from improved energy efficiency.

Actions for Bangkok

To address the likely changes in the climate and their impacts on the city's economy and inhabitants, it is necessary to initiate a coordinated approach from all sectors at the local level. Those requiring timely intervention are energy, transport, alternative energy sources for transport and household uses, health, sustainable agriculture to reduce dependence on the long-haul transport of agricultural products, changes in consumption patterns and behaviour, and education and awareness programmes to increase the understanding of and knowledge about the ongoing and expected climate change impacts.

Bangkok is preparing to adapt to climate change and respond to the effects that already are under way as well as those that may occur in the future. These adaptation measures should include the following:

- Improving the local public health infrastructure;
- Creating early warning systems for severe weather and pollution;
- Implementing stricter zoning and building codes to minimize storm damage;
- Improving disease surveillance and prevention programmes;
- Educating local health professionals and the general public about the health risks associated with climate change;
- Changing both water infrastructure and management to prevent contamination of potable supplies;
- Undertaking steps to protect people living in Bangkok from high temperatures both during the day and at night. This may include providing emergency shelters for the most vulnerable citizens during times of extreme heat;

- Remaining alert for new and better information about the impacts of global warming on the communities and translating that knowledge into local policies and practices that protect public health as well as social and economic infrastructure.

In addition, the following actions will be undertaken by the BMA together with relevant partners:

- Create partnerships with various stakeholders to create momentum, continuity, longevity and success for the various programmes upon which it embarks;
- With regard to municipal buildings, retrofit city buildings with energy efficient lighting and appliances, collaborate with the Ministry of Energy in establishing energy efficient standards for new municipal construction and major renovations, and perform energy audits for existing buildings;
- Work with the Ministry of Transport to install light-emitting diode (LED) traffic signals and traffic flow management systems, update street lighting to a high efficiency level, increase wastewater utilities and establish landfill-gas energy projects;
- Reduce the emissions of its vehicle fleets, using hybrids, alternative fuel vehicles and idle-engine reduction policies and campaigns, as well as establishing programmes to reduce driving on duty by city employees. BMA will also modify school buses, waste haulers and ambulances to use compressed natural gas (CNG) and biofuels;
- Establish purchasing programmes to procure energy-efficient appliances and purchase materials that require less energy and reduce the amount of waste that such appliances and materials produce;
- Continue working with the Thai Industrial Standards Institute to create efficiency standards for office equipment, adopt recycled salvaged product use policies and develop local purchasing programmes;
- Support public and private transport by making the city pedestrian- and bicyclefriendly, providing better access to public transport, creating more park-and-ride facilities, providing incentives for hybrid or low-emission vehicle use and installing plug-in facilities for electric hybrid vehicles.

Existing and new technologies and initiatives yet to be developed will enhance the ability of Bangkok to reduce its emissions of greenhouse gases and adapt to climate change. These investments and efforts should yield a triple dividend, for the economy, for the environment and for society, primarily for the people of Bangkok but also of Thailand and the planet as a whole, as well as contributing to mitigating climate change.