TOWARDS A GREEN AND RESILIENT THAILAND

Overview

Muthukumara Mani and Hector Pollitt

September 2024

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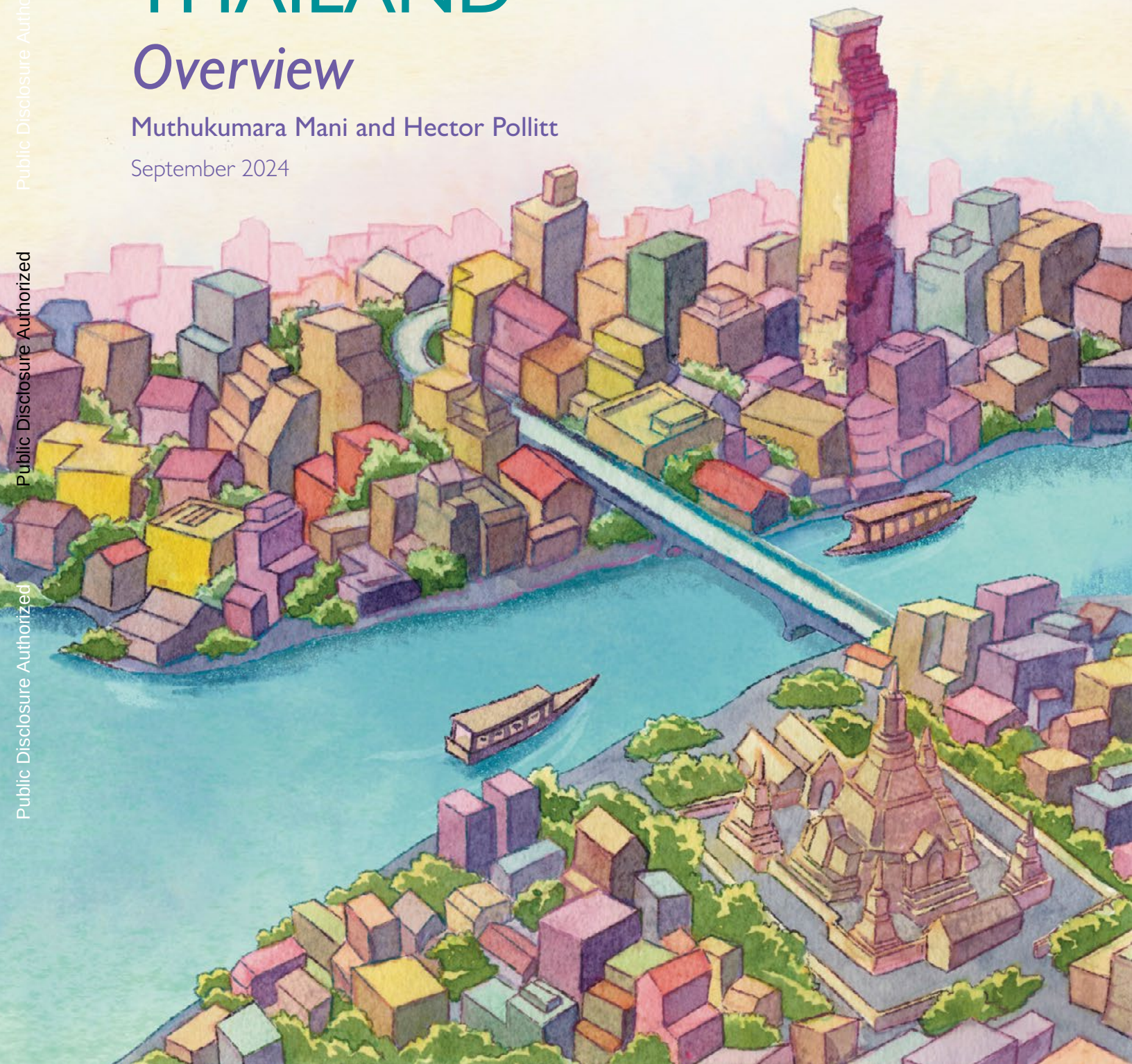

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This report was written by a core team comprising Muthukumara Mani (TTL), Hector Pollitt (co-TTL), Waraporn Hirunwatsiri, Sailesh Tiwari, Mattia Amadio, Erica Honeck, Onil Banerjee, Rattanyu Dechjejaruwat, Anil Markandya and S. Vaideeswaran. The report was prepared under the overall direction of Mona Sur (Practice Manager, SEAE2), Lars Christian Moller (Practice Manager, EEAM2) and Fabrizio Zarcone (Country Manager). The team extends thanks to Peer Reviewers, Ajay Nair, David Kaczan, and Luis Diego Herrera Garcia for their thoughtful comments. The team appreciates the Government of Thailand participants for their insightful contributions to the workshop held on June 19, 2024.

INTRODUCTION

Thailand has made significant progress in its economic development, transitioning from a low-income to an upper-middle-income country. Going forward, the country is facing persistent challenges, including a deceleration in economic growth, climate vulnerability, and environmental degradation.

The government has outlined its vision for a Bio-Circular-Green (BCG) economy to create a sustainable and competitive economic landscape to tackle these challenges. Introduced in 2021, the BCG model seeks to combine Thailand's biological and cultural diversity with technological innovation to create a new growth paradigm.

Mounting evidence shows that Thailand is extremely vulnerable to climate change, with rising sea levels, extreme weather events, and changing precipitation patterns posing significant risks to both urban and rural areas. The nation is vulnerable to a range of natural hazards, including floods, landslides, tropical cyclones, droughts, and coastal erosion. An uneven distribution of climate impacts across the country highlights the need for targeted interventions to address specific vulnerabilities. For example, Thailand's population is predominantly concentrated in urban areas, with rapid urbanization increasing the vulnerability of densely populated concentrations to climate-related risks, particularly floods. Lower-income households, often residing in hazard-prone areas, face greater challenges due to limited access to essential services. The country's vital agricultural sector is also significantly threatened by altered rainfall patterns and temperature extremes, jeopardizing crop production.

The depletion of natural resources, along with environmental degradation, further exacerbate the challenges faced by Thailand. Forest coverage is decreasing, and built-up assets, particularly in major cities, are susceptible to the impacts of climate hazards. The country's rich natural capital plays a crucial role in supporting local livelihoods, and the loss of biodiversity and ecosystem functions poses significant risks to communities and key economic sectors. For example, the total loss of land due to coastal erosion is estimated at two square kilometers per year, with a value equal to .04 percent of gross domestic product (GDP). Cities and economic activities in coastal areas are especially vulnerable to coastal erosion.

Given the increasing climate challenges, this report updates Thailand's BCG model for current circumstances. We call it BCG+. The report uses advanced modeling and other cutting-edge

analytics to take a whole-of-the-economy perspective so that BCG+ is assessed within the context of broader economic development. Beyond environmental concerns, Thailand's economic risks, tied to global trends and its reliance on tourism, necessitate a revised development model. The BCG+ economy could mitigate these exposures by reducing reliance on global commodity prices and enhancing economic resilience. By integrating measures on climate resilience, sustainable resource management, and inclusivity in its development strategy, Thailand can work towards achieving its vision of a BCG economy.

THE BCG+ TRANSITION

Transitioning to a BCG+ economy requires contributions from all sectors of society, with a focus on sector-specific characteristics. Whole-economy policies such as carbon taxes need to consider technological nuances for effectiveness. Circular production poses additional challenges due to multiple inputs and outputs in the business model. Coordination between the public and private sectors is imperative. The public sector must initiate change, finding financing solutions for actions like climate adaptation, potentially through an economy wide carbon tax. Simultaneously, private companies bear responsibility for improving efficiency, fostering innovation, and aligning product designs with bio-circular goals.

The transition offers macro-level opportunities, showcasing potential benefits like increased economic welfare, higher incomes, and enhanced employment levels. Technological advancements and undiscovered productivity avenues underpin these opportunities, positioning the BCG+ economy as a driver for economic development. Crucially, this shift safeguards Thailand from future climate and economic risks while preserving natural capital for sustainable growth.

METHODOLOGY

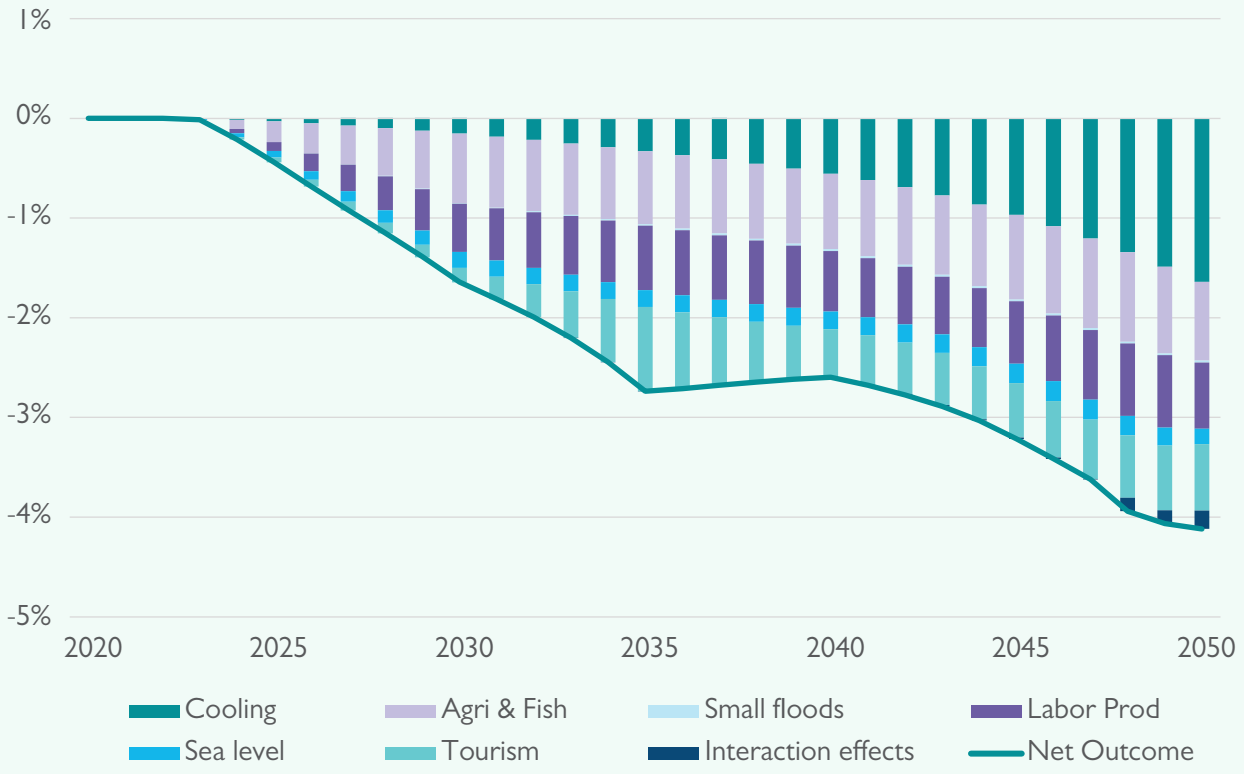
Macro-level and sectoral modeling tools can identify the whole-economy effects of the BCG+ challenge. Although there is considerable uncertainty about the future economic impacts of climate change, modeling tools can help to identify which parts of the economy are most vulnerable, both directly and indirectly. Similarly, for climate change mitigation and other aspects of BCG+, models can be useful in planning future policy. It is important that models are applied appropriately, especially given data limitations related to climate change and potential climate change adaptation measures.

The report applied a suite of advanced modeling tools. The broad coverage of the BCG+ development model means that a variety of quantitative tools is required to assess impacts. The report uses a combination of macro-econometric, input-output, and technology diffusion modeling. It also applies a Computable General Equilibrium model that is linked to high-resolution spatial Land Use Land Cover (LULC) analysis and an ecosystem services model. In all cases, model results are compared to a "business-as-usual" baseline scenario to identify the climate and policy shocks.

KEY FINDINGS

The report underscores that Thailand's agriculture and fishing sectors are particularly susceptible to climate change, a vulnerability heightened by the country's substantial local fishing and shrimp farming industries. This susceptibility is critical as many low-income households rely on these sectors for their livelihoods. The potential impacts are severe: agriculture could experience production losses ranging from $2.9 billion to $5.4 billion, while up to $26.2 billion of fishing production value is at risk. Furthermore, heat stress will severely impact ocean ecosystems, leading to significant fishing losses across all climate scenarios. Additionally, climate change is already reducing productivity in outdoor labor sectors such as agriculture and construction, with potential productivity losses doubling by 2050. Although indoor labor productivity, supported by air conditioning, will face less of an impact, the cost of installing and maintaining cooling systems could reach $11 billion to $17 billion annually by 2050 (Figure ES1).

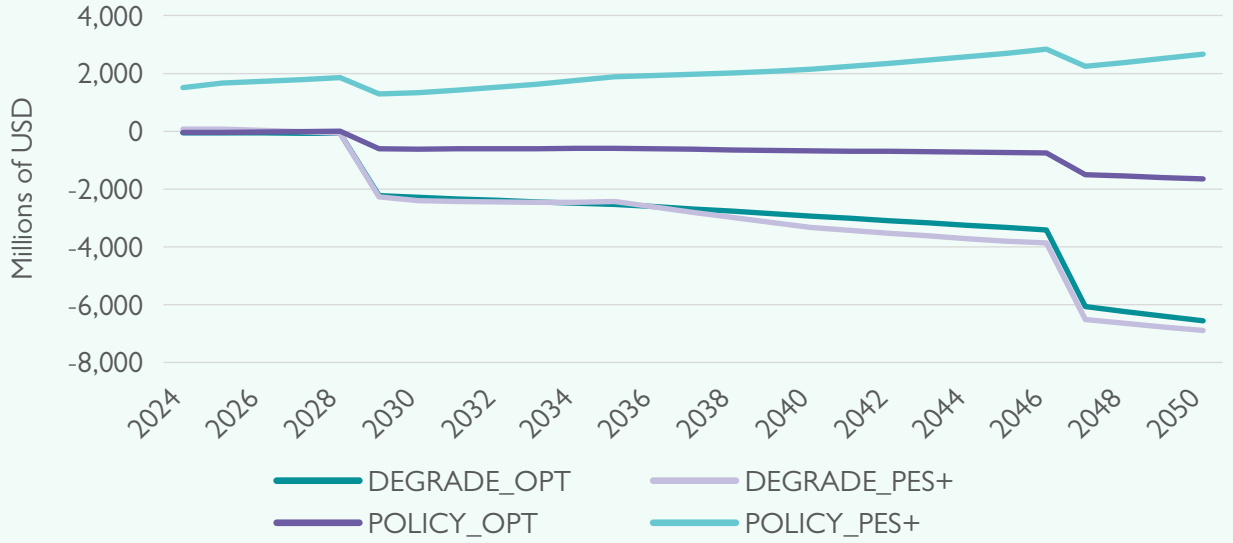
Figure ES1. Impact of different categories of climate damages on GDP



The report also explores the severe economic implications of approaching ecological tipping points, such as excessive deforestation and flooding. It compares two scenarios: DEGRADE, which involves ongoing deforestation and increased flooding, and POLICY, which includes proactive measures to mitigate these effects. Thailand's forest cover has already declined by 12% since 2000, and continued deforestation could lead to substantial ecological and economic losses. Effective policy interventions, such as halting deforestation and promoting reforestation, could mitigate these impacts. Without action, Thailand might face up to $553 billion in GDP losses by 2050. However,

strategic policies could reduce these losses by 68% and potentially enhance cumulative wealth by $54 billion through reforestation and afforestation initiatives.

Figure ES2. Impact of policy interventions to safeguard wealth

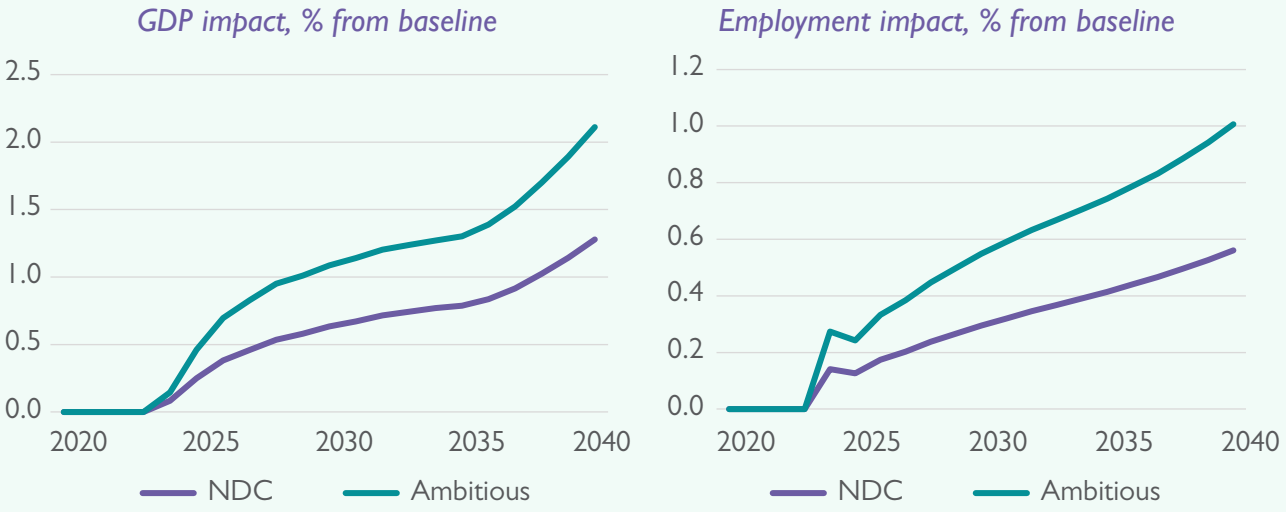


Source: IEEM+ESM results. Note: scenario names that terminate in OPT consider the RCP4.5 pathway while those that terminate in PES use the RCP8.5 pathway projection.

The report highlights that climate change could significantly affect Thailand's economy, especially through increased flood damage and sea-level rise. For instance, the economic impact of a major flood in 2030 could decrease GDP by up to four percentage points. Additionally, costs related to coastal erosion and sea-level rise are projected to increase by approximately $6 billion over time. Addressing these risks will require comprehensive climate adaptation and mitigation strategies. This includes implementing carbon pricing mechanisms and accelerating the transition to electric vehicles (EVs). Carbon pricing can incentivize emission reductions and potentially boost GDP and employment if the revenues are used to lower other taxes (Figure ES3). However, adaptation costs could reach at least 1.6 percent of GDP by the 2030s, with the government likely covering most of these expenses. Power sector reforms, aimed at reducing emissions, may reduce carbon tax revenues, while fuel excise duties could initially increase but decrease with the transition to EVs.

A successful transition to a circular economy by 2030 could lead to a 1.0 percent increase in GDP and the creation of 160,000 jobs. This shift, driven by improved waste management practices and reduced reliance on virgin resources, offers substantial economic benefits. For example, reducing food waste could boost agricultural and food exports, and transforming waste into new materials could increase value added in advanced manufacturing and service sectors. However, the success of these measures will depend on the availability of skilled workers and the need for sector-specific assessments to ensure effective implementation.

Figure ES3. GDP and Employment impact of carbon taxes



FOCUS AREAS AND RECOMMENDATIONS

While all actions in this report are valuable, some are more urgent due to their path dependencies and the opportunities they create, such as governance enhancements leading to larger adaptation investments. The report categorizes actions into short-term (by 2030), medium-term (by 2040), and long-term priorities (beyond 2040-50). Certain measures, including those improving economic and fiscal management, governance, and job creation, will advance both climate and development goals.

Adaptation is a major focus. Thailand should prioritize planning and preparing for climate impacts like flooding. Implementing early warning systems, improving access to essential services for lower-income households, investing in climate-resilient infrastructure, and enforcing land use policies are crucial. Measures such as sustainable land use and green infrastructure can reduce flood damage and other climate risks, potentially lowering the GDP impact of major floods in 2030 by four percentage points. Adapting existing infrastructure and addressing other climate impacts, like reduced fish catches and heat stress, are more challenging. Overall adaptation expenses could be at least 1.6 percent of GDP.

The study's modeling informs key policy recommendations for climate adaptation in Thailand. These recommendations, detailed in Table ES1, are vital for enhancing resilience and mitigating climate impacts. Integrating these strategies into Thailand's adaptation efforts will build a more resilient economy, improve quality of life, and ensure a sustainable future. Investing in adaptation protects communities and infrastructure, reduces disaster-related losses, and enhances productivity in key sectors.

Mitigating climate change is also crucial. Thailand faces challenges in reducing its carbon footprint and achieving carbon neutrality by 2050 amid rapid urbanization and fossil fuel reliance. Key strategies include comprehensive policies, renewable energy investments, and clean technologies.

Transitioning to renewable energy, improving energy efficiency, and promoting electric vehicles are essential. Carbon pricing and electric vehicle adoption will help reduce emissions. Success requires strong policies, collaboration between government and industry, and public awareness. Key recommendations for mitigation strategies are outlined in Table ES2.

The roles of the public and private sectors in achieving carbon neutrality are distinct yet interconnected. The public sector must craft and enforce policies, invest in renewable infrastructure, and raise awareness. The private sector should implement these policies through innovation and investments in clean technologies. Effective collaboration between government and industry is essential for a unified approach to carbon mitigation.

Embracing a circular economy is vital, particularly for addressing plastic waste in the Chao Phraya River. Transitioning to this model reduces plastic consumption, promotes recycling, and minimizes waste. Policies like extended producer responsibility and eco-design standards can curb plastic pollution. Investing in waste management infrastructure and recycling technology will enable efficient waste recovery. The public sector should set regulatory frameworks and invest in infrastructure, while the private sector should drive innovation and improve product design. Key recommendations for transitioning to a circular economy are detailed in Table ES3.

Table ES1. Priority Adaptation Actions

Action	Description	Urgency	Co-benefits	Feasibility
Implement flood management strategies	Given the significant projected impact of floods, Thailand must prioritize comprehensive flood management strategies to reduce the vulnerability of communities and infrastructure. Key measures include investing in flood control infrastructure like levees and flood barriers, implementing nature-based solutions such as wetland restoration and floodplain zoning, and strategically locating new infrastructure away from flood-prone areas. Enhancing resilience through improved drainage systems and promoting green infrastructure can further mitigate the adverse impacts of floods. (Ministry of Natural Resources and Environment, Ministry of Interior, Urban Local Bodies and Communities)	S	3	L
Develop early warning systems and enforce building regulations	Early warning systems are vital for preparedness and reducing the risk of loss during extreme weather events. Thailand should invest in advanced technologies and community engagement for these systems. Enforcing building regulations to ensure structures can withstand and are elevated above flood levels is essential. Strategic planning	S	3	L

Action	Description	Urgency	Co-benefits	Feasibility
	and zoning in flood-prone areas, guided by risk assessments, can minimize exposure, and promote sustainable development. (Ministry of Natural Resources and Environment, Ministry of Interior, Ministry of Agriculture, Local Government Units and Community Organizations)	S	3	L
Enhance coastal resilience	With the increasing threat of sea-level rise and coastal erosion, Thailand should enhance coastal resilience. This includes implementing nature-based solutions like mangrove restoration and beach nourishment and investing in hard infrastructure like seawalls and breakwaters. Developing coastal zone management plans that integrate climate considerations and involve local communities is crucial for sustainable coastal adaptation. (Department of Marine and Coastal Resources, Department of National Parks, Wildlife and Plant Conservation. Local Community Groups)	M	2	HL
Promote climate-smart agriculture	Climate change poses significant risks to Thailand's agriculture, crucial for food security and livelihoods. To build resilience, Thailand should promote climate-smart practices like crop diversification, water-efficient irrigation, and soil conservation. Providing farmers with access to climate information and extension services will help them to adapt and minimize crop losses. (Ministry of Agriculture and Cooperatives, Ministry of Natural Resources and Environment, Local Government Units and Community Organizations, Research Institutions and Academia)	M	I	L
Strengthen urban resilience	As urbanization accelerates, cities in Thailand face increased climate-related risks like heatwaves, urban flooding, and infrastructure damage. Investing in green infrastructure, such as parks and green roofs, can mitigate the urban heat island effect and reduce flood risk. Integrating climate considerations into urban planning and design, including climate-responsive building codes and sustainable transport systems, will enhance urban resilience and promote sustainable development. (Ministry of Interior, Ministry of Natural Resources and	L	2	LL

Action	Description	Urgency	Co-benefits	Feasibility
	Environment, Ministry of Digital Economy and Society, Local Government Units and City Planning Authorities, Private Sector and Industry)	L	2	LL
Enhance community-based adaptation	Recognizing the importance of local knowledge and community participation, Thailand should prioritize community-based adaptation approaches. Empowering local communities to implement tailored adaptation measures will enhance grassroots resilience. Supporting community-led initiatives, such as climate-resilient agriculture and disaster risk reduction activities, can build social cohesion and strengthen adaptive capacity. (Ministry of Agriculture and Cooperatives, Ministry of Natural Resources and Environment, Local Government Units and Community Organizations)	L	2	L
Invest in climate-resilient infrastructure	Climate-proofing infrastructure investments is essential for reducing vulnerability to climate change impacts. Thailand should integrate climate considerations into infrastructure planning, design, and maintenance across sectors like transportation, energy, and water management. This includes incorporating climate risk assessments, designing infrastructure to withstand extreme weather, and ensuring robust maintenance and monitoring systems. (Ministry of Transport, Ministry of Energy, Ministry of Interior. Local Government Units and Municipal Authorities, Private Sector and Industry)	M	2	L

Table ES2. Priority Mitigation Actions

Action	Description	Urgency	Co-benefits	Feasibility
Implement carbon pricing mechanisms	Introducing carbon pricing mechanisms, such as a carbon tax or emissions trading scheme, in Thailand can incentivize businesses to reduce carbon emissions. These mechanisms encourage cleaner technologies and practices, leading to reduced emissions. Revenue from carbon pricing can be reinvested in climate mitigation and adaptation efforts, enhancing Thailand's resilience to climate change.	S	2	HL

Action	Description	Urgency	Co-benefits	Feasibility
	(Ministry of Finance, Ministry of Environment and Natural Resources, Ministry of Industry, Ministry of Energy, Ministry of Agriculture and Cooperatives, Private Sector and Industry)	S	2	HL
Power sector reforms	The Government of Thailand should prioritize power sector reforms to enhance the effectiveness of carbon taxes. By aligning energy pricing with carbon reduction goals, these reforms would encourage investment in cleaner technologies and support a smoother transition to a low-carbon economy. (Ministry of Energy, Electricity Generating Authority of Thailand, Ministry of Finance, Energy Regulatory Commission, Department of Alternative Energy, Development and Efficiency, Private Sector and Industry, International Organizations and Development Partners)	S	3	L
Utilize carbon tax revenues to support other climate policy	The revenue generated from carbon taxes could be channeled into a dedicated climate fund, supporting other critical climate policies and initiatives, further accelerating the country's transition to a low-carbon climate resilient economy. (Ministry of Finance, Ministry of Energy, Office of the National Economic and Social Development Council. Climate Change Department, Ministry of Environment and Natural Resources, Energy Regulatory Commission)	S	3	HL
Collaborate for electric vehicle transition	Collaborating with international organizations and private sector partners can accelerate Thailand's transition to electric vehicles (EVs). By sharing knowledge, expertise, and resources, Thailand can address barriers to EV adoption, such as high upfront costs and limited charging infrastructure. These partnerships can also foster domestic EV manufacturing capabilities, creating new opportunities for economic growth and innovation. (Automobile Manufacturers, Charging Infrastructure Providers, Energy Companies, Ministry of Energy, Ministry of Transport, Thailand Board of Investment)	M	2	L

Action	Description	Urgency	Co-benefits	Feasibility
Implement a comprehensive EV policy package	Thailand can promote widespread EV adoption through a comprehensive policy package. This could include incentives for EV purchases, subsidies for charging infrastructure, and tax breaks for manufacturers. By addressing both supply and demand-side barriers, Thailand can create a supportive environment for EV uptake, reduce GHG emissions from transportation, and improve urban air quality. (Ministry of Energy, Ministry of Transport, Department of Land Transport Electricity Generating Authority of Thailand, Thailand Board of Investment, Ministry of Finance, National Science and Technology Development Agency. Office of the National Economic and Social Development Council)	M	2	L
Implement afforestation and forest restoration measures	Thailand can mitigate climate change and protect ecosystems by implementing afforestation and forest restoration measures. Restoring degraded forests and expanding green cover will sequester carbon dioxide, enhance biodiversity, and provide economic benefits such as job creation in forestry and opportunities for ecotourism. These measures are essential for Thailand's long-term climate resilience and sustainability. (Ministry of Natural Resources and Environment, Department of National Parks, Wildlife and Plant Conservation, Royal Forest Department, Department of Land Development, Ministry of Agriculture and Cooperatives, Office of the National Economic and Social Development Council, Local Government Units and Municipal Authorities, Private Sector and Non-Governmental Organizations)	L	2	L
Enhancing Energy Efficiency	Improving energy efficiency in Thailand is essential for reducing consumption and greenhouse gas emissions. Measures include adopting strict efficiency standards, promoting energy-efficient building designs, and using smart grid technologies. Incentives for energy audits and savings technologies, along with public awareness campaigns and training, will	M	2	L

Action	Description	Urgency	Co-benefits	Feasibility
	support a transition to a greener economy and lower overall energy demand. (Ministry of Energy, Department of Alternative Energy Development and Efficiency, Energy Regulatory Commission, Ministry of Interior, Office of the National Economic and Social Development Council, Thai Green Building Institute, Local Government Units and Municipal Authorities, Private Sector and Industry Associations)			

Table ES3. Priority Circular Economy Actions

Action	Description	Urgency	Co-benefits	Feasibility
Policy Framework for Circular Economy	The Thai government should create a comprehensive policy framework for a circular economy, including regulations, incentives, and guidelines to promote sustainable design, resource efficiency, and waste reduction. Setting clear targets and timelines will guide and hold stakeholders accountable across sectors. (Ministry of Natural Resources and Environment, Department of Environmental Quality Promotion, Ministry of Industry, Office of the National Economic and Social Development Council, Department of Industrial Works, Thailand Board of Investment, Local Government Units and Municipal Authorities)	M	2	HL
Support Innovation and Technology	Thailand should leverage innovation and technology to advance the circular economy. Investing in research and development will help scale up technologies for recycling, remanufacturing, and resource recovery. Embracing digital technologies and data analytics can optimize resource use and support circular business models. By fostering a culture of innovation, Thailand can lead in sustainable resource management and circular solutions. (Ministry of Science and Technology, National Science and Technology Development Agency, Ministry of Industry, Department of Industrial Works Office of the National Economic and Social Development Council, Thailand Board of Investment, Private Sector and Industry Associations, Universities and Research Institutions)	M	3	L

Action	Description	Urgency	Co-benefits	Feasibility
Circular Procurement	Promoting circular procurement practices is essential for driving demand for sustainable products and services in Thailand. The government can lead by incorporating circularity criteria into public procurement. Clear guidelines for evaluating product and service circularity will encourage businesses to adopt circular practices. By boosting market demand for circular products, Thailand can foster innovation, investment, and progress toward sustainability goals. (Ministry of Finance, Office of the Public Procurement, Ministry of Commerce, Department of Internal Trade, Ministry of Industry, Thailand Board of Investment, Office of the National Economic and Social Development Council, Private Sector and Industry Associations, Environmental Non-Governmental Organizations)	M	2	HL
Product Design Improvements	Thailand can encourage businesses to focus on eco-design principles, such as durability, repairability, and recyclability, in product development. Offering incentives and support for sustainable design will help reduce waste and improve resource efficiency. Designing products for easy disassembly and component reuse can extend their lifespan, minimize new resource extraction, and reduce environmental impact. (Ministry of Industry, Department of Industrial Works, National Science and Technology Development Agency, Thailand Board of Investment, Office of the National Economic and Social Development Council, Private Sector and Industry Associations, Environmental Non-Governmental Organizations, Universities and Research Institutions)	M	2	L
Enhanced Material Recycling	Thailand should develop and invest in robust recycling infrastructure and technologies to facilitate efficient collection, sorting, and processing of recyclable materials. By establishing comprehensive recycling programs and promoting consumer awareness and participation, Thailand can increase recycling rates and divert more waste from landfills. Partnering with the private sector and	M	2	M

Action	Description	Urgency	Co-benefits	Feasibility
	incentivizing investment in recycling facilities can accelerate the transition to a circular economy. (Ministry of Natural Resources and Environment, Department of Environmental Quality Promotion, Department of Local Administration, Ministry of Industry, National Science and Technology Development Agency, Thailand Board of Investment, Local Government Units and Municipal Authorities, Private Sector and Industry Associations)			

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