**State of Environment of Thailand in 2023**

 The national state of the environment report is annually conducted to support the formulation of policy, measure, plan, and guidance for an effective and timely response to challenge natural resources and environment. The report presents information on various aspects of environment changes, future projections, and policy recommendations on natural resources and environmental management of Thailand.

**1. Overview**

 **1.1 Changes in social and economic situation in Thailand** In 2022, the national economy continued to improve from the year 2021 through
recovery in a tourist sector, increase in public investment and implementation of stimulation measures. The 2022 Gross Domestic Product (GDP) was found to grow by 2.6% from the previous year and accounted for 17,370.24 billion baht. The economy growth was expected to be continued, particularly in service sectors, despite the rise in household expense by 3.5% on average in 2021. Proportion of households in debt, average debt per household and debt ratio to income was also found increasing.

 In 2022, Thailand's population was 66.09 million, decreasing 0.12% from the
previous year. The number of population has been decreasing consistently over the past 10 years, particularly among the child and the working-age groups. However, the number of elder groups increased and accounted for 19.21% in 2022. Migration in 2022 was reported higher than the past 10 years. In addition, the number of individuals requiring medical attention for listed illnesses rose by 1.3 times compared to the previous year. Bronchitis was the highest type of illness due to COVID-19 infections. Additionally, 10.3 million people suffered from sickness related to air pollution found in the northern region.

 **1.2 Global and regional environment situations**

 In 2022, the atmospheric concentrations of Carbon Dioxide (CO2), Methane (CH4), and Nitrous Oxide (N2O) were found to be 149%, 262%, and 124% of pre-industrial levels (1850-1900), respectively. The average global temperature was increased 1.15 ± 0.13 degrees Celsius. High temperature contributed to a 10-millimeter sea level rise frequently and intense forest fire, drought, heatwave, and flood worldwide, particularly in Southeast Asia. Global
forest resources continuously lost due to agricultural expansion, while biodiversity was
affected by climate change, with 11-98 % land vertebrates and 17-84 % marine animals under threat from habitat loss. The concentration of PM2.5 suspended particulates in Southeast Asia dropped by 5% during the year 2021-2022, with decreasing in Indonesia and Myanmar.

 Thailand set the targets to increase the use of renewable energy to 30% of final energy by 2037, promoting the inclusion of local areas on the international list of natural and cultural heritages, revising the Thailand's Long-term Low Greenhouse Gas Emission Development Strategy, enacting laws to regulate manufacturing processes that use mercury or mercury
compounds, allowing the exclusion of certain wildlife species from protection lists, and
formulating the Action Plans to Against Wildlife Trafficking.

 **1.3 National management of natural resources and environment**

 In Thailand, the Environmental Fund serves as a financial mechanism that provides both funds and loans for the management of natural resources and the environment. In 2022, the Fund allocated 203.53 million baht to support 115 projects and co-financed climate change projects with international donors during the years 2022-2023. There were various tax measures for electric vehicles (EVs), financial support to promote the use of biodegradable plastics, establish community forests, implement measures to stimulate investment in renewable energy and recycling, invest in environmentally sound production lines, and develop Thailand's Taxonomy for an environmentally friendly economy. Additionally, several society groups have phased out single-use plastics, explored recycling and reused options, reduced food waste, and created business platforms for environmentally sound practices

 The 2023 government budget allocated 122,605.96 million baht for environmental
activities under the budget line 'strategy for environmentally friendly growth'. This amount represented a 3.85% increase from the previous year, where 119,107.46 million baht had been set aside for environmental-related tasks.

**2. Environmental quality statement**

The environmental situation in Thailand during 2022-2023 is summarized as follows:

**1)** **Soil resource and land use**: In 2022, 23,776,000 hectares of land, equivalent to 46.33% of the country's total area, were found suitable for agricultural use. Among these, 1,817,600 hectares had low fertility due to natural degradation and inappropriate land use practices, particularly the cultivation of unsuitable crops. Severe land degradation had been increased, while the importation of chemical fertilizers decreased by 25.72% compared to the previous year. This reduction followed a recent trend and reflected the decline in the use of chemical fertilizers and decrease in chemical residues.

**2)** **Mineral resources**: In 2022, mineral production and consumption decreased by 10.68% and 6.45% compared to the previous year, respectively. The most commonly produced mineral was limestone, primarily used in construction. However, imports and exports of minerals decreased by 9.24% and 4.98%, respectively. The majority of imports consisted of lignite, while gypsum was the highest exported mineral. As of June 2022, there were 1,127 mines in operation, with the majority dedicated to limestone extraction for construction. The mining sector was expected to expand in tandem with the growth in the construction industry continuously.

**3)** **Energy**: In 2022, primary energy production decreased by 15.99% compared to the previous year. Natural gas accounted for the majority of primary energy production at 68.73%. The net import of primary energy and the use of final energy reportedly increased by 4.3% and 9.35%, respectively, while the proportion of renewable energy to final energy use was 9.35%. Despite highly efficient energy usage, carbon dioxide emissions from the energy sector in 2022 rose by 1.5% compared to the previous year.

**4)** **Forest resources and wildlife**: In 2022, forested areas covered 31.57% of the country's total land area. There was no significant change in forested areas over the past
10 years, and illegal forest encroachment was observed to be on the decline, particularly in northern Thailand, where most violations had been recorded. However, the areas affected by forest fires were decreased from previous year. Regarding wildlife, a monitoring program conducted on 120 individuals of tigers reported a possible increase in the population of this species. Wildlife trafficking rose due to the use of online platforms for the online trading.

**5) Water resources**:In 2022, the average rainfall reportedly exceeded the 30-year average by 24%. Additionally, the average natural runoff decreased by 3.34%, while water storage in large and medium reservoirs increased by 64.85% and 24.72%, respectively. There was no significant change noted in the quantity and the quality of groundwater remained in good condition.

**6) Marine and coastal resources**: The 2022 catch per unit effort (CPUE), which reflects the state of marine and coastal resources, was found to increase by 1.43% from the previous year. Most seagrass beds were reported to be in moderate condition, while most coral reefs were noted to be in good condition. Mangrove forests were found to have expanded by 12.93% compared to the 2017-2018 period. In 2022, a total of 659 rare marine animals, mostly sea turtles, were found stranded on beaches, marking a decrease in the number compared to the previous year.

**7) Biodiversity:** Agricultural ecosystems and forest ecosystems are the dominant ecosystem~~s~~ in the country, accounting for 78% of the total land area. During 2022-2023, 34 plant species, 20 vertebrate species, 36 invertebrate species, and 14 microbes were discovered. Among all classified plants, 999 species (9.08%) are listed as threatened species, while the list of threatened animals includes 676 species of vertebrates and 302 species of invertebrates. The latest evaluation of threatened species in 2020 found a decline in the number of endangered species compared to 2015.

**8)** **Pollution**: In 2022, air quality exhibited improvement, with the average
concentrations of PM10 and PM2.5 below the safe standards, except in Na Phra Lan Sub-district of Saraburi Province, where these standards were exceeded. Significant concentrations of
persistent organic pollutants (POPs) were also detected at the Map Ta Phut Industrial Estate and surrounding areas in Rayong Province. Noise levels in urban areas were found at stable and below the health standards. While water quality in good condition, except in the upper part of the Gulf of Thailand. In 2022, 25.7 million tons of solid waste were generated, marking an
increase of 2.88% from the previous year. Of this total, 11% was found to consist of single-use plastics, and only 38.13% of the waste was disposed of appropriately. The quantity of hazardous waste from communities, industrial waste and infectious waste was risen.

**9)** **Urban environment**: The 2022 household registration indicated that residents in urban area accounted for 34.21% of the country's population, representing a slight decrease from the previous record. Two new industrial estates employed nearly one million workers and impacted on urban environment and around the sites. The green area per capita in Bangkok, Pattaya, and city municipalities was found to exceed the national target of 5 square meters per individual.

**10)** **Natural and cultural heritages**: land-forms and landscapes designated for conservation (i.e., mountains, caves and waterfalls) were found in good condition. With 3 inclusions in 2022, the list of local geopark is now consisted of 10 sites. Thirty-six areas were declared as old towns. Six sites were included in the tentative list for the World Heritage submissions. Rearing of swamp buffalo in Thale Noi wetland was enlisted as Thailand’s first inclusion in the Globally Important Agricultural Heritage Systems.

**11) Climate change and natural disaster:** In 2022, no significant change was found in the average annual temperature (27.4 degrees Celsius) from previous records while average precipitation reportedly increased from normal value by 24% (2,011.9 millimeters) and was higher than the previous years. One hundred and sixty-four natural disasters were reported between October 2021 and January 2022 and landslide was the most frequent.

**3. Future changes**

 **3.1 Short term:** Changes that are likely to occurring in the next 2 years may include;

**1)** **Change in land use of agricultural and urban expansion**: The expansion of farming, urban area and construction in major cities and tourist destinations is likely to exacerbate soil erosion and other forms of land degradation, leading to generation of pollutants from burning and other waste disposal practices. However, there is a likelihood that the use of chemical and hazardous materials will continue to decline and eventually be phased out, providing an opportunity for soil recovery.

**2) More mineral production and consumption**: Economic stimulus measures, the promotion of investment in mega projects and the expansion of the construction industry lead to an increased use of minerals, particularly limestone in the cement and construction sectors. However, higher mineral production could give rise to issues such as suspended particulate pollution, competing demands for water, reservoir contamination, and potential adverse effects on public health.

**3) Increase in imported energy:** Energy consumption is expected to rise with economic expansion and recovery, especially in the fields of transportation and power generation. However, the growth in energy use may slow down due to rising petroleum prices, increasing adoption of electric vehicles (EVs), and growing demand for renewable energy.

**4)** **Increase in plastics waste**: The use of plastics, especially single-use plastics delivery to prevent the COVID-19 infectious disease and recovery of the tourism industry, is expected to contribute to an increase in the generation of plastic waste. The absence of proper waste segregation is likely to lead to more inappropriate disposal and unintentional environmental pollution suck as public reservoir, river and sea.

**5) Terrestrial and marine biodiversity under threat**:Biodiversity is expected to face ongoing threats from habitat changes, forest fires, illegal hunting and harvesting, tourism, and climate change. These threats could directly and indirectly heighten the risk of species extinction. Additionally, it's important to consider the impacts of invasive alien species on the populations of local species.

**6) More climate disturbance**:The increased fluctuations in temperature, precipitation, humidity, and sea levels are expected to be observed and to have more impacts on water usage across various sectors. Among those most affected by the climate change impacts are farmers, coastal communities and low demographic status groups.

 **3.2 Long term:** Anticipated changes in the next 10 years may involve;

**1)** **Changes from aging society and urban expansion**: The growth of the elderly population would be increased resulted in generating large amount of waste. With the expansion of urban communities, waste generation will extend to broader areas, and the quantity of waste is projected to further rise due to increasing amount of online purchases. It will be significantly influenced by waste segregation practices and the effectiveness of local authorities.

**2) Changes from economic development**:economic growthhas consistently impact on land use, resource utilization, energy consumption, waste generation, and climate change. Aligning economic development with the goals of the Paris Agreement and responding to reduce Greenhouse Gases Emissions resulted in improving environmental awareness of trade partners, trading conditions may help reduce the environmental impacts.

**3) Changes from technology and innovation advances:** Enhancing the efficiency of clean energy production, energy conservation, resource utilization, recycling, and environmental monitoring would bring significantly environmental benefits. However, technological advancements may also deplete natural resources at an accelerated rate and result in the generation of electronic and other by-products.

**4) Changes from climate change**: Climate change impacts the growth and reproduction of plants and animals as well as the survival of corals and other marine life, and agricultural production. These changes are expected to persist alongside the efforts of various countries to establish and achieve targets for reducing greenhouse gas emissions and expanding forested areas to absorb and store carbon from the atmosphere.

**5) Changes from national and international policies:** Embracing the Bio-Circular-Green Economy (BCG) to attain sustainable development and fulfill global and regional commitments can improve the efficient use of resources and decrease greenhouse gas emissions, especially in the transportation and the energy sectors. Political changes may affect the financial support for environmental initiatives.

**4. Policy recommendations**

 **4.1 Short term:** In the next two years, relevant agencies should collaborate and
coordinate with other sectors to implement the following measures.

 **1) Addressing suspended particulate pollution from agriculture**:The issue needs to be promptly addressed at its source by fostering cooperation for recycling and reusing
agricultural by-products, implementing strategies to curb field burning in sensitive areas, and taking tangible measures to prevent cross-border pollution.

 **2)Conducting research and innovation to increase consumption efficiently,
in mining**:To optimize the utilization of mineral resources, it is essential to provide support for research and development of innovative technologies for mineral extraction, processing, and other related production, in line with the principles of sustainability and resource cycling.

 **3) Taking account of lessons learned from adoption of measures for Eco-based Adaptation (EbA)**: Lessons learned from the implementation of Eco-based Adaptation (EbA) measures should be considered and applied for broader adoption of these measures, in conjunction with efforts to enhance the adaptation capacity of groups vulnerable to the impacts of climate change.

 **4.2 Long term:** In the next 10 years, actions should take into account evolving
circumstances, the direction of national development, and the potential for cross-sectoral cooperation. These actions may include the following.

**1) Establishing Systematic disposal of solar cells and EV batteries**: With continued support for solar power generation and the use of electric vehicles (EVs), there is a need for a systematic disposal of used solar cells and batteries. This may involve establishing systems to collect and appropriately dispose of the by-products, implementing regulations to hold manufacturers responsible for the collection and disposal, as well as conducting research and development on effective disposal and recycling methods.

**2) Promoting financial sector roles in investment for biodiversity management:** Actions aligned with the Kunming-Montreal Global Biodiversity Framework could receive support as explicitly outlined in the national biodiversity action plan. These actions may encompass the identification of best practices, priority issues, critical sites, and cooperation mechanisms. It is crucial to demonstrate the connection among biodiversity, climate change, and their impacts on businesses.

**3) Increasing capacity of agricultural sector for climate change adaptation:** Efforts should be made to conduct research and enhance capacity for climate change adaptation in the agricultural sector. These actions may involve disseminating knowledge and raising awareness about the impacts of climate change on farming, conducting risk assessments, developing local adaptation plans, and providing support to farmers in their adaptation endeavors.

**4) Promoting environmentally friendly consumption and services**: Proactive measures must be taken in alignment with national and international directives to prioritize the development of consumer preferences for environmentally friendly products and services. These actions should include waste reduction and segregation, secure the cooperation of tourism operators to promote environmentally responsibility practices throughout their operations and disseminate information on product and services with environmental label certifications. Additionally, another action should be made to explore and expand the market of friendly environmentally products and services.