

Climate Change Outlook of Southeast Asia

Navigating Climate Realities:
State of the Art of
Southeast Asian
Cities' Initiatives



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FOREWORD

As the Secretary General of United Cities and Local Governments Asia Pacific (UCLG ASPAC), I am honoured to present this Climate Change Outlook report, a vital resource for local governments in our region. UCLG ASPAC, as the leading association of local governments, has always prioritised sustainable urban development and addressed many challenges that our cities face. Among these challenges, climate change is one of the most urgent, particularly for the Asia-Pacific region—an area marked by its unique vulnerabilities and its resilience.

Since 2018, UCLG ASPAC has been steadfast in its commitment to supporting local governments in tackling and adapting to climate change by hosting the Secretariat of the Global Covenant of Mayors for Climate and Energy (GCoM) in Southeast Asia, a sub-region that is particularly impacted by climate-related events. Our role in the GCoM Asia Project, funded by the European Union, has enabled us to provide targeted support to local governments, strengthening their capacity to effectively respond to the multifaceted impacts of climate change.

This report, developed with the support of the GCoM Asia Project, offers a comprehensive and timely outlook on climate change, specifically tailored for local governments in the Asia-Pacific region. Learning from local governments of ASEAN countries, it provides valuable insights into the current climate trends, future projections, and actionable strategies. These are critical for local governments that are on the frontline in dealing with the immediate and long-term effects of climate change—from rising sea levels and more frequent extreme weather events to shifts in agricultural patterns and water resources.

Local governments play a pivotal role in implementing climate strategies that protect their communities, promote sustainable development, and build resilience. This report not only highlights the successes achieved but also provides a roadmap for navigating the evolving challenges posed by climate change. It emphasises the importance of local actions and offers practical recommendations that can be adapted to diverse local contexts, empowering policymakers to make informed decisions.

Our collective response to climate change will define the future of our cities, towns, and rural areas. Engaging with this report allows local leaders to gain a deeper understanding of both the emerging risks and the potential opportunities that come with a changing climate. By enhancing their capacity to drive effective climate action, local governments can significantly contribute to global efforts in combating climate change and ensuring a sustainable future for their communities.

Let us use the knowledge and strategies outlined in this document to inspire and to take decisive action. The path ahead may be challenging, but with informed leadership, strong partnerships, and collaborative efforts, we can build a resilient and thriving Asia-Pacific region and secure a better environment and quality of life for generations to come.

Dr. Bernadia Irawati Tjandradewi
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Secretariat of the GCoM in Southeast Asia

EXECUTIVE SUMMARY

Climate Action: From Global to Local

Global temperature rise has garnered attention in recent years. In response, global and regional authorities have implemented various measures to combat climate change. The global stakeholders recognise climate change as a global crisis, highlighting its severe impact such as increasing threats of extreme weather events, rising sea levels, and disruptions to ecosystems and human well-being (Clarke L, 2014; Wright, Norval and Albers, 2015; UN, 2015; ASEAN, 2021; IPCC, 2014). Through the evolution of international climate agreements, from the concept of Common but Differentiated Responsibilities (CBDR) to the Kyoto Protocol, and finally to the Paris Agreement, there has been a notable shift towards collective action and differentiated responsibilities. With 195 parties onboard, the global community stands in the fight against climate change (Bilqis&Afrieansyah, 2020; Hourcade & Shukla, 2015; Ambrósio, et al., 2017).

The evolution of global climate change governance, culminated in the Paris Agreement (PA) of 2015, marks a significant milestone. This treaty aims to limit global temperature rise to a maximum of 2°C above pre-industrial levels, with a preference for 1.5°C. Additionally, this agreement, which received support from nearly all nations, establishes a framework for countries to submit their Nationally Determined Contributions (NDCs) to reduce emissions and adapt to climate change (Ambrósio et al., 2017; UN, 2023). Key provisions include directing financial flows towards low-emission and climate-resilient pathways, strengthening NDCs over time, and conducting regular global stocktakes to assess progress (UNFCCC, 2021).

Global action has been solidified through the Conference of the Parties (COP) meetings, commencing with COP 21 in Paris in 2015. These COP meetings have furthered the Paris Agreement's framework, aiming to operationalise its mechanisms and enhance global ambition. Subsequent COP meetings, including COP 22 in Marrakech, COP 23 in Bonn, COP 24 in Katowice, COP 25 in Madrid, COP 26 in Glasgow, COP 27 in Sham el-Sheikh, and COP 28 in Dubai have all contributed to advancing climate action through commitments to emissions reductions, adaptation measures, climate finance, and technology transfer (UNFCCC, 2023; Ioannou & Stylianou, 2021; UN, 2023).

Southeast Asia (SEA) countries have actively participated in global climate action since the ratification of the Paris Agreement. The national agendas align with the agreement's long-term goals, which include limiting temperature rise, enhancing adaptation, and directing financial flows towards climate-resilient pathways (Handayani et al., 2022; Bain & Company, Temasek, GenZero, and Amazon Web Services, 2023). These countries have introduced their strategic importance in global climate efforts, given their substantial contributions to greenhouse gas (GHG) emissions and their potential to accelerate decarbonisation through renewable energy (ASEAN, 2022; Bain & Company, Temasek, GenZero, and Amazon Web Services, 2023).

SEA countries have formulated strategies to achieve their emissions reduction targets, with a focus on agriculture, forestry, energy, transport, and industry sectors. Furthermore, regional initiatives, particularly within ASEAN, prioritise renewable energy adoption to meet targets, such as achieving a 35% renewable energy mix by 2025 (Bain & Company, Temasek, GenZero, and Amazon Web Services, 2023). (UNFCCC, 2023; ASEAN, 2020).

At the local level, cities play a crucial role in climate action and have been at the forefront of combating climate change due to their significant contribution to global emission reduction efforts. There is a mutual understanding among cities that the international climate agenda should be integrated and mainstreamed within the sub-national agenda. This acknowledgement of the importance of local-level engagement has been cited since COP 22. According to the United Nations Environment Programme (UNEP), cities account for 75% of global carbon emissions, and their leaders are well-positioned to address the problem (UNEP, n.d.). City leaders are expected to reduce emissions, enhance resilience, drive innovation in climate solutions, and engage in global initiatives, such as the Global Climate Action Portal, to monitor progress and collaborate with other cities (UNEP, n.d.; Volz & Pine, 2022; Trotta, 2022; UNFCCC, 2021; OECD, 2010).

Furthermore, this study acknowledges the meaningful collaboration and support provided by developed countries, particularly the European Union (EU), in financing climate-friendly development in Southeast Asia through initiatives such as the ASEAN Catalytic Green Finance (ACGF) (Hutt, 2021; Sudjana, et al., 2023; EU, 2022). It also underscores the crucial role of cities in shaping the future of climate resilience, highlighting the need for multilateral and regional cooperation at all levels of government to effectively address climate action (UCLG, 2021; UNEP, n.d.; World Bank, 2023). Collaboration is indeed essential for implementing climate action initiatives. Assessing the progress and impact of climate initiatives at both national and local levels is important, emphasising the need for ongoing collaboration and strategic partnerships to accelerate climate action and achieve the goals outlined in the PA (Economist, 2023; World Economic Forum, 2023). Therefore, this study aims to outline the outlook, assess the gaps, and identify the challenges of climate action initiatives already carried out in Southeast Asia.

Current Status and Efforts

This study explores the multilayered effort spanning from local authorities to national and regional levels in addressing climate change. At the local level, substantial progress has been achieved in integrating climate action into development agendas. Additionally, national and regional agendas are increasingly aligned with the PA, signalling a concerted effort in combating climate change.

Collaboration and partnerships among diverse actors are essential for accelerating climate action, resonating with the Sustainable Development Goal (SDG) 17. Partnerships have been forged at regional, national, and local levels, including the cooperation between the EU and ASEAN, as well as partnerships with development organisations such as JICA, KOICA, and The World Bank. Notably, this study focuses on local authorities' climate action initiatives facilitated by the United Cities and Local Governments Asia Pacific (UCLG ASPAC).

UCLG ASPAC provides insights into local climate action initiatives in Southeast Asia, particularly through 45 pilot cities and local governments in five countries. Under the two EU-funded projects, namely the International Urban Cooperation (IUC) Asia Project and the Global Covenant of Mayors for Climate and Energy (GCoM) Asia Project, UCLG ASPAC acts as the Secretariat of the GCoM SEA, supporting 28 pilot cities from Indonesia, Malaysia, Thailand, and Vietnam in developing their Climate Action Plans (CAPs). These CAPs cover their GHG emissions, pledged targets, and planned efforts of climate action through adaptation and mitigation programmes. The CAPs formulated by these cities serve as strategic roadmaps, outlining their endeavours to mitigate emissions and contribute to NDCs. Committed to addressing climate change in the region, UCLG ASPAC is also implementing two flagship programmes beyond GCoM SEA; the Climate Resilient and Inclusive Cities (CRIC) funded by the EU and the Integrated Urban Climate Action for Low-Carbon & Resilient Cities (Urban-Act) funded through the International Climate Initiative (IKI) fund (Figure 1).

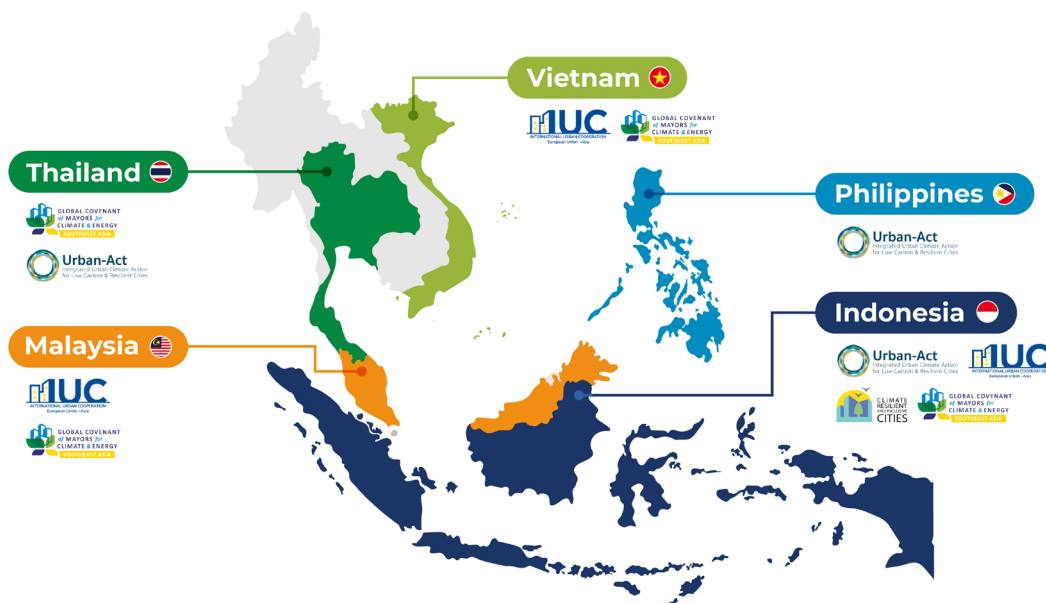


Figure 1: Pilot Cities in Southeast Asian Countries

The GHG reduction initiatives of these cities against the Business as Usual (BaU) 2030 emissions scenario reveal promising progress (Figure 2). Across the SEA region, these cities collectively aim to reduce emissions by approximately 0.47% against the BaU 2030 scenario, making significant contributions to their respective countries' NDCs. Malaysia has shown particularly notable progress in GHG reduction efforts, followed by Indonesia, Vietnam, and Thailand (Figure 2).

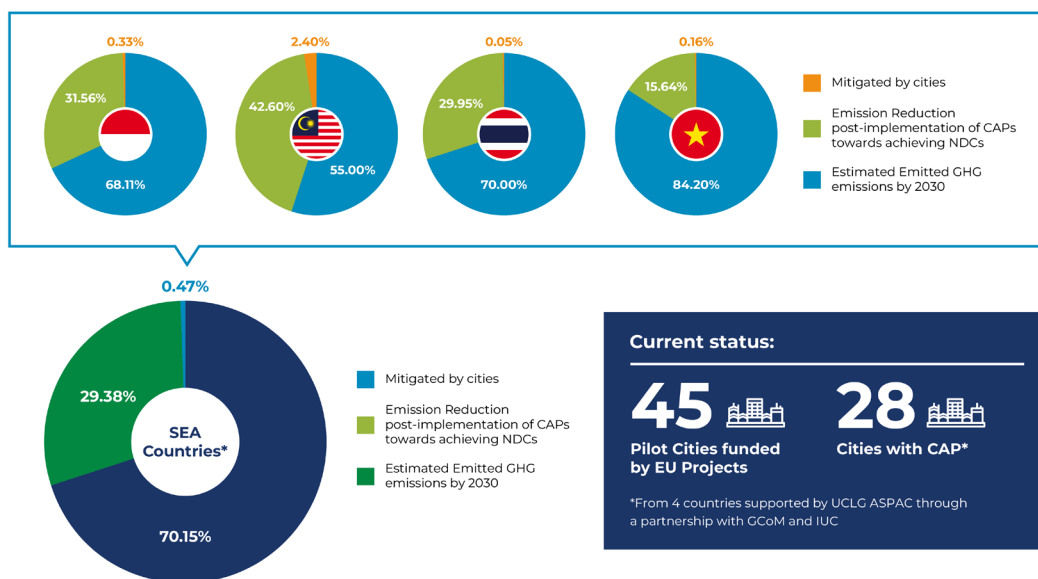


Figure 2: SEA Pilot Cities' Contributions to Countries' NDC

Indonesia's nine pilot cities demonstrate commendable commitments, collectively achieving a reduction of approximately 17.84% in GHG emissions compared to the BaU 2030 projection. Malaysia's pilot cities exhibit a strong commitment to reducing emissions by an average of 47.13%, significantly contributing to the country's emission reduction goals. Thailand and Vietnam also show notable progress, with their pilot cities collectively contributing to GHG emission reductions of 0.05% and 0.16%, respectively, against the BaU 2030 scenario. These efforts underscore the crucial role of cities in achieving broader national climate objectives.

Cities in Action: Unlocking GHG Reduction Potential through Increased Engagement of Cities

Beyond the current efforts, this report explores hypothetical scenarios, illustrating the potential impact of broader city participation in GHG reduction initiatives. If more cities were to adopt similar measures, significant reductions in GHG emissions could be achieved across SEA countries, substantially advancing their NDC achievements.

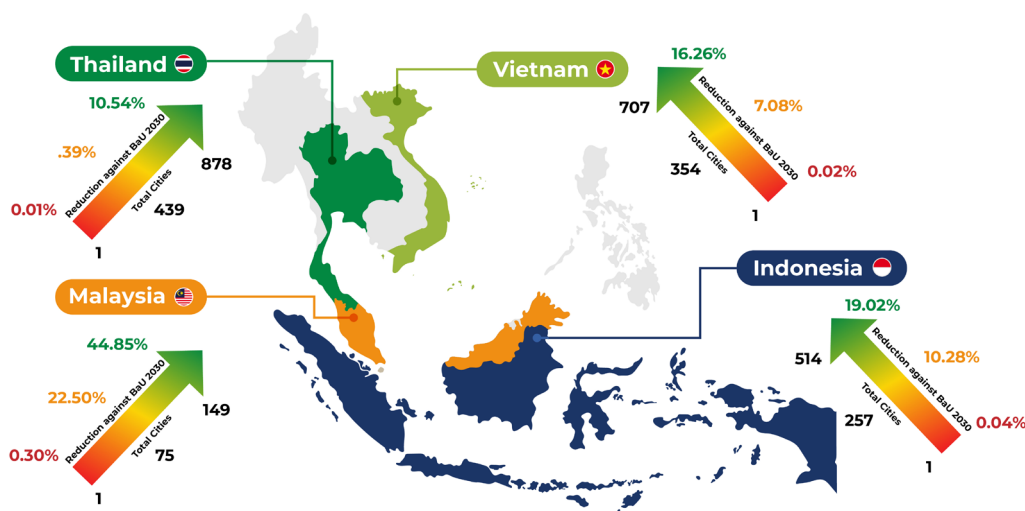


Figure 3: The Hypothetical Assumption of Increased Engagement of Cities to Reduce GHG Emissions against the Countries' BaU Scenario 2030

The engagement of 28 pilot cities across Indonesia, Malaysia, Vietnam, and Thailand, supported by organisations like UCLG ASPAC, showcases significant progress in reducing GHG emissions and aligning with National NDCs. Exploring hypothetical scenarios, the study illustrates the potential impact of broader city participation, projecting substantial GHG reduction percentages (Figure 3). For instance, if all 514 cities/regencies in Indonesia embraced the initiative, they could collectively reduce emissions by approximately 19.02%, making a significant contribution to the country's NDC. Similarly, involvement from all 149 second-level administrations in Malaysia could lead to a reduction of approximately 44.85% against Malaysia's BaU 2030 scenario, nearing the country's NDC target. This highlights the pivotal role of cities in achieving ambitious climate goals and underscores the importance of widespread engagement to drive meaningful emission reductions. Therefore, policies favouring flexibility for cities capable of undertaking climate action are encouraged.

The Gaps in the Efforts

Although there has been some progress, the gap analyses reveal areas where action plans are not meeting their objectives. While there are strengths like a clear focus and alignment with regional planning, there are weaknesses such as lack of innovative actions and insufficient community engagement. These gaps are observed in Indonesia, Malaysia, Thailand, and Vietnam, underscoring the importance of integrated approaches and greater collaboration.

Moving beyond the development of CAPs, many cities have begun implementing their planned actions. However, gaps still exist in these efforts, such as the lack of need for detailed needs assessment, clear benefit delineation, identification of funding sources, community engagement, and innovative approaches. Bridging these gaps requires concerted efforts from all stakeholders to ensure effective and sustainable climate action.

GLOSSARY

AADMER	:	Agreement on Disaster Management and Emergency Response
ADB	:	Asian Development Bank
AEDP	:	Alternative Energy Development Plan
AFOLU	:	Agriculture, Forestry, and Other Land Use
AGCF	:	ASEAN Catalytic Green Finance
ALARP	:	As Low As Reasonable Possible
AMS	:	ASEAN Member States
APAEC	:	Action for Energy Cooperation
ASCC	:	ASEAN Socio-Cultural Community
ASEAN	:	Association of Southeast Asian Nations
ATCS	:	Automatic traffic control system
BaU	:	Business as Usual
BEI	:	Building Energy Index
CAP	:	Climate Action Plan
CBDR	:	Common but Differentiated Responsibilities
CDP	:	Carbon Disclosure Project
CO ₂	:	Carbon dioxide
COP	:	Conference of the Parties
CRIC	:	Climate Resilient and Inclusive Cities
e	:	Equivalent
ECBI	:	European Capacity Building Initiative
EE	:	Energy Efficiency
EEP	:	Energy Efficiency Plan
EPRS	:	European Parliamentary Research Service
ESCAP	:	Economic and Social Commission for Asia and the Pacific
ESG	:	Environmental, Social, and Corporate Governance
EU	:	European Union
EUR	:	Euro
EV	:	Electrical Vehicle
FOLU	:	Forestry and Land Use
GCoM	:	Global Covenant of Mayors for Climate and Energy
GGA	:	Global Goal on Adaptation
GHG	:	Green House Gasses
GIZ	:	Deutsche Gesellschaft für Internationale Zusammenarbeit
GW	:	Gigawatt
GWh	:	Gigawatt hour
GWp	:	Gigawatt Peak
HEV	:	Hybrid Vehicle
HFCs	:	Hydrofluorocarbons

IIED	:	International Institute for Environment and Development
INFORM	:	Index for Risk Management
IP	:	Industrial Process
IPCC	:	Intergovernmental Panel on Climate Change
IPPU	:	Industrial Processes and Product Use
IRRC	:	Integrated Resource Recovery Centre
IUC	:	International Urban Cooperation
JICA	:	Japan International Cooperation Agency
KK	:	Kota Kinabalu
KOICA	:	Korea International Cooperation Agency
LCCF	:	Low Carbon City Framework
LCCF+S	:	Low Carbon City Framework Strategy
LEZ	:	Low-Emission Zone
LFG	:	Landfill Gas
LULUCF	:	Land Use, Land Use Change, and Forestry
MPBJ	:	Majlis Bandaraya Petaling Jaya
MW	:	Megawatt
MWp	:	Megawatt Peak
NDC	:	Nationally Determined Contribution
NLCCM	:	National Low Carbon Cities Masterplan
NPP-4	:	Fourth National Physical Plan
nZEB	:	Nearly Zero-Emission Building
OECD	:	Organisation for Economic Cooperation and Development
PA	:	Paris Agreement
PDP	:	Power Development Plan
PJ	:	Petaling Jaya
PJU	:	<i>Penerangn Jalan Umum</i> (Street Lightning)
PLTS	:	<i>Pembangkit Listrik Tenaga Surya</i> (Solar Power Plant)
PV	:	Photovoltaic
RCP	:	Representative Concentration Programme
RDF	:	Refuse Derived Fuel
RE	:	Renewable Energy
REDD+	:	Reducing Emissions from Deforestation and Forest Degradation
SDGs	:	Sustainable Development Goals
SEA	:	Southeast Asia
SEADRIF	:	Southeast Asia Disaster Risk Insurance Facility
SUTI	:	Sustainable Urban Trasport Programme
SWOT	:	Strengths Weaknesses Opportunities Threats
TOD	:	Transit-Oriented Development
UCLG ASPAC	:	United Cities and Local Government Asia Pacific
UIL	:	UNESCO Institute for Lifelong Learning
UN	:	United Nations
UNDP	:	United Nations Development Programme
UNEP	:	United Nations Environment Programme

UNESCO	:	United Nations Educational, Scientific, and Cultural Organisation
UNFCCC	:	United Nations Framework Convention on Climate Change
UPS	:	<i>Unit Pengolahan Sampah</i> (Waste Processing Unit)
USD	:	United States Dollar
WB	:	World Bank
WRI	:	World Research Institute
WtE	:	Waste to Energy
ZEB	:	Zero-Emission Building

TABLE OF CONTENTS

Foreword			3
Executive Summary			4
Glossary			8
Table of Contents			11
List of Figures			14
List of Tables			15
Chapter	1.0	Introduction	16
Chapter	2.0	Objectives	21
Chapter	3.0	Methods	22
Chapter	4.0	The Goals of Climate Action	23
Chapter	5.0	The Outlook of Climate Action: Target, Planning, and Current Effort	31
	5.1	Indonesia	32
		Bandar Lampung	32
		Banjarmasin	35
		Cirebon	37
		Denpasar	39
		Depok	41
		Gorontalo	43
		Kupang	45
		Makassar	47
		Malang	49
		Mataram	51
		Medan	53
		North Minahasa	57
		Padang	61
		Palembang	63
		Pangkalpinang	66
		Pekanbaru	68

	Pontianak	70
	Samarinda	74
	Tangerang	76
	Ternate	81
	National Context: Indonesia	83
5.2	Malaysia	86
	Hang Tuah Jaya	86
	Iskandar Puteri	90
	Muar	94
	Petaling Jaya	96
	Putrajaya	102
	Segamat	106
	Penampang	109
	Tawau	112
	National Context: Malaysia	115
5.3	Thailand	117
	Hua Hin	118
	Mae Hia	121
	Nonthaburi	124
	Suphan Buri	127
	Other Pilot Cities in Thailand	130
	National Context: Thailand	130
5.4	Vietnam	133
	Can Tho	134
	Cao Lanh	137
	Da Nang	140
	Hue	142
	Nam Dinh	145
	Sa Pa	149
	Tam Ky	153
	National Context: Vietnam	155
5.5	Philippines	158
	National Context: Philippines	158

	5.6	Other Southeast Asian Countries	163
		Brunei Darussalam	163
		Cambodia	164
		Myanmar	164
		Lao PDR	165
		Singapore	165
	5.7	Regional Context: ASEAN	166
Chapter	6.0	City Initiatives: Reducing GHG Emissions and Aligning with National Climate Commitments	167
	6.1	Indonesia	169
	6.2	Malaysia	170
	6.3	Thailand	171
	6.4	Vietnam	172
	6.5	Cities in Action: Unlocking GHG Reduction Potential with Increased Engagement of Cities	173
Chapter	7.0	The Gaps in the Efforts	175
	7.1	Indonesia	175
	7.2	Malaysia	176
	7.3	Thailand	177
	7.4	Vietnam	178
	7.5	Further Action GAP	179
Chapter	8.0	Recommendations	181
	8.1	General Recommendations	181
	8.2	Specific Recommendations	181
		Indonesia	181
		Malaysia	182
		Thailand	182
		Vietnam	182
		Development Partners	183
References			184

LIST OF FIGURES

Figure 1	Pilot Cities in Southeast Asian Countries	6
Figure 2	SEA Pilot Cities' Contributions to Countries' NDC	6
Figure 3	The Hypothetical Assumption of Increased Engagement of Cities to Reduce GHG Emissions against the Countries' BaU Scenario 2030	7
Figure 4	The Development Process of Climate Change Outlook	22
Figure 5	Dates of Paris Agreement Ratification by SEA Countries	28
Figure 6	SEA Countries' Goals Towards Net-zero and Carbon-neutrality	29
Figure 7	Pilot Cities Tagged with the Climate Programme	31
Figure 8	Pilot Cities in Indonesia	32
Figure 9	Climate Actions in Banjarmasin	36
Figure 10	Pilot Cities in Malaysia Tagged with Climate Programmes	86
Figure 11	Pilot Cities in Thailand Tagged with Climate Programmes	117
Figure 12	Pilot Cities in Vietnam Tagged with Climate Programmes	133
Figure 13	Pilot Cities in the Philippines Tagged with Climate Programmes	158
Figure 14	GHG Emission Reduction Contributions of Pilot Cities to the NDCs in 4 Studied SEA Countries	167
Figure 15	GHG Emission Reductions of Pilot Cities in 4 Studied SEA Countries Compared to BaU 2030 (in Logarithmic Scale)	168
Figure 16	Indonesian Pilot Cities' Support to Unconditional NDC of Indonesia	169
Figure 17	GHG Emission Reductions of Indonesian Pilot Cities	169
Figure 18	Malaysian Pilot Cities' Support to Unconditional NDC of Malaysia	170
Figure 19	GHG Emission Reductions of Malaysian Pilot Cities	170
Figure 20	Thai Pilot Cities' Support to Unconditional NDC of Thailand	171
Figure 21	GHG Emission Reductions of Thai Pilot Cities	171
Figure 22	Vietnamese Pilot Cities' Support to Unconditional NDC of Vietnam	172
Figure 23	GHG Emission Reductions of Vietnamese Pilot Cities	172
Figure 24	The Hypothetical Assumption of Increased Engagement of Cities to Reduce GHG Emissions against the Countries' BaU Scenario 2030	173
Figure 25	Status of Advance Pilot Cities Beyond The CAP	179

LIST OF TABLES

Table 1	Critical and strategic role of SEA countries in global climate change	17
Table 2	SWOT Analysis from the CAPs of Indonesian Pilot Cities	175
Table 3	SWOT Analysis from the CAPs of Malaysian Pilot Cities	176
Table 4	SWOT Analysis from the CAPs of Thai Pilot Cities	177
Table 5	SWOT Analysis from the CAPs of Vietnamese Pilot Cities	178

01. Introduction

Climate change represents one of the most pressing global challenges of our time. Research indicates that if current greenhouse gas (GHG) emission trends continue, there is a 100% probability of the average global temperature increasing by at least 20C by the year 2100 (Clarke L, 2014). This warming trend is associated with a rise in extreme heat events (Wright, Norval and Albers, 2015), the rise of sea level (UN, 2015), and the increase of extreme weather phenomena leading to disasters, such as floods, droughts, and typhoons, often resulting in secondary disasters like landslides (ASEAN, 2021). These occurrences reveal the vulnerabilities of ecosystems to current climate variability and highlight the potential for wide-ranging impacts on various sectors.

The consequences of climate change extend beyond environmental concerns, impacting food production, water resources, infrastructure and settlements, morbidity and mortality, as well as human mental health and well-being. These impacts pose significant challenges for countries across all levels of development, revealing a lack of preparedness to address current climate variability in key sectors (IPCC, 2014).

Global Context of Climate Change Initiatives

The urgency of the global threat posed by climate change prompted global action. Efforts to address climate change began as early as the 1960s, with the introduction of the concept of Common but Differentiated Responsibilities (CBDR). This principle formed the basis of the Kyoto Protocol, a landmark international arrangement established in 1997 to address GHG emissions. The Kyoto Protocol marked a significant milestone in raising awareness about climate change and laying the groundwork for international cooperation (Bilqis & Afrieansyah, 2020).

Over time, the urgency of addressing climate change intensified, leading to calls for a new paradigm emphasising sustainable development, mitigation efforts, and equitable burden-sharing (Hourcade & Shukla, 2015). This momentum culminated in the 21st Conference of the Parties (COP 21) in Paris in December 2015, where world leaders negotiated and adopted the Paris Agreement (PA). This international treaty replaced the Kyoto Protocol and signalled a global shift in climate governance.

Compared to the Kyoto Protocol, the PA adopts a more bottom-up approach, allowing countries to voluntarily submit their Nationally Determined Contributions (NDCs) to reduce emissions. This approach is more inclusive, as it involves commitments from all countries, with each setting its NDCs based on its unique circumstances and capabilities. The PA also establishes mechanisms for transparency, accountability, and regular reviews of countries' progress. Moreover, it places emphasis on adaptation efforts and climate finance to support developing countries in their climate actions (Ambrósio, Couto-Santos, & Cunha, 2017).

The journey from CBDR to the Kyoto Protocol and ultimately to the PA marks a notable evolution in international endeavours to tackle climate change. These agreements signify the global recognition of the need for collective action and differentiated responsibilities in addressing the challenges posed by climate change.

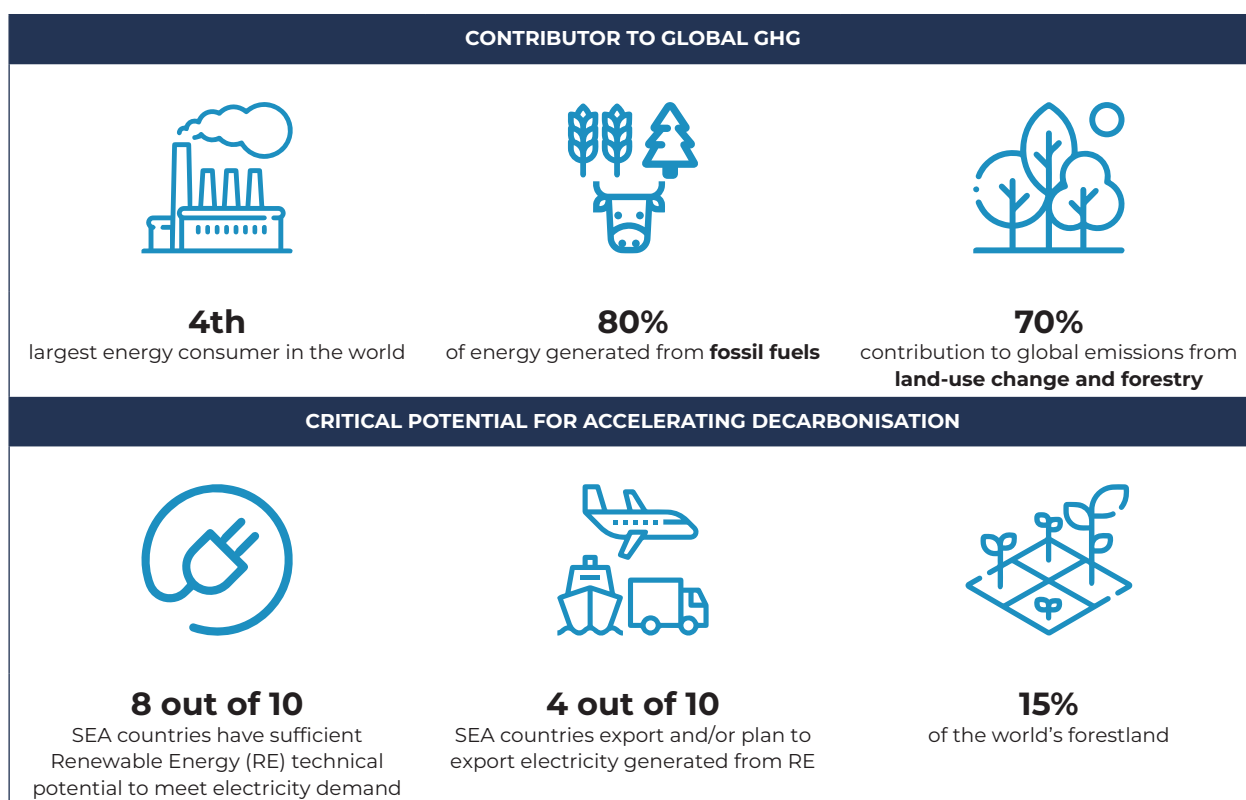
Since the inception of the PA, the global fight against climate change has intensified. Presently, 194 countries and one supranational entity, the European Union (EU), have ratified this global treaty. Southeast Asia (SEA) countries have also demonstrated their commitment to combatting climate change. Singapore led the way in 2015 as the first SEA country to ratify the PA, followed by other SEA nations between 2015 and 2017. Myanmar concluded this process as the final SEA country to ratify the agreement (UNFCCC, 2023).

SEA Context of Climate Change Initiatives

SEA countries collectively span over 4.5 million km² of land area and are home to more than 660 million people, constituting approximately 8% of the world’s population. As of 2021, these countries ranked as the 5th largest economy in the world and the 2nd largest in Asia, with a total Gross Domestic Product (GDP) of USD 3.3 trillion (ASEAN, 2022). Given their significant economic stature, SEA countries hold strategic importance across various aspects of global development, including the climate sector.

Acknowledging their role, the study conducted by Bain & Company, Temasek, GenZero, and AWS (2023) underscores that while SEA contributes to global GHG emissions, it also possesses the potential to drive the energy transition and accelerate decarbonisation efforts (Table 1).

Table 1: Critical and strategic role of SEA countries in global climate change



(Source: Bain & Company, Temasek, GenZero, and Amazon Web Services, 2023)

Climate Change Initiatives: ASEAN Context

At the regional level, Southeast Asian countries address climate change actions within the framework of the Association of Southeast Asian Nations (ASEAN), aligning with the Sustainable Development Goal (SDG) 17: Partnership for the Goals. ASEAN's engagement marks a pivotal moment in the global fight against climate change. The region has witnessed a rise in GHG emissions, driven by industrialisation reliant on fossil-fuel energy and land-use changes leading to the depletion of tropical forests and peatlands, which are rich in biodiversity.

ASEAN member states have taken proactive measures to tackle climate change both nationally and regionally, aligning with their commitments as signatories to the United Nations Framework Convention on Climate Change (UNFCCC) and the PA within the ASEAN Community Vision 2025 (ASEAN, 2020). The significance of ASEAN's role in climate change efforts was underscored at the World Economic Forum in 2023, highlighting the contribution of ASEAN to global environmental targets (World Economic Forum, 2023). ASEAN remains fully committed to the goals of PA and actively engages in global climate change initiatives. With a focus on not only reducing GHG emissions but also enhancing resilience, ASEAN prioritises mitigation and adaptation efforts given its status as one of the world's most climate disaster-prone regions (ASEAN, 2020).

Regional cooperation and intergovernmental relationships play a crucial role in addressing climate change, particularly in collaboration with developed countries and/or regional entities. This aligns with the core principles of the PA, which emphasise the responsibility of developed countries to provide directives and financial support to developing countries. Such collaboration is also consistent with SDG 17. Therefore, there is a pressing need for strategic partnerships between SEA countries and ASEAN with developed countries, particularly the EU. As a key signatory of the PA, the EU is deeply committed to supporting and assisting countries in their climate change initiatives, including SEA countries and ASEAN at the regional level.

Support from Developed Countries

To date, the EU has emerged as a leading benefactor of climate change initiatives in SEA, allocating millions of euros for supporting climate-friendly development in the region. As part of its commitment to financing climate action, the EU has pledged over EUR 780 million to the ASEAN Catalytic Green Finance (ACGF). This funding aims to mobilise EUR 7 billion for green infrastructure projects across SEA, with potential contributions from partners like China (Hutt, 2021, pp. 1-2). The ACGF serves as a strategic response to EU regulations regarding decarbonisation, called the Green Deal. Without adequate support, the implementation of these regulations could pose challenges to the welfare of SEA countries (Sudjana, Vriens and Partners, Tamzil, & Pijar Foundation, 2023). In 2021 alone, the EU allocated EUR 50 million to ACGF (EU, 2022). Overall, the EU's support for climate change initiatives in Southeast Asia, both through multilateral channels like ASEAN and bilateral engagements with individual countries, amounts to billions of euros (EU, 2022).

Cities Shaping the Low-Carbon and Climate-Resilient Future

Multilateral and regional cooperation in addressing climate change is crucial, but the involvement of cities is equally critical. Collaboration should extend to the local level, where governments are closest to the people and can translate national commitments and global agendas into local actions. Local governments possess an inherent understanding of cultural, social, environmental, and economic realities, making their feedback invaluable in safeguarding these assets. Through paradiplomacy and decentralised cooperation, collaboration between local governments can align with the vision of national governments (UCLG ASPAC, 2021).

Climate change profoundly affects cities, impacting basic services, infrastructure, housing, human livelihood, and health. With an estimated 70% of the global population expected to live in urban areas by 2050, cities play a pivotal role in climate change mitigation and adaptation. Cities are significant contributors to GHG emissions, accounting for 75% of global CO₂ emissions attributed to cities, primarily due to transportation and buildings (UNEP, n.d.) (World Bank, 2023).

Cities, both as contributors to and victims of climate change, play a critical role in combatting this global challenge. They have the potential to drive transformative climate action considering their devolved leadership. Over the past decade, many cities have made progress in measuring their emissions, setting targets, and implementing action plans to reduce emissions. Many of them have mainstreamed the SDGs within the heart of urban planning and developed comprehensive, holistic, PA-aligned climate action plans (CAPs). These plans include a decarbonisation strategy that incorporates renewable energy; accessible, affordable, safe, and reliable public transport; energy-efficient housing; green spaces and green infrastructures; pedestrianised areas; city farms and local processing facilities; and green waste management (Economist, 2023). Investing in resilient and inclusive cities today is important for ensuring access to basic services, employment opportunities, and dignified living conditions (World Bank, 2023).

Despite the significant progress, cities encounter challenges in developing and implementing their climate action plans. Similar to national governments, cities require partnerships to accelerate progress in addressing climate change. Collaboration at the national, regional, and international levels, along with engagement with development partners and private sectors, is essential for enhancing cross-sectoral coordination and scaling up climate action efforts. This shows that independent action by cities alone is indeed not feasible.

To address this challenge, UCLG ASPAC as a city and local government association provides solutions to strategic partnerships to tackle various issues, particularly climate change. Climate change and resilience are integral components of UCLG ASPAC's core activities. Currently, we are implementing the Climate Resilient Inclusive Cities (CRIC) Project funded by the EU and the Integrated Urban Climate Action for Low-Carbon & Resilient Cities (Urban Act) Project funded through the International Climate Initiative (IKI) fund. Serving as the Secretariat of the Global Covenant of Mayors for Climate and Energy (GCoM) SEA and the coordinator for the GCoM Global-Regional Coherence (GRC) Asia Pacific, UCLG ASPAC is committed to supporting cities and local governments in climate action initiatives. Additionally, we facilitate learning and training on resilience by utilising the Resilience Module developed by UCLG World and UCLG ASPAC. Through these efforts, UCLG ASPAC has provided support to over 45 cities in five SEA countries, namely Indonesia, Malaysia, Thailand, Vietnam, and the Philippines, through the development of CAPs.

Delving deeper into the GCoM, the EU has allocated a substantial budget of EUR 5.2 million for the implementation of the GCoM Asia Project (EU, 2022). This project is designed to support cities in South, East, and Southeast Asia to transition toward low-carbon and climate-resilient cities. In South and Southeast Asia, the project supports cities in developing CAPs with a bottom-up approach and facilitates their connection with strategic partners for financing the potential and priority climate actions.

In SEA, the GCoM Asia Project has provided technical assistance in developing CAPs for 16 pilot cities from Indonesia, Malaysia, Thailand, and Vietnam. CAPs, at a minimum, include an inventory of existing GHG emissions, reduction targets, and an analysis of the projected risks and impacts of climate change. In addition, the monitoring and reporting mechanisms are also crucial components, which allow aggregating the achievement of the individual local governments.

Following efforts to address climate change mitigation and adaption as well as align local governments' plans with the PA, it is time for a "pit stop". This pause allows for an assessment of the progress made by countries and cities in addressing climate change. To gain a comprehensive understanding of the overall situation. In response to this need, UCLG ASPAC, as the Secretariat of GCoM SEA, developed this document to provide a climate change outlook for SEA countries. This document includes in-depth analyses of 45 pilot cities across five countries in the region, examining the impacts of partnerships within these cities.

02. Objectives

The localisation of the international agenda on climate change allows cities and local governments to undertake climate change efforts at the local levels. It is therefore important to monitor the progress made in supporting national and international agendas. To address this, the document provides the information and analyses, with the following objectives:

- Outlining the main objectives of international and national climate change agendas and their localisation at the local level;
- Detailing the bottom-up efforts to combat climate change, from the local to the national and regional levels;
- Analysing the gap and challenges in adaptation and mitigation efforts at both the local and national levels to ensure alignment with the Paris Agreement (PA);
- Assessing the impacts of international partnership at the local levels in contributing to national climate change efforts and aligning with the PA;
- Providing recommendations for enhancing the localisation of climate action and accelerating efforts in this regard.

03. Methods

The development process of this Climate Change Outlook consists of six main steps outlined in Figure 4 below:



Figure 4: The Development Process of Climate Change Outlook

Framework Development – This study began with framework development, which ensures the project’s timely and quality delivery. There are three principles to conducting this project: (i) avoiding reinventing the wheel; (ii) scientifically and conceptually sound; and (iii) co-creation.

Secondary Data Collection – This study collected secondary data, such as reports, regulations, policies, academic papers, and journal articles. Moreover, this study crawled the required data through various search engines, ensuring maximum results.

Desk Study – Following the secondary data collection, a desk study was undertaken to further analyse the gathered information. This process extracted information, data, and knowledge from prior studies, policies, and project reports related to climate change and climate actions. The main resource of the outlook was the Climate Action Plan (CAP) documents from pilot cities.

Stakeholder Engagement for Primary Data Collection – Focus Group Discussions (FGDs) involving national governments, local governments, and development partners served as a platform to explore how the government can potentially be involved in the initiative. The researcher participated in five FGDs to discuss the document’s objective and get more detailed information.

Analysis – Data analysis was carried out utilising the following methods:

1. **Content analysis** focused on extracting relevant data from CAP documents of Southeast Asian pilot cities.
2. **Gap analysis**, employing the Strengths, Weaknesses, Opportunities, and Threats (SWOT) Analysis framework, provides special empirical insights into the gaps that can arise from inconsistent perceptions of expectations and experiences in climate action planning and implementation.

Recommendation – The gap analyses produced a series of recommendations aimed at addressing the identified gaps in climate action. These recommendations include general guidelines, country-specific strategies, and actionable steps for development partners.

04. The Goals of Climate Action

The international movement on climate change began formally in 1960 with the concept of Common but Differentiated Responsibilities (CBDR), which laid the groundwork for the Kyoto Protocol in 1997. The concept was further developed in the Paris Agreement (PA) in 2015, a landmark treaty aimed at strengthening the global response to climate change. The agreement sets ambitious targets to limit global temperature rise to well below 2°C, preferably 1.5°C, above pre-industrial levels. The agreement sets out a framework for countries to submit their Nationally Determined Contributions (NDCs), which are plans to reduce emissions and adapt to climate change. The agreement also includes provisions for climate finance, technology transfer, capacity building, transparency, and global stocktake. As of April 2023, 193 countries and the European Union (EU) have ratified the agreement (Ambrósio, et al., 2017; UN, 2023).

The PA marked a crucial milestone because, for the first time, most of the world's nations supported the common goal of reducing greenhouse gas (GHG) emissions. Besides aiming to limit the global average temperature increase, the agreement also seeks to increase countries' capacity to address the impacts of climate change and align finance flows with low-carbon and climate-resilient pathways (UNFCCC, 2021).

To achieve these ambitious goals, the PA puts in place appropriate mobilisation and provision of financial resources, a new technology framework, and enhanced capacity-building, particularly to support action by developing countries and the most vulnerable countries in line with their national objectives. The agreement requires all parties to put forward their best efforts through NDCs and strengthen them over time (UNFCCC, 2021). Parties are required to regularly report on their emissions and implementation efforts, with a global stocktake conducted every five years to assess collective progress towards achieving the agreement's objectives (UNFCCC, 2023).

Global Action in Setting Goals for Climate Change

The Secretary-General of the United Nations António Guterres has urged for a commitment to reducing emissions by 45% by 2030, as well as working together to steer humanity to the path of living in harmony with the planet. This ambitious goal follows the 8-year journey of the PA from the 21st Conference of Parties (COP21) to the COP28.

COP21 in Paris, France | 2015

COP21, which was held in Paris, France, in December 2015, aimed to achieve a legally binding and universal agreement on climate change. The goal was to limit global warming below 20C above pre-industrial levels, with an aspiration to keep it below 1.50C. To this day, there are 195 parties to the agreement, including 194 countries and the EU. The PA came into effect on 4 November 2016 (UNFCCC, 2023).

This agreement encourages countries to submit their NDCs outlining their emission reduction targets and climate action plans. Furthermore, it addresses the financial needs of developing countries for both mitigation and adaptation efforts; developed countries commit to providing financial support to assist developing countries in their climate action. To facilitate this, a task force was established within the United Nations Framework Convention on Climate Change (UNFCCC) to mobilise USD 100 billion annually (UNFCCC, 2023). To ensure accountability, transparency and review mechanisms were established to track progress and enhance ambition over time.

COP22 in Marrakech, Morocco | 2016

The COP22, encapsulated in the Marrakech Action Proclamation, reflected a collective commitment to climate action following the PA. It aimed to sustain the momentum generated by the agreement and develop a roadmap for its effective implementation. COP22 placed particular emphasis on the operationalisation of the PA mechanism, with a focus on enhancing adaptation initiatives and providing support to vulnerable communities.

The conference further focused on enhancing the capacity of developing nations to implement climate actions, with an emphasis on the importance of financial assistance and technology transfer. Notably, the Marrakech Action Proclamation broadened its scope by recognising the imperative role of non-state actors, such as businesses, cities, regions, and civil society, in driving global climate action. This comprehensive approach aligns with the conference's objective of accelerating the implementation of the PA through collaborative and inclusive efforts (UNFCCC, 2016; Ioannou & Stylianou, 2021).

COP23 in Bonn, Germany | 2017

The conference marked a significant breakthrough with the introduction of the Fiji Momentum for Implementation, which highlights the vulnerability of small island nations and promotes climate resilience. Additionally, the Talanoa Dialogue was initiated to facilitate a collective, inclusive, and transparent assessment of progress towards the goals outlined in the PA.

COP23 also underscored the significance of pre-2020 climate action, urging countries to fulfil their commitments before the PA officially took effect in 2020. Discussions also revolved around climate finance, with a focus on supporting developing nations in their mitigation and adaptation efforts. The conference recognised the crucial role of non-state actors, encouraging increased engagement of businesses, cities, and civil society in climate action (UNFCCC, 2017; EPRS, 2017; Ioannou & Stylianou, 2021).

COP24 in Katowice, Poland | 2018

The conference aimed to finalise the guidelines for implementing the PA and establish a framework known as the Katowice Rulebook. This rulebook guides countries in implementing the provisions of the PA, defining rules for transparency, reporting, and accounting of climate actions. The goal was to foster a common understanding and ensure a level playing field for all parties.

One of the key achievements of COP24 was the adoption of the Katowice Climate Package, which included guidelines for the operationalisation of the PA. This package outlined how countries should communicate their climate actions, report progress, and enhance transparency. COP24 also addressed the issue of climate finance, seeking to mobilise financial resources to support developing nations in their climate efforts, particularly in coal-dependent regions. In addition, the discussion also resulted in the “Just Transition Declaration,” recognising the need to support workers and communities affected by the transition to a low-carbon economy (UNFCCC, 2018; Ioannou & Stylianou, 2021; Nidhi, 2023).

COP25 in Madrid, Spain | 2019

COP25 aimed to finalise the rules for implementing the PA and increase ambition in reducing GHG emissions by around 45%. The conference addressed the issue of loss and damage from climate change, which affects the most vulnerable countries and communities. It established the Santiago Network on Loss and Damage, which would provide technical assistance and enhance cooperation in addressing loss and damage. However, the conference did not agree on any new sources of finance for loss and damage, which remains a contentious issue between developed and developing countries (Ioannou & Stylianou, 2021; IIED, 2019; ECBI, 2020).

The result was a minimally changed iteration of Article 6, retaining the Katowice wording and leaving Articles 6.2 and 6.4 untouched. The unresolved issues persisted, contributing to ongoing uncertainties and challenges in the interpretation and implementation of key aspects related to carbon market trade mechanisms under the PA. The difficulties faced at COP25 highlighted the complexities and differing perspectives that characterise international climate negotiations (UNFCCC, 2020).

COP26 in Glasgow, United Kingdom | 2021

COP26 marked a crucial summit focusing on the Glasgow Climate Pact, which addressed outstanding issues related to the implementation of the PA. These included finalising rules for international carbon markets, commitments to strengthen NDCs, phasing down unabated coal, increasing adaptation support, and enhancing climate finance.

One of the significant achievements of COP26 was the commitment by many countries to enhance their NDCs to limit global warming to 1.5 degrees Celsius. The conference also emphasised the importance of addressing loss and damage associated with the impacts of climate change, particularly for vulnerable nations (Mountford, et al., 2021). COP26 also witnessed various initiatives and commitments in areas, such as deforestation, methane reduction, and the transition to clean energy. The conference also emphasised the critical role of financial support for developing nations in their climate mitigation and adaptation efforts (Carver, 2022).

In addition, the conference emphasised the need for climate finance and technology transfer to support developing countries. Key agreements from the conference included commitments to phase down coal use and pledges by developed countries to provide USD 100 billion per year in climate finance to developing countries (UNFCCC, 2023). This conference emphasised the Global Net-Zero Momentum, showcasing an increase in net-zero commitments by both countries and businesses.

COP27 in Sham el-Sheikh, Egypt | 2022

COP27 marked a remarkable moment with significant outcomes. There was a launch of a five-year work programme focused on promoting climate technology solutions in developing countries. This initiative reflects a concerted effort to address the technological gap and facilitate sustainable development, particularly in regions vulnerable to climate change impacts. In terms of mitigation, the conference launched a work programme aimed at urgently scaling up mitigation ambition and implementation, with a specific focus on revisiting and strengthening 2030 targets in national climate plans. This comprehensive approach recognises the urgency of transforming energy systems to be more secure, reliable, and resilient, emphasising clean and just transitions to renewable energy during this critical decade. The Global Stocktake, an integral mechanism under the PA, progressed through the second technical dialogue at COP27, setting the stage for a Climate Ambition Summit in 2023, reinforcing the ongoing commitment to raising climate ambition (UNFCCC, 2022).

In addition to these key developments, COP27 witnessed numerous announcements and initiatives. Notable among these were collaborative actions in energy, road transport, steel, hydrogen, and agriculture, signalling a collective commitment to address climate challenges across various sectors. The launch of a Forest and Climate Leaders' Partnership highlighted strides in forest protection, aiming to unite governments, businesses, and community leaders to halt forest loss and land degradation by 2030. Moreover, the financial pledges and plans announced at COP27, such as the USD 3.1 billion early warning systems plan, the Global Shield against Climate Risks, and the Indonesia Just Energy Transition Partnership, underscored the global community's dedication to financial and practical solutions for climate adaptation, mitigation, and justice (UNFCCC, 2022; UNEP, 2022).

At the forefront of financial considerations, the establishment of a Loss and Damage Fund stood out as a historic breakthrough at COP27. This fund aims to provide critical financial assistance to developing countries grappling with the inevitable consequences of climate change, demonstrating progress toward climate justice. However, challenges persist, as highlighted by the Adaptation Gap Report (UNEP, 2022), revealing a substantial shortfall in adaptation finance compared to estimated needs. The call for innovative finance tools, windfall taxes on fossil fuel companies, debt-for-loss-and-damage swaps, and a dedicated finance facility under the UNFCCC emphasises the urgency of mobilising resources to address the mounting challenges faced by the most vulnerable communities.

COP27 focused on several key issues including, loss and damage finance, commitments to reduce coal use, the establishment of a global carbon market, and reforms to publicly funded finance institutions like the World Bank. Developing countries have long sought financial assistance for loss and damage – money needed to rescue and rebuild the physical and social infrastructure of countries devastated by extreme weather – for nearly three decades. Achieving agreement on the fund marks a significant milestone, but the challenge lies in setting up and adequately operationalising the fund. Agreement is still pending on how the finance should be provided and sourced (UNFCCC, 2022; UNEP, 2022; Grace, 2022).

COP28 in Dubai, Uni Emirat Arab | 2023

COP28 concluded with groundbreaking achievements and ambitious goals that signal a transformative shift in global climate action. The agreement reached at the conference marks the “beginning of the end” for the fossil fuel era, emphasising a swift, just, and equitable transition underpinned by deep emissions cuts and scaled-up finance. This monumental step recognises the unstoppable momentum towards a clean energy future and aligns with the overarching goal of limiting global temperature increases to 1.5 degrees Celsius. Additionally, the conference saw the historic operationalisation of the Loss and Damage Fund under the UNFCCC. This substantive decision reflects a significant commitment to supporting vulnerable countries and communities grappling with the adverse impacts of climate change. The funding commitments, totalling more than USD 600 million to date, underscore the global solidarity and urgency in addressing the climate emergency (UNFCCC, 2023; WRI, 2023; World Economic Forum, 2023).

Furthermore, COP28 witnessed major advancements in enhancing global efforts to strengthen resilience, with agreements on targets for the Global Goal on Adaptation (GGA) and its framework. This comprehensive framework covers themes, such as water, food, health, ecosystems, infrastructure, poverty eradication, and cultural heritage, reflecting a global consensus on adaptation targets and emphasising future-oriented measures to guide adaptation planning and strategies at all levels. The conference also highlighted the pivotal role of climate finance as the “great enabler of climate action.” Notable pledges include new funding for the Green Climate Fund (GCF), replenishments for the Least Developed Countries Fund and Special Climate Change Fund, and commitments to the Adaptation Fund. However, the Global Stocktake revealed that current climate finance flows fall short of the trillions needed, emphasising the importance of reforming the multilateral financial architecture and accelerating the establishment of new and innovative sources of finance (UNFCCC, 2023; WRI, 2023; World Economic Forum, 2023).

COP28 showcased unprecedented recognition and momentum for linking climate action with nature conservation, addressing the triple planetary crisis. The decision emphasised the importance of conserving, protecting, and restoring nature and ecosystems, including the formal recognition of pledges such as halting and reversing deforestation by 2030. This integrated approach aligns with the goals of the Kunming-Montreal Global Biodiversity Framework. Parallel to formal negotiations, the Global Climate Action space at COP28 provided a platform for practical climate solutions. The implementation roadmap of 2030 Climate Solutions, launched by the High-Level Champions, outlines effective measures to halve global emissions, address adaptation gaps, and increase resilience by 2030.

COP28 sets the stage for an era of intensified climate action and underscores the collective responsibility to transition towards a sustainable and resilient future. Looking ahead, the negotiations on the ‘enhanced transparency framework’ laid the groundwork for implementing the PA. The next two years are critical, with COP29 focusing on establishing a new climate finance goal and COP30 requiring new NDCs that are economy-wide, cover all greenhouse gases, and are fully aligned with the 1.5 degrees Celsius temperature limit (UNFCCC, 2023; WRI, 2023; World Economic Forum, 2023).

Southeast Asia Towards Net Zero

Global action on climate change has been attempted by countries with the ratification of the PA. SEA countries began their involvement in 2015, with Singapore leading the way followed by Vietnam. Subsequently, other SEA countries ratified the agreement, with Myanmar joining in 2017 (Figure 5). This international agenda is swiftly integrated into their respective national agendas soon after the ratification, particularly focusing on Article 2, which outlines the agreement's long-term goals as follows:

1. To keep the rise of the global average temperature well below 2 degrees Celsius above pre-industrial levels and pursue efforts to limit the temperature increase to 1.5 degrees Celsius.
2. To improve the ability of countries to adapt to the impact of climate change, maintain a low GHG emissions trajectory, and enhance climate resilience in a way that does not threaten food production.
3. To direct financial flows in line with low-emissions and climate-resilient pathways.



Figure 5: Dates of Paris Agreement Ratification by SEA Countries
(Source: Yurnaidi, et al., 2021)

SEA countries are primarily focused on reducing their GHG emission, known as NDCs, under the PA. They implement strategies across five sectors, namely: agriculture, forestry and land use; waste management; energy; transport; and industry to achieve their emission targets of over 33% by 2030 (Handayani, et al., 2022; Bain & Company, et al., 2023).

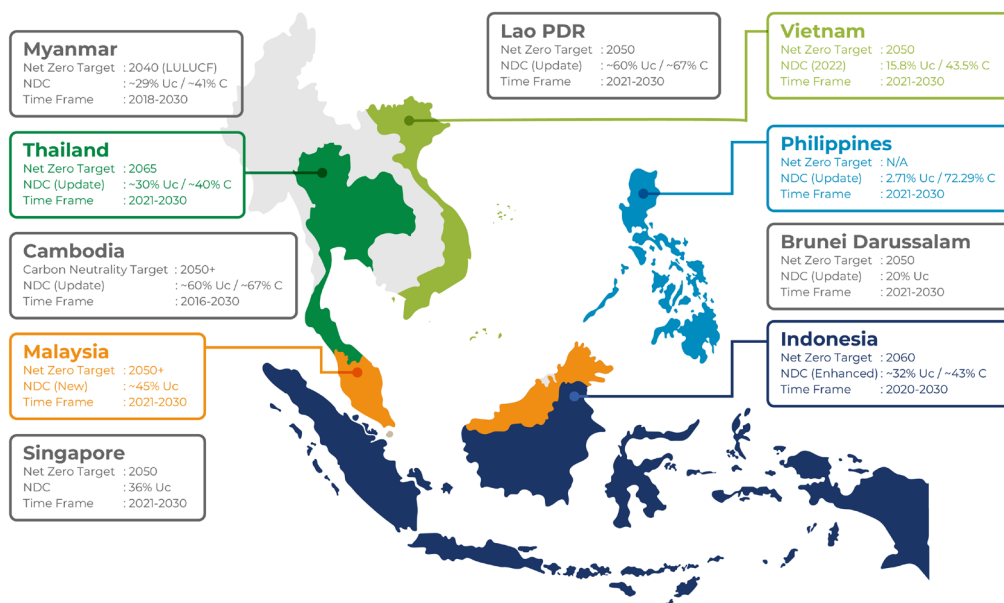


Figure 6: SEA Countries' Goals Towards Net-zero and Carbon-neutrality

The goals of ten SEA countries are shown in the figure above (Yurnaidi, et al., 2021; Bain & Company, et al., 2023). The goals are updated with an NDC report and a Biennial Update Report (BUR) from each country that can be accessed through the UNFCCC website. At the regional level, ASEAN's primary focus remains on the energy sector, given its significant contribution to emissions. Therefore, ASEAN has prioritised increasing the share of renewable energy in the regional energy mix. The target is to achieve a renewable energy mix of 35% by 2025 from approximately 24% in 2018 (Bain & Company, et al., 2023).

Cities have emerged as pivotal actors since COP22, spearheading climate action. Responsible for 75% of global carbon emissions, cities and their leaders are uniquely positioned to address climate challenges (UNEP, n.d.). Below is an overview of the roles of as well as goals and expectations for cities in combating climate change (Volz & Pine, 2022; Trotta, 2022; UNFCCC, 2021; OECD, 2010):

Roles of Cities:

1. **Emission Reduction:** Cities are significant sources of GHG emissions due to their high population density, complex transportation systems, and energy consumption. They have a pivotal role in reducing emissions through sustainable urban planning, energy efficiency, and the promotion of public transportation.
2. **Climate Resilience:** Cities are vulnerable to climate impacts like heat waves, flooding, and sea-level rise. They must implement adaptation measures to enhance resilience, such as improving infrastructure, building green spaces, and implementing early warning systems.
3. **Innovation and Solutions:** Cities are hubs of innovation and technology capable of leading in developing and implementing climate solutions, including the use of renewable energy, sustainable transportation, and low-carbon building designs.
4. **Data and Monitoring:** Many cities collect data on emissions, energy use, and climate impacts. Sharing this data facilitates progress tracking and the development of evidence-based climate policies.
5. **Local Governance:** Local governments can enact policies and regulations that support climate action, such as building codes, renewable energy incentives, and transportation planning.

Goals and Expectations for Cities:

1. **NDCs and City Contributions:** Countries are encouraged to include cities and local governments in their NDCs submitted under the PA, reflecting an expectation that cities will contribute significantly to national climate targets.
2. **Local Climate Action Plans:** Cities are expected to develop and implement their CAPs, aligning them with national and global climate goals. These plans may include emissions reduction targets, renewable energy adoption, and resilience-building measures.
3. **Reporting and Transparency:** Many cities participate in global initiatives to report on their emissions and climate actions. Transparency is essential for tracking progress and demonstrating commitment.
4. **Adaptation Strategies:** Cities in vulnerable regions are expected to develop and implement adaptation strategies to protect their populations, infrastructure, and ecosystems from the impacts of climate change.
5. **Engagement and Collaboration:** Cities are encouraged to engage with international climate initiatives and networks, such as GCoM, to share best practices and collaborate with other cities worldwide.
6. **Innovation and Financing:** Cities are expected to explore innovative financing mechanisms, such as public-private partnerships (PPPs) as well as investments in sustainable infrastructure to support climate goals.
7. **Equity and Social Inclusion:** Climate action at the city level should prioritise social inclusion to ensure that vulnerable communities benefit from the formulated climate solutions and are not disproportionately burdened by climate impacts.
8. **Public Awareness and Education:** Cities can play a significant role in raising public awareness of climate change and promoting sustainable behaviours through education and outreach.
9. **Global Engagement:** Cities are encouraged to voluntarily participate in the Global Climate Action Portal to monitor their climate action commitments. This platform developed by UNFCCC, consists of multiple stakeholders. This fosters cooperative initiatives and enhances collective efforts towards addressing climate change in the future.

05. The Outlook of Climate Action: Targets, Plans, and Current Efforts

This study examines the bottom-up effort of cities and local governments in alignment with the Paris Agreement (PA). It explains the local government's efforts to address climate change issues in their respective development agenda.

Collaboration and partnership are key to accelerating climate action, aligning with Sustainable Development Goal (SDG) 17: Partnerships for the Goals. Partners, like the European Union (EU) and the Association of Southeast Asian Nations (ASEAN), alongside development partners, such as the Asian Development Bank (ADB), Japan International Cooperation Agency (JICA), Korea International Cooperation Agency (KOICA), World Bank (WB), Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ), and the United Nations Development Programme (UNDP) work together at the global, regional, national, and local levels to address the climate issues. These partnerships support governmental bodies at the national level, while also engaging directly with local communities through organisations like UCLG ASPAC. This study is limited to examining the efforts conducted by the pilot cities under UCLG ASPAC's climate programmes.



Figure 7: Pilot Cities Tagged with the Climate Programme

This study provides a comprehensive overview of efforts in addressing climate action in SEA countries, focusing on 45 pilot local authorities (44 cities and one province) from five countries (Figure 7). It delves into various climate programmes conducted by UCLG ASPAC, namely the Global Covenant of Mayors for Climate and Energy Southeast Asia (GCoM SEA), the Climate Resilient and Inclusive Cities (CRIC), and the Integrated Urban Climate Action for Low-Carbon & Resilient Cities (Urban-Act).

Both GCoM and CRIC support cities in formulating Climate Action Plans (CAPs) as well as assisting climate financing, including facilitating cities to engage with potential funders for the implementation of climate actions. The Urban-Act focuses on enabling cities to develop bankable projects for effective climate initiatives. For a more detailed explanation, the description of efforts in climate action from SEA countries affiliated with UCLG ASPAC is explained as follows.

5.1 Indonesia



Figure 8: Pilot Cities in Indonesia

In Indonesia, UCLG ASPAC has collaborated with 20 pilot cities across various programmes. These cities are involved in three programmes under UCLG ASPAC, with one city (Medan) participating in two programmes simultaneously, namely GCoM SEA and Urban Act (Figure 8). The examination of these cities is outlined below.

Bandar Lampung

City Profile


Population	1,209,937
Population Density	6,135 people/ km ²
Land Area	197.22 km ²
Total Districts	20 districts
Total Sub-Districts/Villages	126 sub-districts/ villages
Programme Partnership	CRIC




Key economic activities:
Manufacturing, Transportation and Storage, Wholesale and Retail Trade; Vehicle Repair Service

(Source: BPS Bandar Lampung City, 2023)

Climate Profile







 Rainfall	
Average Annual	Average Increase (2075-2099)
2006.8 mm	10%

 Local Temperature		
Average	Increase RCP 4.5	Increase RCP 8.5
27.8°C – 29.2°C	1.5°C	3.5°C

(Source: BPS Bandar Lampung City, 2023; Kusumastuty, 2021)






Climate-related Disasters in 2012-2021

Risk Index: 139.02 (High Disaster Risk Index)

Type of Disaster					
					
Floods 57	Landslides 34	Abrasion 1	Whirlwind 10	Drought 6	Land Fire & Forest Fire 9
Total: 117					

(Source: DIBI & IRBI, BNPB, 2023)

GHG Inventory

Sector						Total
	Energy	IPPU	Agriculture	FOLU	Waste	
BaU 2020 (tons CO₂e)	15,734,190.00	-	-	-	348,690.00	16,082,880.00
% BAU	97.83	-	-	-	2.17	100.00

(Source: SIGN SMART, KLHK)

Adaptation and Mitigation Target

Bandar Lampung has yet to define any target for both adaptation and mitigation actions. The target is still in discussion with all related stakeholders.

Climate Change Action

Based on the policy analysis conducted by CRIC in 2020, there are seven programmes outlined in the local government's regional mid-term plan addressing climate change. However, the programmes were not specifically categorised as actions related to adaptation or mitigation. The programmes are outlined as follows (Priyadi, et.al., 2020).

1. Develop ten flyovers and one underpass to reduce traffic jams.
2. Improve the quality of 5,261 m long city roads (2019).
3. Improve the quality of 16,265 m long side roads (2019), which are public roads used to serve vehicles with close-range and low-speed trips.
4. Repair inhabitable houses in 67 sub-districts (*kelurahan*).
5. Develop and rehabilitate health and government facilities in 20 districts (*kecamatan*).
6. Design teaching materials and education related to climate change in several elementary and junior high schools (2012-2015).
7. GHG inventory strategic plan of the Environment Department (*Dinas Lingkungan Hidup/DLH*).

Considering our findings, here are some of the gaps in policy implementation.

1. Lack of comprehensiveness and continuity in the community empowerment initiatives aimed at enhancing Bandar Lampung's adaptive capacity. Many programmes implemented are limited to specific districts.
2. Policies and programmes related to waste management have not effectively addressed the waste issue in coastal regions, highlighting a lack of coordination and the need for a more comprehensive policymaking process.
3. Despite city drainage development efforts, there is a lack of change in community behaviour as well as a suboptimal drainage management implementation.
4. The revision of spatial plans (RTRW) should prioritise increasing green open spaces and water catchment areas. Bandar Lampung should aim to increase its public green open spaces to 20% of the city's total area from the current 11.08%, with support from private sectors and NGOs.
5. While the plastic reduction and Reduce, Reuse, Recycle (3R) practice programmes have conducted awareness-raising campaigns, community members have yet to implement these practices effectively on the ground.
6. Implementation of Slum Improvement Action Plan (SIAP) Bandar Lampung, intended to handle and improve slums, remains sectoral and has not embodied all seven indicators of slums.
7. The climate change curriculum has not been fully integrated into schools.
8. Implementation of an integrated early warning system for flooding, particularly in areas prone to frequent floods.
9. GHG inventory must be implemented well following proper methodology.

Bandar Lampung, under the facilitation of CRIC, has formed a working group for addressing climate change action. Currently, Bandar Lampung is in the process of developing a CAP.

Priority Action

Under the support of CRIC, Bandar Lampung has identified priority actions in climate change adaptation through a flood early warning system. By having this system, Bandar Lampung is expected to reduce loss during floods (UCLG ASPAC, 2020).

Banjarmasin

City Profile


Population	667,489
Population Density	6,779 people/ km ²
Land Area	98.46 km ²
Total Districts	5 districts
Total Sub-Districts/Villages	52 sub-districts/ villages
Programme Partnership	CRIC



Key economic activities:
Manufacturing, Wholesale and Retail Trade, Vehicle Repair Service, and Financial and Insurance Activities.


(Source: BPS Banjarmasin City, 2023)

Climate Profile



Rainfall

Average Annual	Average Increase (2075-2099)
2,788.4 mm	5%








Local Temperature

Average	Increase RCP 4.5	Increase RCP 8.5
26.9°C	1.5°C	3.5°C






(Source: BPS Banjarmasin City and KLHK Indonesia, 2023)

Climate-related Disasters in 2012-2021

Risk Index: 84.09 (Medium Disaster Risk Index)

Type of Disaster				
 Floods 7	 Landslides 1	 Whirlwind 15	 Drought 1	 Land Fire & Forest Fire 1
Total: 25				

GHG Inventory

Sector	 Energy	 IPPU	 Agriculture	 FOLU	 Waste	Total
BaU 2020 (tons CO₂e)	15,870.00	6,930.00	-	-	303,710.00	326,510.00
% BAU	4.86	2.12	-	-	93.02	100.00

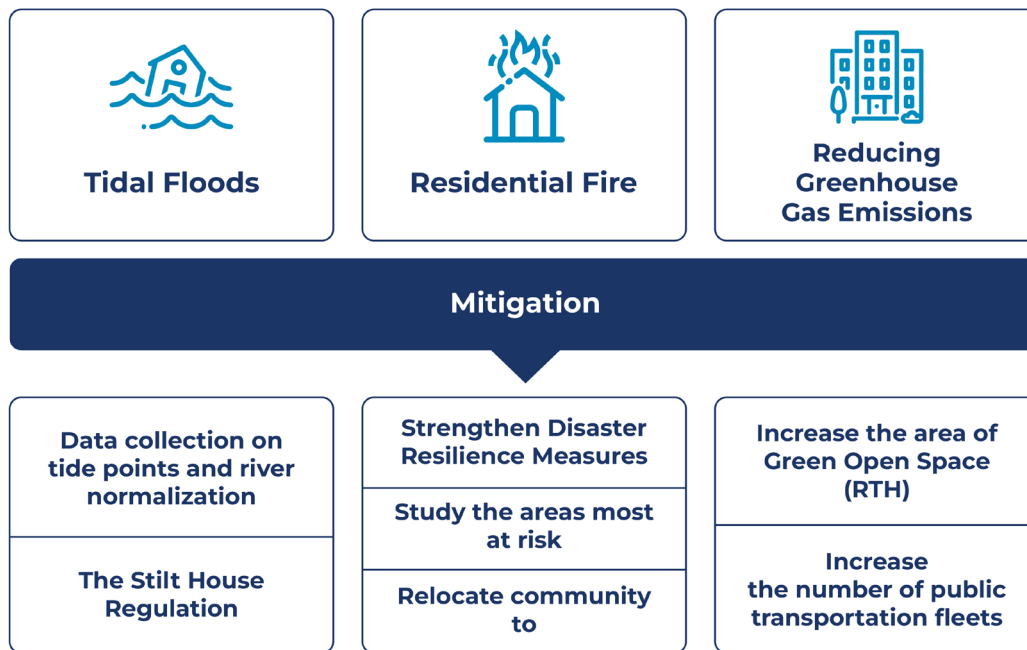
(Source: SIGN SMART, KLHK)

Adaptation and Mitigation Target

Banjarmasin is currently in the process of defining targets for both adaptation and mitigation, with extensive discussions ongoing among stakeholders.

Climate Change Action

Based on the policy analysis by CRIC in 2020, several initiatives under the local government's regional mid-term development plan address climate change in Banjarmasin (Nari, et al., 2020). However, these programmes have yet to be specifically categorised as adaptation or mitigation actions.



*Figure 9: Climate Actions in Banjarmasin
(Source: Nari, et al., 2020)*

Banjarmasin, in partnership with CRIC, has formed a working group for addressing climate change action. Under the support of the CRIC Project, Banjarmasin is in the process of developing a CAP.

Priority Action

Banjarmasin has identified its priority action as water management. With support from CRIC, Banjarmasin commits to ensuring water quality through water management tools and the engagement of river-based livelihood communities (UCLG ASPAC, 2020).

Cirebon

City Profile


Population	341,235
Population Density	9,131 people/ km ²
Land Area	37.36 km ²
Total Districts	5 districts
Total Sub-Districts/Villages	22 sub-districts/ villages
Programme Partnership	CRIC



Key economic activities:
Wholesale and Retail Trade, Vehicle Repair Service, Transportation and Storage, and Financial and Insurance Activities


(Source: BPS Cirebon City, 2023)

Climate Profile



Rainfall

Average Annual	Average Increase (2075-2099)
1009.1 – 1011.2 mm	5%









Local Temperature

Average	Increase RCP 4.5	Increase RCP 8.5
25.6°C – 28.3°C	1.5°C	3.5°C

(Source: BPS Cirebon City and KLHK Indonesia, 2023)






Climate-related Disasters in 2012-2021

Risk Index: 156.58 (High Disaster Risk Index)

Type of Disaster					
 Floods 126	 Landslides 25	 Abrasion 1	 Whirlwind 77	 Drought 29	 Land Fire & Forest Fire 14
Total: 272					

(Source: DIBI & IRBI, BNPB, 2023)

GHG Inventory

Sector	 Energy	 IPPU	 Agriculture	 FOLU	 Waste	Total
BaU 2020 (tons CO₂e)	221,820.00	-	4,280.00	-	79,810.00	305,910.00
% BAU	1.38	-	0.03	-	0.50	1.90

(Source: SIGN SMART, KLHK)

Adaptation and Mitigation Target

Cirebon is currently in the process of defining targets for both adaptation and mitigation, with extensive discussions ongoing among stakeholders.

Climate Change Action

Based on CRIC's policy analysis in 2020, four missions under the local government's regional mid-term development plan are in line with issues of climate change (Priyadi, Marlinang, Kristanti, & Aldian, 2020).

1. Improve the quality of local human resources who are competitive, cultured, and excellent in all fields.
2. Establish a clean, accountable, and innovative governance.
3. Improve the quality of environmentally friendly public facilities and infrastructure.
4. Create a conducive public order.

Cirebon, in partnership with CRIC, has formed a working group to discuss climate change actions. Currently, Cirebon is in the process of developing a CAP.

Priority Action

Cirebon has defined its priority as waste management, particularly community-based waste management. Engagement at the grassroots level aims to reduce GHG emissions while providing alternative livelihoods by reutilising waste and adding value to it within the community (UCLG ASPAC, 2020).

Denpasar

City Profile


Population	726,800 people
Population Density	5,770 people/ km ²
Land Area	127.78 km ²
Total Districts	4 districts
Total Sub-Districts/Villages	43 sub-districts/ villages
Programme Partnership	IUC Asia




Key economic activities:
Accommodation, Food & Beverages,
Education, and Constructions

(Source: BPS Denpasar City, 2023)

Climate Profile



Rainfall	
Average Annual	Average Increase (2075-2099)
2545.7 mm	5%







Local Temperature		
Average	Increase RCP 4.5	Increase RCP 8.5
28.9°C – 31.5°C	1.5°C	3.5°C

(Source: BPS Denpasar City and KLHK Indonesia, 2023)

Climate-related Disasters in 2012-2021

Risk Index: 104.39 (Medium Disaster Risk Index)

Type of Disaster			
 Floods 7	 Landslides 1	 Whirlwind 8	 Land Fire & Forest Fire 1
Total: 17			

(Source: DIBI & IRBI, BNPB, 2023)

GHG Inventory

Sector	Energy	IPPU	Agriculture	FOLU	Waste	Total
BaU 2020 (tons CO₂e)	89,961,536.22	38,019,298.77	1,518,621.69	-	4,891,843.32	2,624,663.00
% BAU	66.940	28.290	1.130	-	3.640	100.00

(Source: IUC Asia, 2021)

Adaptation Action Plan

Denpasar has put their concern to enhancing climate resilience through three sectors as follows (IUC ASIA, 2021).




Sector	Adaptation Actions
Socio-Economic	Implement fishery cultivation business development
	Develop business support systems for the empowerment of Small and Medium Enterprises (SMEs)
	Increase implementation of agricultural/plantation technology (utilisation of biogas as an alternative source for cooking and utilisation of used cooking oil for biodiesel)
Environment	Conserve and conduct damage control of water resources
	Manage and rehabilitate of coral, mangrove, seagrass, estuaries, and bay
	Rehabilitate forest and land
Infrastructure	Improve irrigation system
	Build and maintain of drainage channels
	Improve irrigation networks
	Improve river cleaning and dredging

(Source: IUC Asia, 2021)

Mitigation Target

Based on IUC 2020, Denpasar is estimated to reduce GHG emissions by approximately 231,341 tons of CO₂e or around 8% of the BaU 2030 scenario (IUC Asia, 2021).

Mitigation Actions

Sector	Mitigation Actions
 Stationary Energy	Implement energy efficiency measures in municipal building
	Implement energy efficiency in hotels through initiatives, such as the Green Hotel programme
	Support national government-initiated renewable energy power generation that will gradually reduce GHG emission factor in grid electricity (estimated 1% per year starting in 2021)
 Transportation	Support national government-initiated biodiesel programme, which could contribute to a lower emission factor for fuels (30% reduction)
 Waste	Improve the Suwung Municipal Waste Management Site through the development of a sanitary landfill system
	Reduce organic waste transported into Suwung as a part of the implementation of the National Policy and Strategy (JAKSTRANAS) on waste reduction
	Improve wastewater management systems through the conversion of household septic tanks to communal septic tanks and reduce the number of households dependent on river/ sea discharge systems.

(Source: IUC Asia, 2021)

Depok

City Profile


Population	2,123,000
Population Density	10,601 people/ km ²
Land Area	199,906 km ²
Total Districts	6 districts
Total Sub-Districts/Villages	63 sub-districts/ villages
Programme Partnership	IUC Asia




Key economic activities:
Manufacturing, Wholesale and Retail Trade;
Vehicle Repair Service, and Construction

(Source: BPS Depok City, 2023)

Climate Profile



Rainfall	
Average Annual	Average Increase (2075-2099)
3500 mm	20%







Local Temperature		
Average	Increase RCP 4.5	Increase RCP 8.5
23°C – 24°C	2.5°C	4.0°C

(Source: BPS Depok City and KLHK Indonesia, 2023)

Climate-related Disasters in 2012-2021

Risk Index: 76.53 (Medium Disaster Risk Index)

Type of Disaster			
 Floods 18	 Landslides 11	 Whirlwind 14	 Land Fire & Forest Fire 3
Total: 46			

(Source: DIBI & IRBI, BNPB, 2023)

GHG Inventory

Sector	Energy	IPPU	Agriculture	FOLU	Waste	Total
BaU 2020 (tons CO₂e)	3,076,500.00	-	74,030.00	109,550.00	429,060.00	3,689,140.00
% BAU	83.3934196	0	2.006700749	2.969526773	11.63035287	100.00

(Source: IUC Asia, 2021)

Adaptation Action Plan

Depok is in the process of increasing its adaptive capacity through six sectors as follows (IUC ASIA, 2021).




Sector	Adaptation Actions
Socio-Economic	Increase the quality of social protection and security services during and after natural as well as social disasters
Environmental	Improve clean water management and services
	Conserve biological and water resources
Education	Increase the number of members and environmental communities (green camp).
Infrastructure	Establish integrated Green Open Space (RTH) management of city and village parks
	Rehabilitate and normalise irrigation and drainage canals by involving the community
Governance	Enhance the capacity of firefighters and disaster management
	Improve post-natural and social disaster services

(Source: IUC Asia, 2021)

Mitigation Target

Under the BaU scenario, Depok is projected to reach 6,209,926 tons of CO₂e in 2030. Therefore, the city has a target to reduce emissions by around 11% against the 2030 BaU projection (IUC Asia, 2021).

Mitigation Actions

Sector	Mitigation Actions
 Stationary Energy	Implement energy efficiency in residential and commercial areas and government offices
	Implement Depok City gas network development
	Develop Rooftop Solar Power Plant (PLTS) in schools and government offices
	Retrofit lamps and installation of solar cells in public street lighting
 Transportation	Improve public mass transport
	Expand and improve bike and pedestrian paths
	Automatic traffic control system (ATCS)
	Implement transit-oriented development using biodiesel B30
 Waste	Build and maintain organic waste processing units (UPS)
	Build and maintain recycling centres and waste banks
	Implement refuse-derived fuel (RDF) and utilise methane gas (LFG) at the Cipayung landfill
	Implement education and cooperation in zero waste activities (waste reduction, sorting, and processing) involving public members and local communities
	Establish centralised aerobic treatment of domestic wastewater
	Utilise methane from an anaerobic wastewater treatment unit

(Source: IUC Asia, 2021)

Gorontalo

City Profile


Population	201,350
Population Density	7,181 people/ km ²
Land Area	79.59 km ²
Total Districts	9 districts
Total Sub-Districts/Villages	50 sub-districts/ villages
Programme Partnership	CRIC



Key economic activities:
Wholesale and Retail Trade, Vehicle Repair Service, Construction, and Financial and Insurance Activities


(Source: BPS Gorontalo City, 2023)

Climate Profile



Rainfall

Average Annual	Average Increase (2075-2099)
2081 mm	20%





Local Temperature

Average	Increase RCP 4.5	Increase RCP 8.5
26.10°C – 30.6°C	2.3°C	3.8°C

(Source: BPS Depok City and KLHK Indonesia, 2023)






Climate-related Disasters in 2012-2021

Risk Index: 84.34 (Medium Disaster Risk Index)

Type of Disaster	
 <p>Floods 23</p>	 <p>Landslides 3</p>
Total: 26	

(Source: DIBI & IRBI, BNPB, 2023)

GHG Inventory

Sector	 Energy	 IPPU	 Agriculture	 FOLU	 Waste	Total
BaU 2020 (tons CO₂e)	280.00	-	11,040.00	-	16,670.00	27,990.00
% BAU	1.00	-	39.44	-	59.56	100.00

(Source: SIGN SMART, KLHK)

Adaptation and Mitigation Target

Gorontalo is still in the process of defining adaptation and mitigation targets through discussions with all related stakeholders.

Climate Change Action

Climate Change Actions

Based on CRIC's policy analysis in 2020, several strategies under the government's regional mid-term plan address climate change as follows (Dilon, Angelica, & Khudi, 2020).

1. Provision of housing and settlement facilities
2. Disaster risk mitigation
3. Integrated drainage for flood control
4. 3R waste management
5. Waste bank based on community empowerment
6. Green Open Space fulfilment to reach 30% of the total city area

Gorontalo, under the facilitation of CRIC, has established a working group for addressing climate change action as well as developing a comprehensive CAP.

Priority Action

Gorontalo has identified water and sanitation as their priority focus to combat the decreasing quality from the impact of floods (UCLG ASPAC, 2020).

Kupang

City Profile


Population	468,913
Population Density	2,601 people/ km ²
Land Area	180.27 km ²
Total Districts	6 districts
Total Sub-Districts/Villages	51 sub-districts/ villages
Programme Partnership	CRIC




Key economic activities:
Wholesale and Retail Trade, Vehicle Repair Service, Construction, and Education

(Source: BPS Kupang City, 2023)

Climate Profile



Rainfall	
Average Annual ¹⁵	Average Increase (2075-2099) ¹²
2202.7mm	3.6%








Local Temperature		
Average ¹⁵	Increase RCP 4.5 ¹²	Increase RCP 8.5 ¹²
25.8°C – 28.8°C	1.4°C	2.7°C

(Source: BPS Kupang City and KLHK Indonesia, 2023)






Climate-related Disasters in 2012-2021

Risk Index: 97.18 (Medium Disaster Risk Index)

Type of Disaster				
 Floods 20	 Landslides 6	 Abrasion 3	 Whirlwind 13	 Drought 2
Total: 44				

(Source: DIBI & IRBI, BNPB, 2023)

GHG Inventory

Sector	 Energy	 IPPU	 Agriculture	 FOLU	 Waste	Total
BaU 2020 (tons CO₂e)	531,210.00	44,400.00	-	-1,850.00	68,570.00	642,330.00
% BAU	82.70	6.91	-	-0.29	10.68	100.00

(Source: SIGN SMART, KLHK)

1. Kupang City Stastical Agency.

Adaptation and Mitigation Target

Kupang is currently in the process of defining adaptation and mitigation targets through discussions with all related stakeholders.

Climate Change Action

Based on CRIC's policy analysis in 2020, Kupang's regional mid-term development plan includes a mission that aligns with the climate change issues. This mission is represented in mission number four "*To Prepare Kupang as Integrated Metropolitan and Environmental Insight.*" The programmes under this mission are as follows (Ridwansyah, Telupere, Asfahani, & Kanzil, 2020).

1. Improve water conservation
2. Improve waste management
3. Improve water and sanitation
4. Manage space utilisation
5. Improve transportation infrastructure
6. Implement disaster mitigation
7. Utilise Information technology

Kupang, in partnership with CRIC, has established a working group for addressing climate change action as well as developing a comprehensive CAP.

Priority Action

In Kupang, access to clean water is crucial, with communities spending around 17-40% of their income on water. With support from CRIC, Kupang plans to focus its efforts on natural resource management, particularly water conservation. The city aims to develop water management tools that address availability, needs, and distribution, integrating climate change analysis to ensure resilience in environmental challenges (UCLG ASPAC, 2020).

Makassar

City Profile


Population	1,432,190
Population Density	8,148 people/ km ²
Land Area	175.77 km ²
Total Districts	15 districts
Total Sub-Districts/Villages	153 sub-districts/ villages
Programme Partnership	IUC Asia




Key economic activities:
Wholesale and Retail Trade, Vehicle Repair Service, Manufacturing, and Construction.

(Source: BPS Makassar City, 2023)

Climate Profile



Rainfall	
Average Annual	Average Increase (2075-2099)
3721.9mm	-2.9%







Local Temperature		
Average	Increase RCP 4.5	Increase RCP 8.5
27.13°C – 28.73°C	1.3°C	2.5°C

(Source: BPS Makassar City and KLHK Indonesia, 2023)






Climate-related Disasters in 2012-2021

Risk Index: 119.49 (Medium Disaster Risk Index)

Type of Disaster			
 Floods 22	 Landslides 1	 Whirlwind 13	 Drought 1
Total: 37			

(Source: DIBI & IRBI, BNPB, 2023)

GHG Inventory

Sector	 Energy	 IPPU	 Agriculture	 FOLU	 Waste	Total
BaU 2020 (tons CO₂e)	5,167,340.00	260.00	11,420.00	-	257,440.00	5,436,460.00
% BAU	95.050	0.005	0.210	-	4.735	1.90

(Source: IUC Asia, 2021)

Adaptation Action Plan

The specific goals of Makassar’s adaptation plan are still under stakeholder consultation. However, their overarching target tends to aim to reduce the vulnerability of villages in high-impact areas. To achieve this, the adaptation actions in Makassar focus on four key sectors (IUC ASIA, 2021).




Sector	Adaptation Actions
Governance	Implement disaster prevention and preparedness
	Conduct training of psychological recovery and damaged infrastructure post-disaster
	Increase prevention and preparedness for fire disaster threats
Health	Improve health services, particularly for low-income households
Environment	Protect and conserve natural resources
	Monitor watershed management
	Provide waste bank infrastructure
Infrastructure	Improve sanitation facilities
	Develop drainage systems or water tunnels
	Develop and maintain the city’s green space
	Increase waste management capacity

(Source: IUC Asia, 2021)

Mitigation Target

Based on IUC’s report (2021), Makassar should aim to reduce at least 20% of its GHG emissions. This target is based on the assumption of reducing the intensity of energy consumption by 1% from the 2010 baseline.

Mitigation Actions

Sector	Mitigation Actions
 Stationary Energy Sector	Install smart street lighting Implement energy conservation in industry and buildings as well as energy efficiency in residential and commercial areas Install rooftop solar power
 Transportation Sector	Utilise bus rapid transit (BRT), smart driving, electric vehicles, and biodiesel
 Waste (Organic Management)	Utilise methane gas in landfills

(Source: IUC Asia, 2021)

Malang

City Profile


Population	846,126 people
Population Density	7,617 people/ km ²
Land Area	111.08 km ²
Total Districts	5 districts
Total Sub-Districts/Villages	57 sub-districts
Programme Partnership	IUC Asia



Key economic activities:
Wholesale and Retail Trade, Vehicle Repair Service, Manufacturing, and Construction


(Source: BPS Malang City, 2023)

Climate Profile



Rainfall

Average Annual	Average Increase (2075-2099)
3059.7 mm	-2.8%









Local Temperature

Average	Increase RCP 4.5	Increase RCP 8.5
24.4°C – 26°C	1.3°C	2.3°C

(Source: BPS Malang City and KLHK Indonesia, 2023)






Climate-related Disasters in 2012-2021

Risk Index: 80.15 (Medium Disaster Risk Index)

Type of Disaster					
 Floods 48	 Landslides 40	 Abrasion 2	 Whirlwind 77	 Drought 3	 Land Fire & Forest Fire 6
Total: 176					

(Source: DIBI & IRBI, BNPB, 2023)

GHG Inventory

Sector	 Energy	 IPPU	 Agriculture	 FOLU	 Waste	Total
BaU 2020 (tons CO₂e)	94,839,940.41	18,559,438.53	1,102,008.66	-	19,889,912.40	1,343,913.00
% BAU	70.570	13.810	0.820	-	14.800	1.90

(Source: IUC Asia, 2021)

Adaptation Action Plan

The local government has committed to achieving an adaptation goal focused on reducing the number of villages highly vulnerable to climate change. Therefore, Malang is addressing climate resilience across three key sectors below (IUC ASIA, 2021).




Sector	Adaptation Actions
Socio-Economic	Improve food security through flood and drought-tolerant crops
Environment	Provide clean water through water well drilling,
	Raise awareness on waste reduction through 3R activity
Infrastructure	Manage slum area
	Develop public green spaces
	Develop drainage/water tunnel systems

(Source: IUC Asia, 2021)

Mitigation Target

Based on the BaU projection, Malang is estimated to generate an increase in of emissions up to 1,799,996 tons of CO₂e without any intervention in 2030, representing a significant rise of 31% in GHG emissions. In response to this, Malang aims to reduce emissions by around 12% against the BaU 2030 projection (IUC ASIA, 2021).

Mitigation Actions

Sector	Mitigation Actions
 Stationary Energy Sector	Increase efficiency of electricity consumption in residential areas, commercial areas, and government offices
	Install rooftop solar power plants (PLTS) in schools and offices
	Retrofit lamps and installing solar cells for public street lighting (PJU)
 Transportation Sector	Implement the Sustainable National Urban Transportation Programme (SUTI) as well as the usage of biodiesel B30
 Waste (Organic) Management	Compost organic waste
	Build and operate recycling centres and waste banks
	Utilise methane gas (LFG) at landfills as well as biogas for SMEs

(Source: IUC Asia, 2021)

Climate Change Mitigation Efforts

Malang is recognised through the Transformative Action Program (TAP), highlighting its commitment to sustainable initiatives. The decarbonisation plan project, focusing on energy recovery at the Supit Urang sanitary landfill, underscores Malang's dedication to reducing GHG emissions.

Mataram

City Profile


Population	434,331
Population Density	7,085 people/ km ²
Land Area	61.30 km ²
Total Districts	6 districts
Total Sub-Districts/Villages	50 sub-districts/ villages
Programme Partnership	CRIC



Key economic activities:
Wholesale and Retail Trade, Vehicle Repair Service, Financial and Insurance Activities, and Construction


(Source: BPS Mataram City, 2023)

Climate Profile



Rainfall

Average Annual	Average Increase (2075-2099)
2673 mm	-2.9%







Local Temperature

Average	Increase RCP 4.5	Increase RCP 8.5
26.99°C	1.3°C	2.6°C

(Source: BPS Mataram City and KLHK Indonesia, 2023)






Climate-related Disasters in 2012-2021

Risk Index: 90.03 (Medium Disaster Risk Index)

Type of Disaster			
 Floods 11	 Landslides 1	 Abrasion 6	 Whirlwind 11
Total: 29			

(Source: DIBI & IRBI, BNPB, 2023)

GHG Inventory

Sector	 Energy	 IPPU	 Agriculture	 FOLU	 Waste	Total
BaU 2020 (tons CO₂e)	-	-	-	900.00	6,800.00	7,700.00
% BAU	-	-	-	11.69	88.31	100.00

(Source: SIGN SMART, KLHK)

Adaptation and Mitigation Target

Mataram is currently in the process of defining adaptation and mitigation targets through discussions with all related stakeholders.

Climate Change Action

Based on CRIC's policy analysis in 2020, there are programmes under the local government's regional mid-term development plan addressing climate change (Mulyana & Pratiwi, 2020).

Sector	Plan and Programme
Air Pollution	Vehicle emission test
Water Pollution	Prokasih (Clean River Programme)
Water Supply	Masterplan of Water Supply Provision System (RISPAM), 2015
Wastewater	City Sanitation Strategy (SSK) 2016-2021
	Small Scale Liquid WTP – Temporary Storage for Liquid Waste (Plan International)
	Feasibility study on sewerage system Development project (SSDP) – ADB and the Ministry of Public Works and Housing
Solid Waste Management	Sister city programme with Shah Alam, Malaysia and Pengzhou, China on green technology for waste to energy (WtE)
	Implementation of zero waste programme through waste bank
Open Space	Participate in the Green City Programme for Eco District
	Eco-Edu Tourism
Slum Settlement	Slum Prevention and Quality Improvement Plan (RP2KPKP)
	National Flagship Programme on Cities Without Slums (KOTAKU)
Energy	Masterplan for Smart Street Lighting (AFC & Citeos-Omexcom France)
Transport	Vehicle emission test
Disaster Management	Warning receiver system
	Earthquake and tsunami contingency plan

(Source: Mulyana & Pratiwi, 2020)

Mataram, in partnership with CRIC, has established a working group for addressing climate change action as well as developing a comprehensive CAP.

Priority Action

Mataram has defined its priority action as waste management. The city established an initiative to convert waste into energy (WtE) to reduce landfill waste and transition to renewable energy sources. With support from CRIC, Mataram aims to develop the Integrated Resource Recovery Centre (IRRC). The facility could generate biogas effectively from 80-90% waste which would be directly utilised by communities (UCLG ASPAC, 2020)

Medan

City Profile


Population	2,435,252
Population Density	9,186 people/km ²
Land Area	265.10 km ²
Total Districts	21 districts
Total Sub-Districts/Villages	151 sub-districts
Programme Partnership	GCoM Asia and Urban-Act



Key economic activities:
Wholesale and Retail Trade, Vehicle
Repair, Construction, and Manufacturing


(Source: BPS Medan City, 2023)

Climate Profile



Rainfall

Average Annual	Average Increase (2075-2099)
2000-3000 mm	0-5%







Local Temperature

Average	Increase RCP 4.5	Increase RCP 8.5
27-28°C	2.31°C	4.16°C

(Source: GCoM Asia, 2023)

Climate-related Disasters in 2012-2021

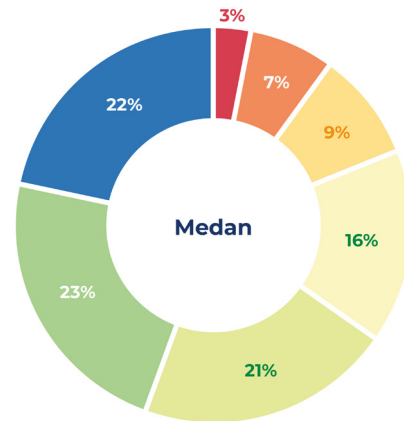
Risk Index: 97.68 (Medium Disaster Risk Index)

Type of Disaster			
 Floods 36	 Tidal/Abrasion Wave 1	 Whirlwind 37	 Forest and Land Fire 1
Total: 29			

(Source: DIBI & IRBI, BNPB, 2023)

Potential Impact of Climate Hazard

No	Category of Potential Impact	Number of Sub-districts	Per cent (%)
1	Very Low	33	22%
2	Low	34	23%
3	Rather Low	32	21%
4	Medium	24	16%
5	Rather High	13	9%
6	High	10	7%
7	Very High	5	3%
Total		151	100%



(Source: GCoM Asia, 2023)





Adaptation Action Plan

Medan has identified the need to enhance its climate resiliency through these nine key programmes (GCoM Asia, 2023).

1. Social Rehabilitation Programme
2. Industrial Planning and Development Programme
3. Settlement Development Programme
4. Spatial Planning Implementation Programme
5. Housing Development Programme
6. Residential Area Programme
7. Regional Development Planning Coordination and Synchronisation Programme
8. Pollution Control and/or Environmental Damage Programme
9. Waste Management Programme

GHG Inventory





The total GHG emissions in Medan based on the 2020 evaluation amount to 3,417,687.59 tons of CO₂e. The energy sector contributes over 79% of these emissions, with the remaining distributed across other sectors as listed below (GCoM Asia, 2023).

Sector	 Energy	 Agriculture	 FOLU	 Waste	Total
BaU 2020 (tons CO₂e)	2,720,396.40	8,446.57	-24,202.88	713,047.50	3,417,687.59
% BAU	79.59757	0.247143	-0.70817	20.86345	100

(Source: GCoM Asia, 2023)

Mitigation Target

Medan has an ambitious target of reducing GHG emissions by approximately 27.8% from the BaU 2030 scenario focusing on four key sectors, with the details explained in the table below.





Sector	 Energy	 Agriculture	 FOLU	 Waste	Total
BaU 2020 (tons CO ₂ e)	7,716,174.03	8,002.66	-1,533.25	827,209.92	8,549,853.36
Mitigation (tons CO ₂ e)	5,385,145.25	7,099.79	-1,207.77	779,139.45	6,170,176.72
Emission Reduction (ER) (tons CO ₂ e)	2,331,028.78	902.87	-325.48	2,379,676.64	2,379,676.64
% ER	27.26%	0.01%	0.00%	0.56%	27.83%

(Source: GCoM Asia, 2023)

The Medan City Government is currently utilising planned and pending activities across various departments and agencies (GCoM Asia, 2023).

Mitigation Actions

To carry out its ambitious goals, Medan is focusing on four main sectors, along with an additional sector as outlined in the table below.

Sector	Mitigation Actions
 Industry	<ul style="list-style-type: none"> Assist with electricity-saving equipment for Micro, Small and Medium Enterprises (UMKM) for 5 electrical appliances that has acquired the Energy Saving Sign Label (LTHE) Cooperate with certain industries to obtain funding assistance for GHG mitigation actions from donor countries
 Transportation	<ul style="list-style-type: none"> Implement railroad reactivation Utilise Battery-Based Electric Motorised Vehicles (KBLBB), such as motorcycles and cars, for government officials' vehicles Install Energy-Efficient Public Street Lighting (PJU) Replace traffic lights with energy-efficient lights Implement of bike lanes with strict supervision Procure compacted waste trucks to transport waste Propose action plans for Energy-Efficient Public Street Lighting to be financed by donor countries
 Household	<ul style="list-style-type: none"> Procure electricity-saving electrical equipment for government officials' houses (5 types of equipment have acquired LTHE) Install rooftop solar panels for government officials' houses
 Commercial	<ul style="list-style-type: none"> Install rooftop solar panels for government buildings Implement energy audits of government buildings at the expense of the APBD

Sector	Mitigation Actions
Other mitigation action options	Propose action plans for energy audits of government buildings to receive assistance from donor countries
	Utilise waste into Refuse Derived Fuel (RDF) at the RDF Plant
	Implement waste treatment through bio digestion in the Anaerobic Digester Plant
	Implement zero landfill disposal
	Implement domestic wastewater management, with aerobic system and/or anaerobic system as well as methane utilisation
	Implement aerobic treatment of industrial wastewater.

(Source: GCoM Asia, 2023)

Priority Action

Among the 19 identified mitigation actions, Medan prioritises four actions for addressing climate change, including Public Lighting and Smart Roadway Monitoring System, Sanitary Landfill and Landfill Gas, Mangrove Plantation, and Public Transportation (GCoM Asia, 2023).

Climate Change Mitigation Efforts

As of 2023, Medan has successfully reduced GHG emissions of around 366,588.95 tons CO₂e from nine specific actions as well as establishing a CAP. The actions span across three sectors as explained in the table below (GCoM Asia, 2023).

Actions		GHG Reduction (tCO ₂ e)	% GHG Reduction	Achieved in
Development of New and Renewable Energy Sector		939	0.26	
1	Construction and development of infrastructure for residential areas in strategic districts/sub-districts	939	0.26	2022
Transportation Sector		365563.95	99.72	
2	Dissemination of Orderly Road Traffic	6.45	0.00	2022
3	Vehicle Crew Resource Improvements	84.24	0.02	2022
4	Car Free Day in Merdeka Square Area, Benteng Square Area, and Medan Mayor's Office Area	2.26	0.00	2022
5	Public Service Improvement Programme	66	0.02	2022
6	Traffic Management and Engineering Improvement Programme	46743	12.75	2022
7	Implementation of E-Parking in the Kesawan Area	66	0.02	2022
8	Operations of BRT Trans Medan	318,596	86.91	2022
Waste Sector		86	100	
9	Improvement of Final Processing Site (TPA); Waste Processing Site (TPS); Integrated Waste Processing Site (TPS); Reduce, Reuse, Recycle Waste Processing Site (TPS3R)	86	0.02	2022
Total		366,588.95	100	

(Source: GCoM Asia, 2023)

North Minahasa

City Profile


Population	229,368
Population Density	106 people/ km ²
Land Area	1059.24 km ²
Total Districts	10 districts
Total Sub-Districts/Villages	131 sub-districts/villages
Programme Partnership	GCoM Asia




Key economic activities:
Agriculture, Forestry, and Fishing,
Manufacturing, and Construction

(Source: BPS North Minahasa Regency, 2023)

Climate Profile



Rainfall	
Average Annual	Average Increase (2075-2099)
4,596 mm	17.7%







Local Temperature		
Average	Increase RCP 4.5	Increase RCP 8.5
25.5°C – 27.8°C	2.14°C	3.87°C

(Source: BPS North Minahasa Regency and KLHK Indonesia, 2023)

Climate-related Disasters in 2012-2021

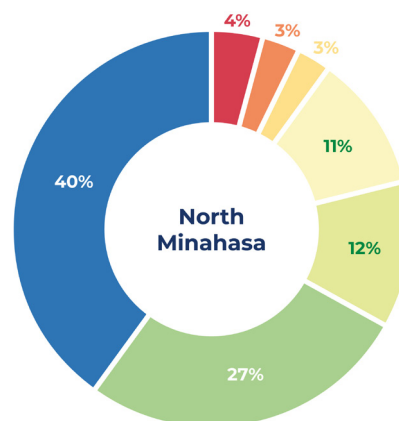
Risk Index: 122.58 (Medium Disaster Risk Index)

Type of Disaster			
 Floods 41	 Landslides 19	 Abrasion 2	 Whirlwind 18
Total: 80			

(Source: DIBI & IRBI, BNPB, 2023)

Potential Impact of Climate Hazard

No	Category of Potential Impact	Number of Sub-districts	Per cent (%)
1	Very Low	53	40%
2	Low	35	27%
3	Rather Low	16	12%
4	Medium	14	11%
5	Rather High	4	3%
6	High	4	3%
7	Very High	5	4%
Total		131	100%



(Source: GCoM Asia, 2023)

Adaptation Action Plan

North Minahasa has identified climate change as a priority in its mid-term regional development plan, with a focus on enhancing climate resilience through 545 activities. Among these, 72 actions have been designated as high priority. These actions are grouped into four major categories, including flood and abrasion-related resilience enhancements, water and wastewater-related issues, waste-related issues, and disaster risk management and reduction-related issues. Responsibility for implementing these activities falls to four local agencies, as detailed in the table below (GCoM Asia, 2023).

No	Local Government Department/Agency	Actions with high potential impact directly related to disasters
1	Department of the Environment (DLH)	10
2	Department of Public Works and Spatial Planning (Dinas PUPR)	47
3	Regional Disaster Management Agency (BPBD)	8
4	Department of Public Housing and Residential Areas (Dinas Perkimtan)	7

(Source: GCoM Asia, 2023)





GHG Inventory

The total GHG emissions in Medan based on the 2020 evaluation amount to 3,417,687.59 tons of CO₂e. The energy sector contributes over 79% of these emissions, with the remaining distributed across other sectors as listed below (GCoM Asia, 2023).

Sector	Energy	Agriculture	FOLU	Waste	Total
BaU 2020 (tons CO₂e)	168,931.46	51,778.52	-220,413.40	53,913.37	54,209.96
% BAU	311.62	95.51	-406.59	99.45	100.00






(Source: GCoM Asia, 2023)

Mitigation Target

Sector	 Energy	 Agriculture	 FOLU	 Waste	Total
BaU 2020 (tons CO ₂ e)	317,865.03	62,662.50	216,773.28	70,756.44	668,057.25
Mitigation (tons CO ₂ e)	271,551,332.00	54,912.65	91,508.19	65,044.87	483,017.03
Emission Reduction (ER) (tons CO ₂ e)	46,313.71	7,749.85	125,265.09	5,711.58	173,096.75
% ER	6.93	1.16	18.75	0.85	27.70

(Source: GCoM Asia, 2023)

Mitigation Actions

Sector	Mitigation Actions
 Agriculture	Manage livestock manure for biogas
	Utilise compost from animal/livestock manure in food crop agriculture
	Implement System Rice Intensification (SRI) and organic fertilisers
	Develop and utilise organic fertiliser (UPPO)
	Utilise low-emission rice varieties
	Implement efficient use of N fertiliser
 Waste	Utilise waste into RDF at the RDF Plant
	Implement waste treatment with biodigester in the Anaerobic Digester Plant
	Implement zero landfill disposal
	Implement domestic wastewater management, with an aerobic system and/ or anaerobic system with methane utilisation
	Implement aerobic treatment of industrial wastewater
 Transportation	Utilise electric vehicles for government officials' vehicles
	Install energy-efficient streetlights and solar cell streetlights on all public streetlighting
	Replace traffic lights with energy-efficient lights
	Build designated bike lanes with strict supervision
	Utilise compacted waste truck to transport waste
	Propose an action plan for the energy-efficient street light proposal to be funded by donor countries
 Household	Procure energy-efficient electrical equipment in the government officials' residences
	Construct rooftop solar panels for government officials' residences
 Commercial	Construct solar panels on top of the government building
	Implement an energy audit in government buildings at the expense of the local government budget (APBD)
	Propose an energy audit action plan and implement it at government buildings to get funding support.

(Source: GCoM Asia, 2023)

Priority Action

North Minahasa has identified mangrove planting and rehabilitation of critical lands as the priority actions in addressing climate change.

Climate Change Mitigation Efforts

North Minahasa has taken significant steps to address climate change, as outlined in its CAP. Two key actions have been implemented to mitigate the impacts of climate change. First, North Minahasa has established a solar panel power plant capable of generating 15 MW per day. This initiative is projected to reduce GHG emissions by up to 20.01 kilotons of CO₂e. Second, North Minahasa focused on the economic and tourism-based utilisation and development of mangroves in the Wori tourism village. Utilising estimates of the mangroves' carbon absorption capacity, which is approximately 27.6 tons CO₂e per hectare per year (Cameron, Hutley, Friess, & Brown, 2019), it is anticipated that the mangroves in Wori village can absorb GHG emissions of approximately 753,866.4 tons of CO₂e.

Padang

City Profile


Population	919,145
Population Density	1,323 people/ km ²
Land Area	694.96 km ²
Total Districts	11 districts
Total Sub-Districts/Villages	104 sub-districts/ villages
Programme Partnership	Urban-Act



Key economic activities:
Wholesale and Retail Trade; Vehicle Repair Service, Transportation and Storage, and Manufacturing


(Source: BPS Padang City, 2023)

Climate Profile



Rainfall

Average Annual	Average Increase (2075-2099)
4697.3 mm	8%









Local Temperature

Average	Increase RCP 4.5	Increase RCP 8.5
26.40°C – 28.10°C	2.5°C	4°C

(Source: BPS Padang City and KLHK Indonesia, 2023)

Climate-related Disasters in 2012-2021






Risk Index: 179.03 (High Disaster Risk Index)

Type of Disaster					
 Floods 47	 Landslides 15	 Abrasion 10	 Whirlwind 27	 Drought 4	 Land Fire & Forest Fire 1
Total: 104					

(Source: DIBI & IRBI, BNPB, 2023)

GHG Inventory

Based on the SIGN SMART platform in 2018, Padang City has identified GHG emissions in two sectors, including waste and FOLU.

Sector	 Energy	 IPPU	 Agriculture	 FOLU	 Waste	Total
BaU 2020 (tons CO ₂ e)	-	-	-	8,500.00	10,530.00	2,030.00
% BAU	-	-	-	-418.72	518.72	100.00

(Source: GCoM Asia, 2023)

Climate Change Adaptation and Mitigation Efforts

Padang has yet to develop a comprehensive CAP. Efforts to address climate change are currently dispersed across various strategic plans within different agencies of the government. However, Padang City is actively participating in a national initiative known as *Program Kampung Iklim* (PROKLIM). Six sub-districts within the city are engaged in this programme, aiming to mitigate GHG emissions and enhance climate resilience (Kusnadi, 2023).

Palembang

City Profile


Population	1,721,392
Population Density	4,317 people/ km ²
Land Area	352.51 km ²
Total Districts	18 districts
Total Sub-Districts/Villages	107 sub-districts/ villages
Programme Partnership	IUC Asia



Key economic activities:
Manufacturing, Wholesale and Retail Trade; Vehicle Repair Service, and Construction


(Source: BPS Palembang City, 2023)

Climate Profile



Rainfall

Average Annual	Average Increase (2075-2099)
2917.9mm	5%







Local Temperature

Average	Increase RCP 4.5	Increase RCP 8.5
26.80°C	1.6°C	2.3°C

(Source: BPS Palembang City & KLHK Indonesia, 2023)






Climate-related Disasters in 2012-2021

Risk Index: 131.5 (Medium Disaster Risk Index)

Type of Disaster			
 Floods 20	 Landslides 1	 Whirlwind 10	 Land Fire & Forest Fire 2
Total: 33			

(Source: DIBI & IRBI, BNPB, 2023)

GHG Inventory

Sector	 Energy	 IPPU	 Agriculture	 FOLU	 Waste	Total
BaU 2020 (tons CO₂e)	4,974,390.00	160,310.00	9,480.00	-	453,270.00	5,597,450.00
% BAU	3,491.606	112.524	6.654	-	318.158	100.000

(Source: IUC Asia, 2021)

Adaptation Action Plan

The goal of the adaptation action is to reduce the number of vulnerable villages in relation to climate-related risks. To achieve this goal, Palembang has identified four key sectors as follows.




Sector	Adaptation Actions
Socio-Economic	Implement the Entrepreneurship Development Programme and the Small and Medium Enterprises Competitive Advantages
	Improve farmers' institutional capacity
	Implement the Agricultural Technology Improvement Programme with the utilisation of biogas technology
	Improve the Food Security Programme
Government/Institutional	Improve basic education
	Increase community participation in environmental management
Education	Develop disaster-resilient villages
	Integrate CAP to the Urban Spatial Plan
Infrastructure	Improve basic public health
	Improve the flood management programme
	Rehabilitate and maintain the irrigation network
	Provide infrastructure and facilities for solid waste management

(Source: IUC Asia, 2021)

Mitigation Target

Palembang is projected to experience an increase in emissions based on the BaU 2030 scenario, estimated at 7,059,485 tCO₂e without any intervention. In response, Palembang has set a target to reduce emissions by 15% (IUC ASIA, 2021).

Mitigation Actions

Sector	Mitigation Actions
 Stationary Energy	Increase electricity consumption efficiency in residential areas 1. Implement an energy roadmap in Pertamina Refinery Unit III Application of energy roadmap in Pertamina Refinery Unit III laju (crude oil refinery unit). 2. Implement efficient use of natural gas at PT. PUSR (a urea fertiliser producer). Implement electricity consumption efficiency in commercial areas.
 Transportation	Implement the Sustainable National Urban Transportation Programme (SUTI) with the usage of biodiesel B30.
 Waste (Organic) Management	Implement Landfill Gas (LFG) Recovery at solid waste disposal sites, organic waste composting, as well as the 3R programme (Reuse, Reduce, Recycle).

(Source: IUC Asia, 2021)

Climate Change Mitigation Efforts

Palembang has been recognised by the City Climate Finance Gap Fund (known as “Gap Fund”) for its efforts in conducting a cost-benefit analysis, formulating strategies, and creating an action plan for green, resilient construction, and energy-efficient affordable housing.

Pangkalpinang

City Profile


Population	226,297
Population Density	2,165 people/ km ²
Land Area	104.5 km ²
Total Districts	7 districts
Total Sub-Districts/Villages	42 sub-districts/ villages
Programme Partnership	CRIC




Key economic activities:
Wholesale and Retail Trade, Vehicle Repair Service, Manufacturing, and Construction

(Source: BPS Pangkalpinang City, 2023)

Climate Profile



Rainfall	
Average Annual	Average Increase (2075-2099)
2970.90 mm	5%







Local Temperature		
Average	Increase RCP 4.5	Increase RCP 8.5
26.7°C	1.6°C	2.3°C

(Source: BPS Pangkalpinang City & KLHK Indonesia, 2023)






Climate-related Disasters in 2012-2021

Risk Index: 120.4 (Medium Disaster Risk Index)

Type of Disaster			
 Floods 97	 Landslides 1	 Whirlwind 48	 Land Fire & Forest Fire 32
Total: 178			

(Source: DIBI & IRBI, BNPB, 2023)

GHG Inventory

Sector	 Energy	 IPPU	 Agriculture	 FOLU	 Waste	Total
BaU 2020 (tons CO₂e)	240,260.00	87,800.00	87,800.00	2,850.00	3,770.00	422,480.00
% BAU	56.87	20.78	20.78	0.67	0.89	100.00

Adaptation and Mitigation Target

Pangkalpinang is still in the process of defining targets for both adaptation and mitigation with all related stakeholders.

Climate Change Action

Pangkalpinang, in partnership with CRIC, has formed a working group to address climate change. Together, they are in the process of developing a comprehensive CAP. Any action addressing climate change through adaptation and mitigation is still under discussion with all related stakeholders.

Priority Action

Pangkalpinang has identified implementing a flood early warning system as their priority action to reduce loss during flood events (UCLG ASPAC, 2020).

Pekanbaru

City Profile


Population	1,007,540
Population Density	1,594 people/ km ²
Land Area	632.26 km ²
Total Districts	8 districts
Total Sub-Districts/Villages	45 sub-districts/ villages
Programme Partnership	CRIC



Key economic activities:
Wholesale and Retail Trade; Vehicle Repair Service, Construction, and Manufacturing


(Source: BPS Pekanbaru City, 2023)

Climate Profile



Rainfall

Average Annual	Average Increase (2075-2099)
473 mm	5%






Local Temperature

Average	Increase RCP 4.5	Increase RCP 8.5
35.9°C	1.6°C	2.3°C

(Source: BPS Pekanbaru City & KLHK Indonesia, 2023)






Climate-related Disasters in 2012-2021

Risk Index: 130.98 (Medium Disaster Risk Index)

Type of Disaster		
 Floods 15	 Whirlwind 5	 Land Fire & Forest Fire 15
Total: 35		

(Source: DIBI & IRBI, BNPB, 2023)

GHG Inventory

Sector	 Energy	 IPPU	 Agriculture	 FOLU	 Waste	Total
BaU 2020 (tons CO₂e)	30,547.50	-	115.80	5,443.93	300.55	36,407.78
% BAU	1,504.80	-	5.70	268.17	14.81	1,793.49

Adaptation and Mitigation Target

Pekanbaru is in the process of defining the targets for both adaptation and mitigation with all related stakeholders.

Climate Change Action

Based on CRIC's policy analysis in 2020, the local government's regional mid-term plan has included programmes addressing climate change, as can be seen in the table below (Mulyana & Pratiwi, 2020).

Sector	Mitigation Actions
Air Pollution	<ul style="list-style-type: none">Vehicle Emission TestGreenhouse Gas Emissions Inventory Report (2014 and 2017)
Water Pollution	<ul style="list-style-type: none">Prokasih (Clean River Programme)
Water Supply	<ul style="list-style-type: none">Masterplan of Water Supply Provision System (RISPAM)2015 Public-Private Partnership on Regional Water Supply Project (KPBU SPAM Kota Pekanbaru)
Wastewater	<ul style="list-style-type: none">City Sanitation Strategy (SSK) 2018Community-Based Wastewater Treatment Plant and City-Wide Wastewater Treatment Project funded by the Ministry of Housing and Public Works and the Asian Development Bank (ADB)
Solid waste management	<ul style="list-style-type: none">Regional Waste Management Policy and Strategy in Pekanbaru 2018-2025GIZ NEXUS Programme on The Preliminary Feasibility Study of Implementing the Sustainable Sanitary Landfill to Energy System (SSLTES)Daehan Consortium Korea Processing Waste to Solid Refused Fuel (SRF)
Green Open Space	<ul style="list-style-type: none">Conduct partnership among city government, universities, and communities
Slum Settlement	<ul style="list-style-type: none">Slum Prevention and Quality Improvement Plan (RP2KPKP)National Flagship Programme on Cities Without Slums (KOTAKU)
Transport	<ul style="list-style-type: none">Develop Trans Metro PekanbaruDevelop monorail
Disaster management	<ul style="list-style-type: none">Program Kampung Iklim (Climate Village Programme)

(Source: Mulyana & Pratiwi, 2020)

Pekanbaru, in partnership with CRIC, has formed a working group for addressing climate change action and developing a CAP.

Priority Action

Pekanbaru has defined waste management as their priority action. Pekanbaru has made a significant commitment to waste reduction by aiming to decrease waste by 1,000 tons per day. This goal will result in only 700 tons of waste being brought to the landfill (UCLG ASPAC, 2020).

Pontianak

City Profile


Population	669,795
Population Density	5,661.36 people/ km ²
Land Area	118.31 km ²
Total Districts	6 districts
Total Sub-Districts/Villages	29 sub-districts/villages
Programme Partnership	GCoM Asia



Key economic activities:
Manufacturing, Wholesale and Retail Trade, Vehicle Repair Service, and Construction


(Source: BPS Pontianak City, 2023)

Climate Profile



Rainfall

Average Annual	Average Increase (2075-2099)
3422.5 mm	17.7%






Local Temperature

Average	Increase RCP 4.5	Increase RCP 8.5
27°C – 28°C	2.14 °C	3.87°C

(Source: GCoM Asia, 2023)

Climate-related Disasters in 2012-2021

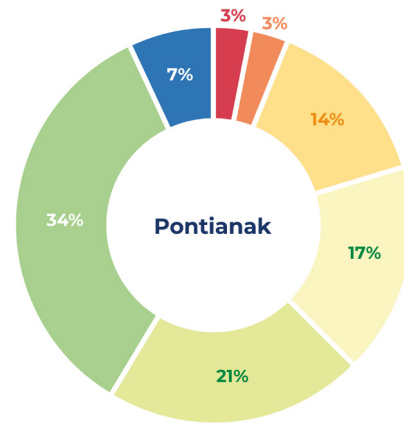
Risk Index: 90.63 (Medium Disaster Risk Index)

Type of Disaster		
 Floods 16	 Whirlwind 26	 Land Fire 24
Total: 66		

(Source: DIBI & IRBI, BNPB, 2023)

Potential Impact of Climate Hazard

No	Category of Potential Impact	Number of Sub-districts	Per cent (%)
1	Very Low	2	7%
2	Low	10	34%
3	Rather Low	6	21%
4	Medium	5	17%
5	Rather High	4	14%
6	High	1	3%
7	Very High	1	3%
Total		29	100%







(Source: GCoM Asia, 2023)

Adaptation Action Plan

Pontianak has identified eleven priority programmes aimed at addressing climate change adaptation explained as follows (GCoM Asia, 2023).





1. Fulfilment of individual health efforts and community health efforts
2. Regional waste management and system development programme
3. Social rehabilitation programme
4. Industrial planning and development programme
5. Settlement development programme
6. Spatial planning implementation programme
7. Housing development programme
8. Residential area programme
9. Regional development planning coordination and synchronisation programme
10. Pollution control programme and/or environmental damage
11. Waste management programme

GHG Inventory

Sector	 Energy	 Agriculture	 FOLU	 Waste	Total
BaU 2020 (tons CO₂e)	850,204.46	3,529.86	69,651.62	363,925.77	1,287,311.72
% BAU	66.04	0.27	5.41	28.27	100.00

(Source: GCoM Asia, 2023)

Mitigation Target

Sector	 Energy	 Agriculture	 FOLU	 Waste	Total
BaU 2020 (tons CO ₂ e)	1,198,926.01	4,061.66	59,834.88	465,827.80	1,728,650.35
Mitigation (tons CO ₂ e)	858,990.52	3,508.68	56,855.42	437,914.49	1,357,269.12
Emission Reduction (ER) (tons CO ₂ e)	339,935.49	552.98	2,979.46	27,913.31	371,381.24
% ER	19.67%	0.03%	0.17%	1.62%	21.48%

(Source: GCoM Asia, 2023)

Mitigation Actions

Sector	Mitigation Actions
 Industry	<p>Assist the installation of electricity-saving equipment for MSMEs (Micro, Small, and Medium Enterprises) for five electrical equipment that have acquired LTHE</p> <p>Collaborate with certain industries to obtain funding assistance for GHG mitigation actions from donor countries</p>
 Transportation	<p>Usage of electricity vehicles (motorcycles and cars) for officials' vehicles</p> <p>Install energy-saving PJU and PLTS PJU lamps for all public street lighting</p> <p>Replace traffic lights with energy-saving lamps</p> <p>Implement bicycle lanes with tight supervision</p> <p>Procure compacted waste trucks to transport waste</p> <p>Propose an energy-efficient PJU action plan to be funded by donor countries</p>
 Household	<p>Procure of electricity-saving electrical equipment for government officials' residences (5 types of equipment have acquired LTHE)</p> <p>Build rooftop solar plant (PLTS) for government officials' houses</p>
 Commercial	<p>Develop rooftop solar plant (PLTS) for government buildings</p> <p>Implement energy audits in government buildings by allocating funds from the regional budget</p> <p>Propose action plans for energy audits in government buildings to receive assistance from donor countries</p>
 Agriculture	<p>Utilise livestock manure to produce bioenergy</p> <p>Utilise compost from animal/livestock manure in food crop agriculture</p> <p>Implement System Rice Intensification (SRI) and use organic fertilisers</p>
 Waste	<p>Utilise waste into RDF at the RDF Plant</p> <p>Implement waste treatment with bio-digestion in the anaerobic digester plant</p> <p>Implement zero landfill disposal</p> <p>Manage domestic wastewater, with an aerobic system and/or an anaerobic system as well as methane utilisation</p> <p>Implement aerobic industrial wastewater treatment</p>

(Source: GCoM Asia, 2023)


Climate Change Mitigation Efforts

Pontianak started its climate action efforts in 2022 with the development of a comprehensive climate plan to reduce GHG emissions in 2030 by approximately 21.48%.

Samarinda

City Profile


Population	834,824
Population Density	1,153 people/ km ²
Land Area	718 km ²
Total Districts	10 districts
Total Sub-Districts/Villages	59 sub-districts
Programme Partnership	CRIC



Key economic activities:
Construction, Wholesale and Retail Trade;
Vehicle Repair Service, and Mining and
Quarrying


(Source: BPS Samarinda City, 2023)

Climate Profile



Rainfall

Average Annual	Average Increase (2075-2099)
2720.1 mm	5%









Local Temperature

Average	Increase RCP 4.5	Increase RCP 8.5
28.7°C – 29.5°C	1.6°C	2.3°C

(Source: BPS Samarinda City & KLHK Indonesia, 2023)




Climate-related Disasters in 2012-2021

Risk Index: 130.98 (Medium Disaster Risk Index)

Type of Disaster					
					
Floods 51	Landslides 61	Abrasion 1	Whirlwind 6	Drought 4	Land Fire & Forest Fire 55
Total: 178					

(Source: DIBI & IRBI, BNPB, 2023)

GHG Inventory

Sector				Total
	Energy	AFOLU	Waste	
BaU 2020 (tons CO₂e)	54,375,620	3,652,636	1,948,712	59,976,945
% BAU	90.66	6.09	3.25	100

Adaptation and Mitigation Target

Samarinda has set an ambitious reduction target of approximately 49,366,294 tons of CO₂e, equivalent to around 17.69% of the BaU 2030 scenario. However, Samarinda has yet to define a specific target for mitigation efforts. Discussions with all related stakeholders are ongoing to establish clear mitigation objectives and strategies (Amri, Jamalianuri, & Delphia, 2020).

Climate Change Action

Based on CRIC's policy analysis in 2020, the local government's regional mid-term development plan has included 13 programmes addressing climate change as can be seen in the table below (Amri, Jamalianuri, & Delphia, 2020).

Programmes	Indicators
Healthy environment & Wastewater	Number of IPAL units (Wastewater Treatment Plants)
Portable water system	Households with access to potable water
Spatial planning	Changes in land use (Ha)
Retention wall development	Percentage of embankment walls along the river
	Construction of an embankment wall along the river
Drainage	Percentage of drainage systems in good condition within the city
Flood management	The remaining number of flooded areas
Urban sanitation improvement	Area covered by sanitation services
Green open space	Percentage of public green open space
Post-disaster rehabilitation and reconstruction	Percentage of recovered public facilities and infrastructure post-disaster
Emergency logistics	Percentage of disaster victims evacuated using complete emergency response
Pre-fire preparedness and prevention	Coverage of firefighting services
	Percentage of people in fire-prone areas who understand early fire prevention and control
	Percentage of buildings and business areas with fire protection equipment
	Response time in fire management service areas
Waste management	Water quality status
	Urban ambient and air quality index
Improvement of waste management	Transported and processed waste in the landfill
	Percentage of waste reduction

(Source: Amri, Jamalianuri, & Delphia, 2020)

Samarinda has implemented regulations to limit waste disposal time and prohibit sellers from providing plastic bags to buyers, aiming to reduce plastic waste. Additionally, with support from the CRIC Project, Samarinda has formed a working group to address climate change action as well as developing a CAP.

Priority Action

Samarinda has identified its priority action as waste management, focusing on organic waste management to achieve a target of 60% of total waste production (UCLG ASPAC, 2020).

Tangerang

City Profile


Population	1,930,556
Population Density	11,732 people/ km ²
Land Area	164.55 km ²
Total Districts	13 districts
Total Sub-Districts/Villages	104 sub-districts/villages
Programme Partnership	GCoM Asia



Key economic activities:
Manufacturing, and Transportation and Storage


(Source: BPS Tangerang City, 2023)

Climate Profile



Rainfall

Average Annual	Average Increase (2075-2099)
1500-2500 mm	20%







Local Temperature

Average	Increase RCP 4.5	Increase RCP 8.5
27°C – 28°C	2.39°C	4.22°C

(Source: GCoM Asia, 2023)

Climate-related Disasters in 2012-2021

Risk Index: 116.8 (Medium Disaster Risk Index)

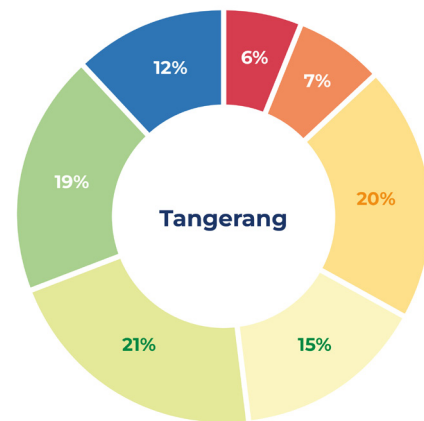
Type of Disaster			
 Floods 19	 Landslides 2	 Whirlwind 2	 Drought 1
Total: 24			

Type of Disaster	Total
Flood	19
Landslide	2
Whirlwind	2
Drought	1
Total	24

(Source: DIBI & IRBI, BNPB, 2023)

Potential Impact of Climate Hazard

No	Category of Potential Impact	Number of Sub-districts	Per cent (%)
1	Very Low	12	12
2	Low	20	19
3	Rather Low	22	21
4	Medium	16	15
5	Rather High	21	20
6	High	7	7
7	Very High	6	6
Total		104	100%







(Source: GCoM Asia, 2023)

Adaptation Action Plan

Tangerang has identified its priority adaptation actions from 209 climate change-related programmes explained as follows (GCoM Asia, 2023).





- Provide personnel costs for students.
- Provide educators and education personnel for education units.
- Manage the school operational assistance fund (BOS).
- Build and maintain the Drinking Water Supply System (SPAM) pipe network.
- Repair uninhabitable houses.
- Improve the government's ability to the Potential Sources of Family Social Welfare (PSKS) tracking system.
- Coordinate awareness-raising campaign and implementation of the Disaster Preparedness Village (KSB) programme.
- Build and rehabilitate river embankments.
- Build polder or retention ponds.
- Rehabilitate flood control gates or dams.
- Improve Flood Pump Station.
- Restore and normalise rivers.
- Develop and maintain an urban drainage system.
- Improve environmental drainage channel.
- Rehabilitate roads.
- Compile city or regency disaster management regulations.
- Coordination, synchronisation, and implementation of environmental pollution prevention on soil, water, air, and sea.
- Coordination, synchronisation, and implementation of GHG emission control as well as climate change mitigation and adaptation actions.

GHG Inventory

Sector	 Energy	 Agriculture	 FOLU	 Waste	Total
BaU 2020 (tons CO ₂ e)	12,049,007.82	5,343.16	0	670,154.10	12,724,505.08
% BAU	94.69136712	0.041991103	0	5.266641773	100






(Source: GCoM Asia, 2023)

Mitigation Target

Sector	 Energy	 Agriculture	 FOLU	 Waste	Total
BaU 2020 (tons CO ₂ e)	22,081,560.92	3,148.69	0	761,688.54	22,846,398.16
Mitigation (tons CO ₂ e)	18,392,594.46	2,857.89	-15,590.63	456,691.30	18,836,553.02
Emission Reduction (ER) (tons CO ₂ e)	3,688,966.46	290.81	15,590.63	304,997.25	4,009,845.14
% ER	16.147	0.001	0.068	1.335	17.55

(Source: GCoM Asia, 2023)

Mitigation Actions

Sector	Mitigation Actions
 Industry	Assist the installation of electricity-saving equipment for Micro, Small and Medium Enterprises (MSMEs) for 5 electrical appliances that have acquired LTHE Collaborate with certain industries to obtain funding support for GHG mitigation actions from donor countries
 Transportation	Utilise electric vehicles for government officials' vehicles Install energy-efficient public street lighting (PJU) Replace traffic lights with energy-efficient lights Implement designated bike lanes with strict supervision Utilise compacted waste trucks to transport waste Propose an action plan for energy-efficient public street lighting to be financed by donor countries
 Household	Procure energy-efficient electrical equipment in the official residence Construct rooftop solar panels (PLTS) for government officials' residences.
 Commercial	Construct rooftop solar panels for government buildings Implement energy audits in government buildings by allocating funds from the local government budget (APBD) Propose energy audit action plan and implementation at government buildings to get funding support
 Other mitigation action options in the waste sector	Utilise waste into Refuse Derived Fuel (RDF) at the RDF Plant Implement waste treatment utilising biodigester in the Anaerobic Digester Plant Implement zero landfill disposal Implement domestic wastewater management, with an aerobic system and/ or anaerobic system with methane utilisation Implement aerobic treatment of industrial wastewater

(Source: GCoM Asia, 2023)

Priority Action

Tangerang has identified 19 actions aimed to be implemented from 2024 to 2026.

Actions	Stakeholders	Year of implementation
Making livestock biogas with the community.	Food Security Department (DKP)	2024 – 2026
Usage of organic fertiliser.	Food Security Department (DKP)	2024 – 2026
Planting urban forest/city park.	Food Security Department (DKP)	2024 – 2026
Planting trees along the roadside.	Department of Culture, Tourism and Parks (Disbudpar)	2024 – 2026
Conducting land rehabilitation.	BBWS Ciliwung Cisadane	2024 – 2026
Utilisation of waste into RDF at the RDF plant.	Department of the Environment, investor (PT Oligo)	> 2026
Waste treatment with bio digestion technique in the digester anaerobic plant.	Department of the Environment, investor (PT Oligo)	> 2026
Waste recycle.	Department of the Environment	2024 – 2026
Domestic wastewater management with aerobic and anaerobic systems.	Department of Housing, Settlements, and Land Affairs (Dinas Perkimtan)	2024 – 2026
Standardised domestic wastewater treatment plant (WWTP).	Department of Housing, Settlements, and Land Affairs (Dinas Perkimtan)	2024 – 2026
Industrial liquid waste management with an aerobic system.	Each industry	2024 – 2026
Policies related to the use of battery-based electric motorised vehicles.	Department of Transportation (Dishub)	2024 – 2026
Installation of energy-efficient lights on all public street lighting.	Department of Transportation (Dishub)	2024 – 2026
Replacement of streetlights with energy-efficient lights.	Department of Transportation (Dishub)	2024 – 2026
Designated bike lanes with strong supervision.	Department of Transportation (Dishub)	2024 – 2026
Compacted waste truck to transport waste.	Department of the Environment	> 2026
Construction of solar panels on top of the government building.	Department of Housing, Settlements, and Land Affairs (Dinas Perkimtan)	2024 – 2026
Implementation of an energy audit in government buildings.	Directorate General of Mineral and Coal (ESDM) of Banten Province	2024 – 2026
Proposal of energy audit action plan and implementation at government buildings to get funding support.	Directorate General of Mineral and Coal (ESDM) of Banten Province	2024 – 2026

(Source: GCoM Asia, 2023)

Tangerang focuses more on renewable energy utilisation, especially solar power in street lighting. Utilising solar panels on the streetlight system can reduce emissions of up to 500 tons of CO₂e per unit. By installing 500 solar panels for streetlights, it is possible to reduce emissions of around 250,000 tons of CO₂e.

Ternate

City Profile


Population	206,745
Population Density	1,275 people/ km ²
Land Area	162.2 km ²
Total Districts	8 districts
Total Sub-Districts/Villages	78 sub-districts/ villages
Programme Partnership	CRIC



Key economic activities:
Wholesale and Retail Trade; Vehicle Repair Service, and Transportation and Storage


(Source: BPS Ternate City, 2023)

Climate Profile



Rainfall

Average Annual	Average Increase (2075-2099)
2913.9 mm	N/A






Local Temperature

Average	Increase RCP 4.5	Increase RCP 8.5
26.7°C – 27.7°C	9°C	N/A






(Source: BPS Ternate City & KLHK Indonesia, 2023)

Climate-related Disasters in 2012-2021

Type of Disaster		
 Floods 11	 Landslides 3	 Whirlwind 7
Total: 21		

(Source: DIBI & IRBI, BNPB, 2023)

GHG Inventory

Sector	 Energy	 IPPU	 Agriculture	 FOLU	 Waste	Total
BaU 2020 (tons CO₂e)	142,465.46	-	-	-	1.66	142,467.12
% BAU	99.999	-	-	-	0.001	100.000

Adaptation and Mitigation Target

Ternate is in the process of defining targets for both adaptation and mitigation with all related stakeholders.

Climate Change Action

Based on CRIC's policy analysis in 2020, Ternate's long-term and mid-term planning have included policies addressing climate change (Dilon, Angelica, & Khudi, 2020).

- Long-term:
 1. Equitable clean water service distribution
 2. Strive to be trash-free
 3. Strive to be flood-free
- Mid-term:
 1. Implement solid waste activities
 2. Implement wastewater activities
 3. Implement drainage activities

Beyond those plans, Ternate has implemented regulations addressing climate change concerning:

1. Infiltration wells
2. Green open space management
3. Water quality management and water pollution control
4. Domestic wastewater management
5. Environmental protection and management

These programmes were not defined as the action on adaptation or mitigation. To enhance its climate actions, Ternate in partnership with CRIC, has formed a working group for addressing climate change action as well as developing a CAP.

Priority Action

Recognising the necessity for climate change adaptation, Ternate aims to implement a coastal warning system to bolster resilience against disasters and climate change impacts, safeguarding tourism, the economy, and the fisheries sector. Additionally, Ternate is committed to developing a smart island, utilising information technology and communication for enhanced intra-island connectivity and reducing vulnerability (UCLG ASPAC, 2020).

National Context: Indonesia



Indonesia, the largest archipelago country in Southeast Asia (SEA), boasts over 17,500 islands with a total population of 270.6 million people, ranking it as the fourth most populous country globally and the largest economy in the region. Its diverse geography encompasses a wide array of ecosystems, from coastal areas and peat swamps to montane forests. Indonesia faces significant climate risks, ranking among the top third of countries globally in terms of exposure to climate risks, such as flooding and extreme heat. The intensity of these hazards is expected to grow as the climate changes. Moreover, Indonesia is vulnerable to sea-level rise, impacting agricultural production, particularly rice cultivation (World Bank and ADB, 2021).

Sector	GDP %
Manufacturing	18.34
Wholesale and Retail Trade, Vehicle Repair Service	12.85
Agriculture, Forestry, and Fishing	12.40
Mining and Quarrying	12.22
Construction	9.77

(Source: KLHK Indonesia, 2023)

Indonesia has ratified the Paris Agreement (PA) and made fighting climate change a national agenda through Law No. 16 of 2016. The latest policy supporting climate action is the Presidential Regulation No. 98 of 2021 regarding carbon economic value.







Climate Profile

			
Rainfall		Local Temperature	
Average Annual	Average Increase (2075-2099)	Average	Increase in 2050
2,900 mm	2.9 %	23°C – 24°C	0.8°C – 1.4°C

(Source: World Bank and ADB, 2021)

Climate-related Disasters in 2012-2021

Among a total of 43,023 reported disasters in Indonesia, most of them are climate-related disasters as can be seen in the table below (DIBI, 2023). Furthermore, based on INFORM RISK Indonesia has an index value of 4.6 which is categorised as a medium-risk country (JRC, 2023).

Type of Disaster					
					
Floods 14,219	Landslides 9,620	Abrasion 500	Whirlwind 11,335	Drought 2,235	Land Fire & Forest Fire 4,162
Total: 42,071					






Adaptation Goals and Action Plan

Indonesia's adaptation goals focus on reducing risk, enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change in all development sectors. The efforts implemented to achieve the goals are listed below (Government of Indonesia, 2021).

Strategy	Focus	Programme
<ol style="list-style-type: none"> Enhance climate literacy Strengthen local capacity Improve knowledge management Formulate convergent policy on climate change 	<ol style="list-style-type: none"> Enhance economic resilience Enhance social and livelihood resilience Enhance ecosystem and landscape resilience 	<ol style="list-style-type: none"> Reduce drivers of vulnerability to climate change impacts Respond to climate change impacts and manage the risks Enhance the capacity of communities and the sustainability of ecosystem services Enhance the engagement of stakeholders at all levels in building climate resilience

(Source: NDC Indonesia, 2021)

GHG Inventory

Sector	 Energy*	 Waste	 IPPU	 Agriculture	 FOLU**	Total
GHG Emission Level 2010* (Baseline) (Mton CO ₂ e)	453.2	88	36	110.5	647	1,334
% GHG Emission Level 2010* (Baseline) (Mton CO ₂ e)	33.97	6.60	2.70	8.28	48.50	100.00
GHG Emission Level 2021 (Mton CO ₂ e)	22.03	168.67	59.73	120.89	433.99	805.30
% GHG Emission Level 2021 (Mton CO ₂ e)	2.74	20.94	7.42	15.01	53.89	100.00

(Source: NDC Indonesia, 2021)





Mitigation Target

Sector	GHG Emission Level 2030			GHG Emission Reduction				Annual Average Growth BaU (2010-2030)	Average Growth 2000-2012
	Mton CO ₂ e			Mton CO ₂ e		% of Total BaU			
	BaU	CM1	CM2	CM1	CM2	CM1	CM2		
1. Energy*	1,669	1,311	1,223	358	446	12.50%	15.50%	6.70%	4.50%
2. Waste	296	256	253	40	43.5	1.40%	1.50%	6.30%	4.00%
3. IPPU	69.6	63	61	7	9	0.20%	0.30%	3.40%	0.10%
4. Agriculture	119.66	110	108	10	12	0.30%	0.40%	0.40%	1.30%
5. Forestry and Other Land Uses (FOLU)**	714	214	-15	500	729	17.40%	25.40%	0.50%	2.70%
TOTAL	2,869	1,953	1,632	915	1,240	31.89%	43.20%	3.90%	3.2

(Source: NDC Indonesia, 2021)

Mitigation Actions and Priority Actions

Indonesia has prioritised action in four key sectors (see table below). The focus is primarily on the FOLU sector to achieve REDD+, followed by the energy sector, given their significant impact on GHG emissions in Indonesia (Government of Indonesia, 2021).

Sector	Action
 FOLU	<ol style="list-style-type: none"> Restore 2 million ha of peatland Rehabilitate 12 million ha of degraded land
 Energy	Enhance mixed energy supply: <ol style="list-style-type: none"> New and renewable energy should comprise at least 23% by 2025 and at least 31% by 2050 Oil should constitute less than 25% by 2025 and less than 20% by 2050 Coal should represent a minimum of 30% by 2025 and a minimum of 25% by 2050 Gas should account for a minimum of 22% by 2025 and a minimum of 24% by 2050
 Waste	<ol style="list-style-type: none"> Develop a comprehensive strategy to improve policy and institutional capacity at the local level Promote the implementation of 3R Utilise waste and garbage for energy production
 IPPU	<ol style="list-style-type: none"> Utilise Wastewater Treatment Plant (WWTP) sludge and industrial solid waste through composting, reuse as raw material and energy generation Implement wastewater treatment in palm oil, pulp and paper, fruits/vegetables and juices processing, and other industries. Implement methane capture and utilisation (biogas)

(Source: NDC Indonesia, 2021)

Climate Change Mitigation Efforts

Indonesia still focuses on prioritising the FOLU sector, particularly on the implementation of the REDD+ framework over the years.

5.2 Malaysia

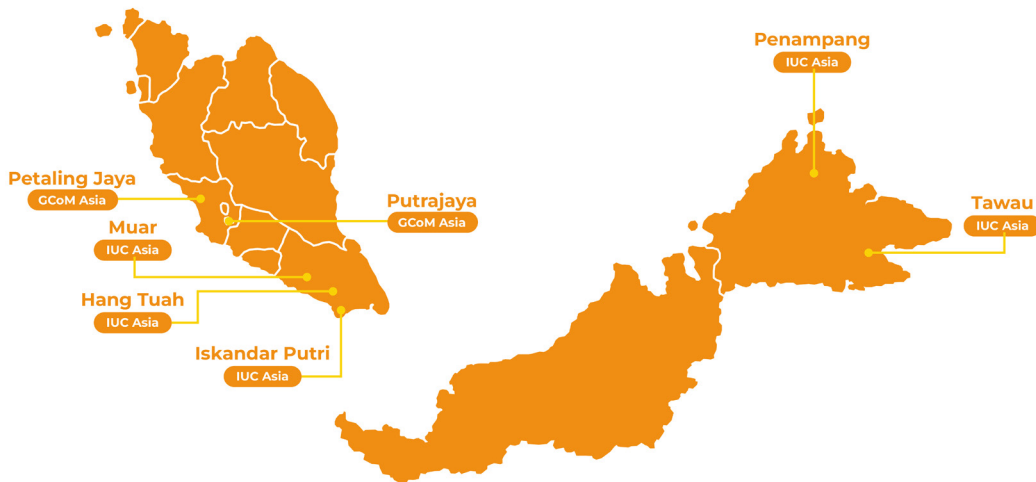


Figure 10: Pilot Cities in Malaysia Tagged with Climate Programmes

In Malaysia, there are eight pilot cities engaged with GCoM-related projects. Four cities were part of the IUC Asia Project (2018-2020), while the remaining four cities joined the GCoM Asia Project (2021-2024) (Figure 10).

Hang Tuah Jaya

City Profile

Population	124,000
Population Density	857 people/ km ²
Land Area	144.6 km ²
Total Districts	4 districts
Programme Partnership	IUC Asia



Key economic activities:
Services, Industry, Tourism

City Goals

Hang Tuah Jaya Municipal Council (MPHTJ) aims to become a leading municipality in carbon mitigation and climate adaptation, striving to embody a green city through the vision of *“Hang Tuah Jaya makes world-class intelligent city concept of green technology.”* To achieve this vision, Hang Tuah Jaya follows the National Low Carbon Cities Framework + Society (LCCF+S). Since 2012, Hang Tuah Jaya has been a pioneering project for the development of green cities in Malacca through the implementation of LCCF





(Source: IUC Asia, 2020)

Climate Profile

 Rainfall		 Local Temperature		
Average Annual	Average Increase (2075-2099)	Average	Increase RCP 4.5	Increase RCP 8.5
1,972.1 mm	-5%	22.7°C – 23.4°C	31.1°C – 33.1°C	2.50°C – 2.95°C

(Source: IUC Asia, 2020)

Climate Risk

Climate Hazard	Risk Level	Most Relevant Assets	Vulnerable Populations Affected
 Monsoon	Medium	Transportation; Food and agriculture	Low-income households
 Drought	Medium	Water supply and sanitation; Food and agriculture; Environment, biodiversity, forestry; Industrial; Tourism	Elderly; Persons with disabilities; Low-income households
 Flash/surface flood	Medium	Transportation; Commercial; Emergency services.	Low-income households
 Vector-borne diseases	Medium	Residential; Public Health	Children and youth; Elderly; Persons with chronic diseases





(Source: IUC Asia, 2020)

Adaptation Goals and Action Plan

Hang Tuah Jaya has identified three primary goals for climate change adaptation, outlined as follows (IUC Asia, 2020).

- Goal 1** Reduce property damage due to monsoon and flooding by 50% by 2030 compared to 2010 levels.
- Goal 2** Reduce the number of days of water rationing caused by drought by 50% by 2030 compared to 2017.
- Goal 3** Reduce the number of dengue cases by 50% by 2030 compared to 2017 levels.










To achieve these goals, Hang Tuah Jaya has devised four main actions based on the climate hazard thematic action, which aligns with the LCCF+S (IUC Asia, 2020).

Climate Hazard	Adaptation Actions
 Monsoon	<ul style="list-style-type: none"> Provide a comprehensive public transport network, including real-time online information about bus locations and arrivals Provide user-friendly pathways for pedestrians and cyclists
 Drought	<ul style="list-style-type: none"> Ensure new developments are integrated with rainwater harvesting systems and greywater recycling for non-potable usage Encourage industries to use grey water for non-potable purposes
 Flash/surface flood	<ul style="list-style-type: none"> Provide a comprehensive public transport network, including real-time online information about bus locations and arrivals Increase potential activity centres for the pedestrian zone
 Vector-borne diseases	<ul style="list-style-type: none"> Raise community awareness on the prevention of dengue

(Source: IUC Asia, 2020)

GHG Inventory

Hang Tuah Jaya emits a total of GHG emissions of around 1,030,238 tons of CO₂e based on the 2018 baseline.

Sector	 Industrial	 Transportation	 Waste	 Institution	 Residential
Emissions (%)	54	37	3	2	1
Sector	 Commercial	 Administration (Government)	 Water	 Municipal	
Emissions (%)	1	1	1	0	




(Source: IUC Asia, 2020)

Mitigation Target

Following the regulation from the Malacca State and the federal government, Hang Tuah Jaya has committed to achieving a 45% NDC emission reduction compared to the BAU scenario from the 2005 Baseline (IUC Asia, 2020).

Mitigation Actions

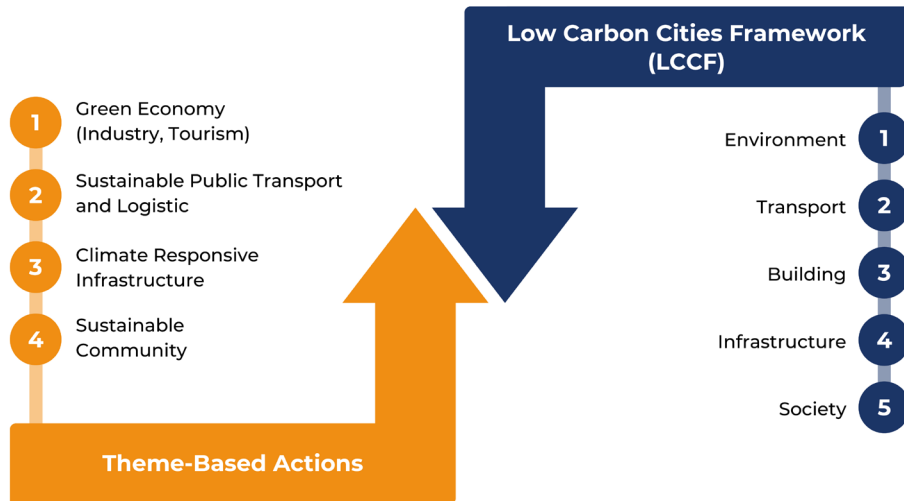
In line with LCCF+S, there are four thematic mitigation actions to achieve the mitigation target.

Emission Sector	Mitigation Actions
 Stationary Energy	<ul style="list-style-type: none"> Conduct a feasibility study on industrial symbiosis (including Waste-to-Wealth) for existing industrial areas Promote low-carbon tourism products and services to reduce environmental impacts Install energy efficiency (EE) equipment and smart meters on commercial buildings as an energy-saving initiative Promote photovoltaic (PV) technology for various applications in new buildings, water heaters, and streetlights
 Transportation	<ul style="list-style-type: none"> Implement Transit Oriented Development (TOD) Convert district vehicle fleet to hybrid and electric Run district buses on recycled oil from food courts
 Waste	<ul style="list-style-type: none"> Promote community recycling of used cooking Establish decentralised and community-oriented composting sites Implement a 'pay-as-you-throw' waste system

(Source: IUC Asia, 2020)

Priority Action

Under the synchronisation of LCCF+S, Hang Tuah Jaya has established 39 priority actions covered in four thematic actions.



These thematic actions are divided into two periods of action implemented in 2020-2025 and 2026-2030.


Iskandar Puteri

City Profile

Population	921,826
Population Density	3028 people/ km ²
Land Area	304.48 km ²
Total Districts	6 districts
Programme Partnership	GCoM Asia



Key economic activities:
Services and Manufacture




Iskandar Puteri City Council (MBIP) aims to facilitate a low-carbon society for a *“Green Liveable City & Creative Innovation Belt”*

City Goals


(Source: GCoM Asia, 2023)

Climate Profile



Rainfall

Average Annual	Average Increase (2075-2099)
2,366 mm	-5%







Local Temperature

Average	Increase RCP 4.5	Increase RCP 8.5
22°C – 23°C	30°C – 33°C	2.50°C – 2.95°C

(Source: GCoM Asia, 2023)

Climate Risk

Climate Hazard	Risk Level	Most Relevant Assets	Vulnerable Populations Affected
 Monsoon	High	<ul style="list-style-type: none"> Food and Agriculture Tourism 	<ul style="list-style-type: none"> Low-income households
 Heatwave	Low	<ul style="list-style-type: none"> Residential Tourism 	<ul style="list-style-type: none"> Elderly Persons with disabilities Persons with chronic diseases
 Flash/surface flood	High	<ul style="list-style-type: none"> Water supply & sanitation Food and agriculture Waste management Environment, biodiversity, forestry Emergency services Land use planning 	<ul style="list-style-type: none"> Indigenous population Persons with disabilities Low-income households
 Vector-borne diseases	Medium High	<ul style="list-style-type: none"> Industrial Commercial Residential Public Health 	<ul style="list-style-type: none"> Children & youth; Elderly Persons with chronic diseases Low-income households

(Source: GCoM Asia, 2023)

Adaptation Goals and Action Plan

Iskandar Puteri has identified three primary goals for climate change adaptation, explained below (GCoM Asia, 2023).




1. **Goal 1** Increase resilience against flood
2. **Goal 2** Reduce the number of dengue cases
3. **Goal 3** Cope with heat waves through landscaping

To achieve these goals, nine actions are defined as follows:

- Implement monitoring and development control in flood-prone areas
- Provide a flood management response plan to reduce the impact of flooding
- Establish early warning systems through multi-hazard platforms, such as social media, newspapers, and public announcements
- Improve existing facilities, such as schools and community halls designated as disaster temporary evacuation centres by providing generators, toilets, cots, rubber partitions, and tents
- Implement drought management and response plan to reduce the impact of drought
- Introduce water consumption reduction initiatives in commercial and residential areas
- Increase monitoring at hotspot areas which have frequent open burning/forest fire cases through land and aerial patrols, utilising drones, satellite images, and geographic information systems/GIS)
- Raise community awareness of dengue prevention
- Enforce inspections to inspect potential mosquito breeding sites in public and residential buildings by MBIP

GHG Inventory

Iskandar Puteri emits GHG emissions around 4,115,821 tons of CO₂e.

Sector	 Stationary Energy	 Transportation	 Waste
Emissions (%)	58	31	11

(Source: GCoM Asia, 2023)

Mitigation Target

Iskandar Puteri commits to reducing its GHG emissions by approximately 63% from the 2010 baseline, surpassing the national percentage (GCoM Asia, 2023).

Mitigation Actions

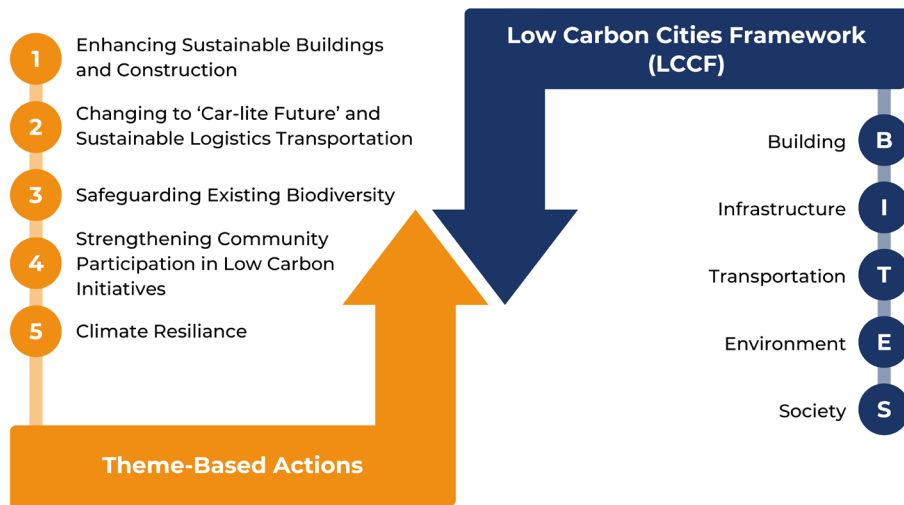
Iskandar Puteri has implemented over twenty actions targeting the reduction of GHG emissions across three main emitter sectors.

Emission Sector	Mitigation Actions
 <p>Stationary Energy</p>	<ul style="list-style-type: none"> • Install solar-powered streetlights on Central Business District (CBD)'s main roads and all new developments, especially private companies • Ensure new developments are integrated with rainwater harvesting systems and greywater recycling for non-potable usage • Promote photovoltaic (PV) and solar thermal systems on institution, commercial and residential buildings • Promote solar water heaters in new developments • Install energy efficiency (EE) equipment and smart meters for MBIP assets (government office, community halls, market, stadium, etc.) as a model to lead by example • Install EE equipment and smart meters on commercial buildings as an energy-saving initiative • Install EE equipment and smart meters on industry operations, especially boilers and furnaces • Promote the use of the Green Building certification (e.g., CASBEE Iskandar, GBI, GreenRE, etc.) • Promote the adoption of passive architecture in new buildings (e.g., natural ventilation, shading, and lighting) • Promote the use of sustainable materials in construction • Promote "Air to Water" (Heat Transfer – e.g., Daikin Technology) on commercial buildings (hotels, serviced apartments, etc.) • Promote Zero-Emission Building (ZEB) or Nearly Zero-Emission • Implement nearly Zero Energy Buildings (nZEB) in all new developments with a minimum Building Energy Index (BEI) • Promote biogas plants from food waste of commercial and residential units (Waste to Energy)
 <p>Transportation</p>	<ul style="list-style-type: none"> • Provide pedestrian walkways and bicycle lanes to promote active mobility • Introduce the "Cycle to Work" and "Cycle to School" initiatives involving the MBIP staff and school students through environmental, social, and corporate governance (ESG) • Improve modal interchanges between active transports and public transports • Develop transit terminal facilities and expand the service network of public bus transportation • Upgrade Muafakat Johor buses with low-carbon/EV buses • Establish a Car Free Day or Car Free Zone in the MBIP area (eg. Kota Iskandar). • Convert MBIP's vehicle fleet to low-carbon vehicles (Biofuel, NGS, hybrid or electric) • Provide real-time online information about bus locations and arrivals • Establish free parking for low-carbon vehicles • Promote hybrid freight transport to the freight operators
 <p>Waste</p>	<ul style="list-style-type: none"> • Implement a smart bin programme such as 5R2C (Rethink, Repair, Reduce, Reuse, Recycle, Compost, Close the Loop) at all housing estates (residential neighbourhood) to increase community waste collection efficiency • Set up Low-Carbon Residential association involving MBIP's councillors • Promote compost from food of commercial and residential units • Implement the Waste-to-Wealth programme for the reduction of waste to landfill site • Conduct a feasibility study on industrial symbiosis, including Waste-to-Wealth, for existing industrial areas

(Source: GCoM Asia, 2023)

Priority Action

Iskandar Puteri has defined 41 priority actions under the five overarching thematic actions in line with the LCCF framework (GCoM Asia, 2023).



Iskandar Puteri mainly focuses its priority actions on the energy aspects of construction and transportation to achieve a 63% reduction of GHG emissions.


Muar

City Profile

Population	281,500
Population Density	208 people/km ²
Land Area	1,354 m ²
Total Districts	12 districts
Programme Partnership	IUC Asia



Key economic activities:
Industry and Tourism




City Goals

Muar Municipal Council (MPM) aims to transform into a competitive, low-carbon, and sustainable municipality by leveraging smart technology while honouring its rich cultural heritage. Aligning with the Paris Agreement and Sendai Framework for Disaster Risk Reduction, the government envisions Muar as a clean, environmentally friendly hub for talent, knowledge, and a high quality of life for all residents


(Source: IUC Asia, 2020)

Climate Profile



Rainfall

Average Annual	Average Increase (2075-2099)
1,971.8 mm	-5%










Local Temperature

Average	Increase RCP 4.5	Increase RCP 8.5
22.7°C – 23.7°C	31.1°C – 33.1°C	2.50°C – 2.95°C

(Source: IUC Asia, 2020)

Climate Risk

Climate Hazard	Risk Level	Most Relevant Assets	Vulnerable Populations Affected
 <p>Monsoon</p>	Medium High	<ul style="list-style-type: none"> Food and agriculture Tourism 	<ul style="list-style-type: none"> Low-income households
 <p>Flash/surface flood</p>	Medium High	<ul style="list-style-type: none"> Water supply & sanitation Waste management Transportation Emergency services 	<ul style="list-style-type: none"> Children & youth Elderly Low-income households
 <p>Saltwater intrusion</p>	Medium High	<ul style="list-style-type: none"> Water supply & sanitation Food and agriculture Environment, biodiversity, forestry 	<ul style="list-style-type: none"> Low-income household Others – (e.g. farmers, fishermen)
 <p>Forest fire</p>	Medium	<ul style="list-style-type: none"> Food and agriculture Environment, biodiversity, forestry Tourism Emergency services 	<ul style="list-style-type: none"> Children & youth Elderly Indigenous population

Climate Hazard	Risk Level	Most Relevant Assets	Vulnerable Populations Affected
 River flood	Medium	<ul style="list-style-type: none"> Water supply & sanitation Food and agriculture Waste management Environment, biodiversity, forestry Emergency services Land use planning 	<ul style="list-style-type: none"> Persons with disabilities Low-income households
 Vector-bone diseases	Medium	<ul style="list-style-type: none"> Industrial Commercial Residential Public Health 	<ul style="list-style-type: none"> Children & youth Elderly Persons with chronic diseases Low-income households
 Coastal flood	Low	<ul style="list-style-type: none"> Water supply & sanitation Food and agriculture Environment, biodiversity, forestry Land use planning 	<ul style="list-style-type: none"> Low-income households Persons living in sub-standard housing






(Source: IUC Asia, 2020)

Adaptation Goals and Action Plan

Muar has identified three primary goals in climate change adaptation, explained as follows (IUC Asia, 2020).

- Goal 1** Reduce property damage due to monsoon and flooding by 50% by 2030 compared to 2017 levels
- Goal 2** Reduce human-induced forest fire by 30% by 2030 compared to 2017 levels
- Goal 3** Reduce the number of dengue cases by 50% by 2030 compared to 2017 levels




To achieve these adaptation goals, Muar has established five thematic actions based on each climate hazard aligned with the LCCF+S.

Climate Hazard	Adaptation Actions
 Flood	<ul style="list-style-type: none"> Promote urban growth boundary (UGB) to avoid urban sprawl Encourage affordable housing in local centres and Transit-Oriented Development (TOD) areas Permit higher plot ratios or densities within TOD and corridor development areas
 Monsoon	<ul style="list-style-type: none"> Establish a special action plan for the Muar River Improve river basin management Gazette mangrove forests especially along the Muar River and the coastal area of Malacca Strait
 Forest fire	<ul style="list-style-type: none"> Control development around forest reserves and provide 20 m buffer zones Promote “<i>Stop Open Burning</i>” especially in areas near permanent forest campaigns to prevent forest fire and pollution
 Saltwater intrusion	<ul style="list-style-type: none"> Provide access to alternative water supplies such as underground water Build a water treatment plant in Pagoh, upgrade the Panchor water treatment plant, and construct Meda Dam to ensure sufficient water supply
 Vector-bone diseases	<ul style="list-style-type: none"> Promote ‘adaptive reuse’ of dilapidated commercial buildings in the CBD and other grey field sites to raise community awareness on the prevention of dengue

(Source: IUC Asia, 2020)

GHG Inventory

Muar's GHG emissions were at 1,620,345 tons of CO₂e in 2017.

Sector	 Stationary Energy	 Transportation	 Waste
Emissions (%)	63	32	5

(Source: IUC Asia, 2020)

Mitigation Target

Muar commits to reducing 63% of GHG emissions by 2030 compared to the 2010 baseline (IUC Asia, 2020).

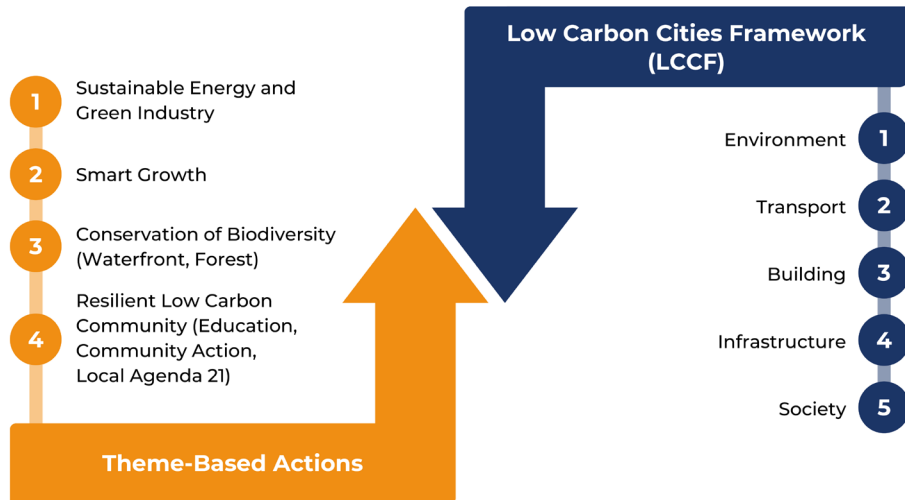
Mitigation Actions

The Muar Municipal Council commits to achieving its mitigation targets through three thematic actions based on the emissions sector aligned with the LCCF+S.

Emission Sector	Mitigation Actions
 Stationary Energy	<ul style="list-style-type: none"> Promote the use of the Green Building certification (CASBEE, GBI, GreenRE, etc) Promote Photovoltaic (PV) and solar thermal systems in residential buildings Install energy efficiency (EE) equipment and smart meters on commercial buildings as an energy-saving initiative
 Transportation	<ul style="list-style-type: none"> Promote mixed-use and high-density development at corridor and TOD areas to facilitate sustainable development Implement TOD To provide a low-carbon shuttle bus between the new MPM office to Pagoh University Town and Maharani Royal Town
 Waste	<ul style="list-style-type: none"> Establish Muar Furniture Park as a model for industrial symbiosis and circular economy. Promote the use of waste from industrial (i.e. wood chips) and agricultural activities for generating biomass energy Build an integrated solar farm with landfill gas recovery in Bukit Bakri landfill (expected shutdown in December 2020) Promote compost from food and agro-waste (Waste-to-Wealth)

(Source: IUC Asia, 2020)

Priority Action



Muar has identified 38 priority actions categorised into four thematic areas aligned with the LCCF+S. These are further divided into two implementation periods which are 2021-2025 and 2026-2030 (IUC Asia, 2020).


Petaling Jaya

City Profile

Population	793,636
Population Density	8,165 people/ km ²
Land Area	97.2 km ²
Total Districts	3 districts
Programme Partnership	GCoM Asia



Key economic activities:
Manufacturing, Wholesale & Retail Trade, Food & Beverage, Accommodation Utility, Transport & Storage, and Information & Communication




City Goals

Petaling Jaya City Council (MBPJ) becomes a leader in low-carbon urban development by implementing an integrated and comprehensive approach to mitigating GHG emissions within the city


(Source: GCoM Asia, 2023)

Climate Profile



Rainfall

Average Annual	Average Increase (2075-2099)
2,723.8 mm	-5%






Local Temperature

Average	Increase RCP 4.5	Increase RCP 8.5
23.1°C – 24.4°C	31.9°C – 33.5°C	2.50°C – 2.95°C

(Source: GCoM Asia, 2023)

Climate Risk




Climate Hazard	Risk Level	Most Relevant Assets	Vulnerable Populations Affected
 <p>Extreme hot temperature/heatwave</p>	High	<ul style="list-style-type: none"> Water supply & sanitation Environment, biodiversity, forestry Industrial Commercial Residential Public Health 	<ul style="list-style-type: none"> Elderly Persons with disabilities Persons with chronic diseases Low-income households
 <p>Sea level rise & river flood</p>	High	<ul style="list-style-type: none"> Waste management Emergency services Land use planning Industrial Commercial Residential Public Health 	<ul style="list-style-type: none"> Elderly Children & youth Persons with disabilities Low-income household
 <p>Vector-borne disease</p>	High	<ul style="list-style-type: none"> Industrial Commercial Residential Public Health 	<ul style="list-style-type: none"> Children & youth Elderly Low-income households Persons living in substandard housing

(Source: GCoM Asia, 2023)

Adaptation Goals and Action Plan

Petaling Jaya has identified three primary goals for climate change adaptation (GCoM Asia, 2023).

1. **Goal 1** Decrease flooding by better protection
2. **Goal 2** Reduce the number of dengue cases
3. **Goal 3** Increase resilience against drought

Emission Sector	Adaptation Actions
 Extreme hot temperature/ heatwave	<ul style="list-style-type: none"> Introduce drought mitigation and response plans to reduce the impact of drought Implement programmes or initiatives to reduce water consumption in commercial and residential areas
 Sea level rise & river flood	<ul style="list-style-type: none"> Provide a smart flood control water level response mechanism that will trigger a warning signal to alert citizens Improve real-time monitoring of schools and community halls designated temporary evacuation centres for flood disasters by providing generators, toileting, dustbins, portable sanitation, and drainage Reduce waste littering in the drainage system to reduce blockages with an awareness campaign
 Vector-borne disease	<ul style="list-style-type: none"> Raise community awareness and participation in the prevention of dengue Improve enforcement by MBPJ to inspect potential mosquito breeding sites and issue compounds to offenders Enhance the quality of public health services by providing more clinics, ambulances, and medical staff Promote healthy lifestyle and wellness activities among the residents Strengthen collaboration with NGOs and community leaders to address social issues such as drug abuse, domestic violence, and mental health

(Source: GCoM Asia, 2023)

GHG Inventory

Petaling Jaya emits around 5,000,436 tons of CO₂e.

Sector	Stationary Energy	Transportation	Waste
Emissions (%)	61.75	31.86	6.39

(Source: GCoM Asia, 2023)

Mitigation Target

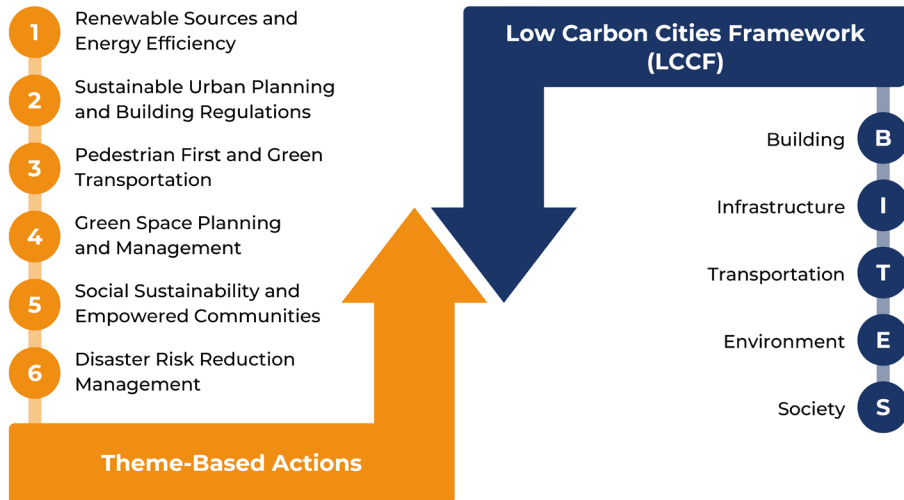
Petaling Jaya commits to reducing their GHG emissions by around 33% (GCoM Asia, 2023)

Mitigation Actions

Emission Sector	Mitigation Actions
 <p>Stationary Energy</p>	<ul style="list-style-type: none"> • Ensure new developments are integrated with rainwater harvesting systems and greywater recycling for non-potable usage • Promote installation of photovoltaic (PV) and solar thermal systems on institutional, commercial, industrial, and residential buildings • Promote solar water heaters in new developments • Install energy efficiency (EE) equipment and smart meters for the government, commercial, and industry • Promote the use of electric vehicles (EVs) and hybrid vehicles (HEVs) and provide charging stations at strategic locations • Implement green procurement policy and practices for MBPJ's assets and operations • Promote the adoption of passive architecture in new buildings (natural ventilation, shading, and lighting) • Promote the use of sustainable materials in construction • Promote ZEB or nZEB in all new developments with minimum BEI standards • Retrofit existing buildings and amenities to improve energy and resource efficiency
 <p>Transportation</p>	<ul style="list-style-type: none"> • Introduce the "Cycle to Work" and "Cycle to School" initiatives involving the MBPJ workers • Improve and connect pedestrian walkways and bike lanes to promote active mobility • Enhance modal interchange between bicycles and public transport • Convert MBPJ's vehicle fleet to low-carbon vehicles (biofuel, hybrid, or electric) • Increase the number of EV buses, routes, and bus stops for the PJ City Bus • Improve real-time online information application for PJ City Bus operations • Organise monthly or weekly Car Free Day • Establish a Low Emission Zone (LEZ) in the CBD and major corridors in the MBPJ area • Promote hybrid freight transport to freight operators • Provide sufficient EV charging infrastructure • Redesign Petaling Jaya to be more compact in line with the 15-minute city concept, especially in the CBD and transit station
 <p>Waste</p>	<ul style="list-style-type: none"> • Involve the residential association in MBPJ's policies • Implement No Single-Use Plastic Bag in commercial areas and vendors. • Organise the "One Neighbourhood, One Urban Farm" programme • Enhance urban farming in schools and involve the school children • Promote implementation of Petaling Jaya's Zero Waste Textile Scheme for green initiative • The Learning Cities Award 2019 by The UNESCO Institute for Lifelong Learning (UIL) • Uplift and alleviate living standards for Petaling Jaya's poor through a green economy • Implement MBPJ's Food Bank Scheme • Promote compost from food waste of commercial and residential units (Waste-to-Wealth) for reduction of waste to landfills • Collaborate with associations involving MBPJ's councillors which encourages reusing bottles of cleaning agents that can be refilled in SS2, Petaling Jaya (Eco Vend) • Establish Smart PJ Waste Solution Lab in SS2, Petaling Jaya • Develop Petaling Jaya Carbon Management Plan. • Adaptively reuse existing buildings and amenities to reduce construction waste

(Source: GCoM Asia, 2023)

Priority Action



Petaling Jaya has formulated 50 actions categorised into six thematic areas aligned with the LCCF (GCoM Asia, 2023).

Putrajaya

City Profile

Population	134,391
Population Density	2,745 people/km ²
Land Area	49 km ²
Total Districts	9 districts
Programme Partnership	GCoM Asia



City Goals

Putrajaya Corporation (PPJ) becomes a green city based on sustainable development principles. This entails implementing programmes and initiatives aimed at preserving the environment and natural resources to mitigate the negative impact of human activities on the environment. This vision is divided into three primary aims as follows (GCoM Asia, 2023):

1. To minimise negative environmental impacts and the use of resources
2. To promote human interaction with nature
3. To reduce carbon emissions related to human activities

(Source: GCoM Asia, 2023)

Climate Profile

Rainfall	
Average Annual	Average Increase (2075-2099)
2960 mm	-5%

Local Temperature		
Average	Increase RCP 4.5	Increase RCP 8.5
22.4°C – 23.8°C	28.7°C – 30.1°C	2.50°C – 2.95°C

(Source: GCoM Asia, 2023)

Climate Risk





Climate Hazard	Risk Level	Most Relevant Assets	Vulnerable Populations Affected
 Storms and severe wind	High	<ul style="list-style-type: none"> • Energy • Transportation • Environment, biodiversity, forestry 	<ul style="list-style-type: none"> • Elderly • Persons with disabilities • Persons with chronic diseases
 Extreme hot temperature/ heatwave	Medium	<ul style="list-style-type: none"> • Residential • Tourism 	<ul style="list-style-type: none"> • Elderly • Persons with disabilities • Persons with chronic diseases
 Sea level rise & river flood	Low	<ul style="list-style-type: none"> • Water supply & sanitation • Food and agriculture • Waste management • Environment, biodiversity, forestry • Emergency services; • Land use planning 	<ul style="list-style-type: none"> • Women & girls • Children & youth • Elderly • Persons with disabilities • Low-income households
 Vector-borne disease	High	<ul style="list-style-type: none"> • Industrial • Commercial • Residential • Public Health 	<ul style="list-style-type: none"> • Children & youth • Elderly • Low-income households • Persons living in sub-standard housing

(Source: GCoM Asia, 2023)

Adaptation Goals and Action Plan

Putrajaya has identified three primary goals of climate change adaptation (GCoM Asia, 2023).

1. **Goal 1** Develop a cooler environment for Putrajaya
2. **Goal 2** Prevent dengue cases
3. **Goal 3** Improve landscaping against severe wind

Emission Sector	Adaptation Actions
 Storms and severe wind	<ul style="list-style-type: none"> Identify potential spots and frequency of downed trees in residential and commercial areas Improve tree selection and landscape design to reduce the impact of severe wind
 Extreme hot temperature/ heatwave	<ul style="list-style-type: none"> Protect cultural identity, precincts' character, and sense of place through sustainable urban design practices (TOD and compact development) Promote vertical gardens and green roofs in commercial buildings, schools, and government buildings Conduct a tree-planting campaign in line with the 100 million Tree-Planting Campaign 2020-2025 Conduct Continuous Enhancement of Urban Biodiversity Promote Nature-Based Solutions (NbS) to protect, restore and manage natural and semi-natural ecosystems Enhance the Putrajaya Lake Awareness Programme Expand and improve monitoring systems through social media or other communication platforms to reduce outdoor activities due to heat waves Introduce programmes or initiatives to reduce water consumption in commercial and residential areas
 Sea level rise & river flood	<ul style="list-style-type: none"> Improve maintenance of the drainage system Improve early warning systems through multi-hazard platforms, such as social media, newspapers, public announcements, and other applications
 Vector-borne disease	<ul style="list-style-type: none"> Improve enforcement to inspect potential mosquito breeding sites (construction sites and residential neighbourhoods) Raise community awareness and participation in the prevention of dengue through a step-by-step guide, such as BLOCK and COMBI

(Source: GCoM Asia, 2023)

GHG Inventory

Putrajaya is estimated to emit around 1,428,284 tons of CO₂e.

Sector	Stationary Energy	Transportation	Waste
Emissions (%)	48	43	9

(Source: GCoM Asia, 2023)

Mitigation Target

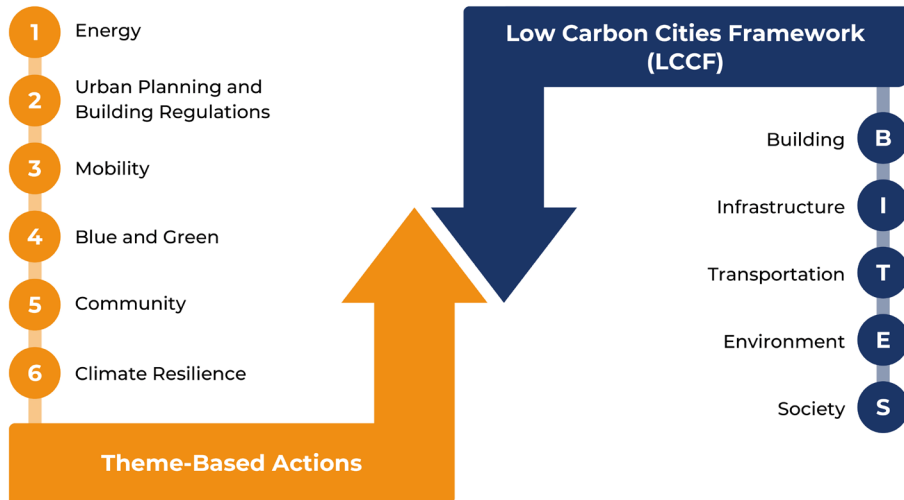
Putrajaya has set its target to reduce emissions by around 33% against the BaU 2030 scenario.

Mitigation Actions

Emission Sector	Mitigation Actions
 <p>Stationary Energy</p>	<ul style="list-style-type: none"> • Encourage walking and cycling as preferred modes of transportation for commuting • Maintain comfortable and safe pedestrian networks • Rebrand the existing Car Free Day event into a monthly active mobility programme • Promote a shift from private vehicles to public transportation • Provide more environmentally friendly public bus services by using clean and green fuel • Install a digital display board for real-time information on public transportation • Promote the adoption of green economy practices and the future of personal mobility (e.g. partnering with EV car-sharing companies)
 <p>Transportation</p>	<ul style="list-style-type: none"> • Collaborate with the Sustainable Energy Development Authority (SEDA) and other relevant agencies to promote solar energy systems (PV) and solar thermal systems on buildings • Carry out a pilot project of a floating solar farm on the lake • Implement an online energy monitoring system • Adopt energy-efficient infrastructures and facilities (energy-saving street lights, sensor site facilities, centralised electronic bulletin board) • Install EE equipment and smart meters for PPJ's assets and commercial buildings • Adopt and implement Safe City practices to promote active mobility and the use of public transport • Protect cultural identity, precincts' character, and sense of place through sustainable urban design practices, such as TOD and compact development • Incorporate the latest green building designs and certification in development control • Promote the adoption of passive architecture in new buildings via natural ventilation, shading, and lighting • Expand the adoption of the rainwater harvesting system and implement its periodical maintenance • Promote vertical gardens and green roofs in commercial buildings, schools, and government buildings • Conduct a tree-planting campaign in line with the 100 million Tree Planting Campaign 2020-2025 • Conduct continuous monitoring of existing tree inventory • Conduct continuous enhancement of urban biodiversity • Promote NbS to protect, restore, and manage natural and semi-natural ecosystems • Enhance the Putrajaya Lake Awareness Programme • Monitor and preserve lake water quality
 <p>Waste</p>	<ul style="list-style-type: none"> • Transform existing residents associations, local businesses, and industries into Low-Carbon Communities • Strengthen the Putrajaya Urban Farming Programme (Programme Pertanian Bandar 'PUF') by increasing the participation and involvement of the residents • Expand the Food Waste Composting Programme for community farming • Further expand the Waste-to-Wealth programme (e.g. CAREton@Putrajaya) by collaborating with other private companies • Enhance community awareness on 3R, proper disposal, and illegal dumping • Cultivate the recycling behaviour of the public through FIKS (Fasiliti Inovasi Kitar Semula)

(Source: GCoM Asia, 2023)

Priority Action



Putrajaya has formulated 64 priority actions developed from the CAP theme-based actions. These actions are categorised into five LCCF+S sectors (GCoM Asia, 2023).

Segamat

City Profile

Population	152,458
Population Density	108 people/ km ²
Land Area	1,416 km ²
Total Districts	8 districts
Programme Partnership	GCoM Asia



Key economic activities:
Agriculture, Manufacturing, and Services




Segamat Municipal Council (MPSgt) becomes a smart and sustainable agriculture hub with an emphasis on economic, environmental, and social development

City Goals


(Source: GCoM Asia, 2023)

Climate Profile



Rainfall

Average Annual	Average Increase (2075-2099)
1,956 mm	-5%






Local Temperature

Average	Increase RCP 4.5	Increase RCP 8.5
22°C – 23°C	30°C – 32°C	2.50°C – 2.95°C

(Source: GCoM Asia, 2023)

Climate Risk




Climate Hazard	Risk Level	Most Relevant Assets	Vulnerable Populations Affected
 <p>Extreme precipitation, monsoons</p>	High	<ul style="list-style-type: none"> Food and Agriculture Tourism Transportation Industrial Commercial Residential Emergency services Land use planning 	<ul style="list-style-type: none"> Children & youth Elderly Indigenous population Persons with disabilities Persons with chronic diseases Low-income households Unemployed Persons Persons living in substandard housing
 <p>Floods and sea level rise</p>	High	<ul style="list-style-type: none"> Water supply & sanitation Food and agriculture Waste management Environment, biodiversity, forestry Emergency services Land use planning 	<ul style="list-style-type: none"> Women & girls Children & youth Elderly Persons with disabilities Low-income households
 <p>Vector-borne disease</p>	Medium High	<ul style="list-style-type: none"> Industrial Commercial Residential Public Health 	<ul style="list-style-type: none"> Children & youth Elderly Persons with chronic diseases Low-income households

(Source: GCoM Asia, 2023)

Adaptation Goals and Action Plan

Segamat has identified three primary goals of climate change adaptation (GCoM Asia, 2023).

1. **Goal 1** Better protection against flooding
2. **Goal 2** Prevent dengue cases
3. **Goal 3** Reduce downtime of utilities caused by tropical storms

Emission Sector	Adaptation Actions
 <p>Extreme precipitation, monsoons</p>	<ul style="list-style-type: none"> • Improve monitoring and development control in flood-prone areas • Implement flood management & response plans to reduce the impact of flooding • Provide an early warning system through Multi-Hazard Platforms, such as social media, newspapers, public announcements and other applications • Improve existing facilities of schools and community halls designated temporary evacuation centres for disasters by providing generators, toilets, dustbins, paper partitions, and tents
 <p>Floods and sea level rise</p>	<ul style="list-style-type: none"> • Implement drought management and response plan to reduce the impact of drought • Introduce programmes or initiatives to reduce water consumption in commercial and residential areas
 <p>Vector-borne disease</p>	<ul style="list-style-type: none"> • Raise community awareness on the prevention of dengue • Enhance the capacity of local authorities and communities in disaster risk reduction and management

(Source: GCoM Asia, 2023)

GHG Inventory

Segamat emits around 1,293,912 tons of CO₂e from these three main sectors below.




Sector	Stationary Energy	Transportation	Waste
Emissions (%)	62	31	7

(Source: GCoM Asia, 2023)

Mitigation Target

Segamat has committed to reducing its GHG emission by around 50% compared to the BaU 2030 projection (GCoM Asia, 2023).

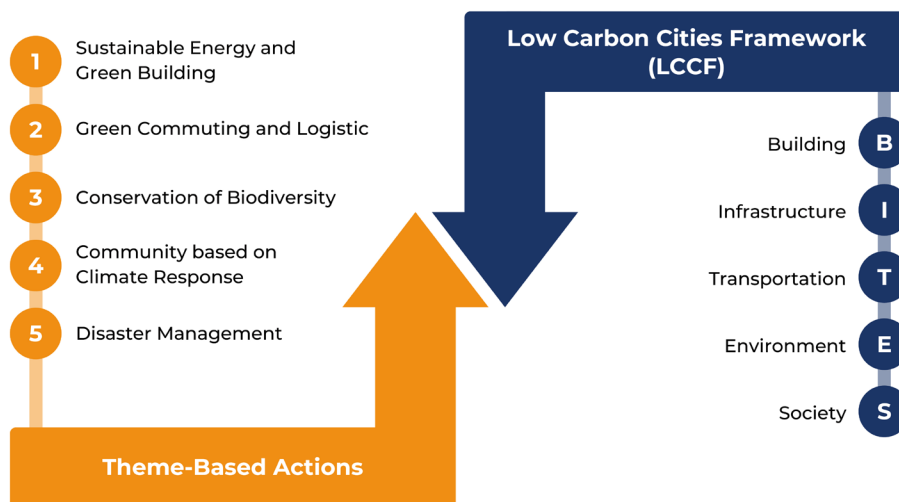
Mitigation Actions

Emission Sector	Mitigation Actions
 Stationary Energy	<ul style="list-style-type: none"> Install EE equipment and smart meters for MPS assets (government office, community hall, etc.), Install EE equipment and smart meters for MPS assets (government office, community hall, etc.), setting an example for others to follow Install EE equipment and smart meters on commercial buildings as an energy-saving initiative and industry operation, especially boilers and furnaces Install LED streetlights on state roads, namely Jalan Bukoh Kasah (FTI) and Jalan Muar (FT2S) Ensure new developments are integrated with rainwater harvesting systems and greywater recycling for non-potable usage Promote Photovoltaic (PV) and solar thermal systems
 Transportation	<ul style="list-style-type: none"> Implement TOD at KTM Segamat Railway Station by integrating bus terminals, taxis, and railway station planning Provide pedestrian walkways and bicycle lanes with safety elements (good lighting, bollards, facilities for the disabled, and green lanes for e-bikes) Introduce the 'Cycle to Work' and 'Cycle to School' initiatives involving the Segamat Municipal Council workers and school students Improve existing amenities at Terminal Pengangkutan Awam Segamat and expand the service network in Segamat Town Centre including a passenger information centre and well-designed low-floor Introduce a low-carbon shuttle bus Convert the government officials' vehicle fleet to low-carbon vehicles Promote hybrid freight transport, especially in port and industrial zones
 Waste	<ul style="list-style-type: none"> Implement smart bin programmes such as 52RC (Rethink, Repair, Reduce, Recycle, Compost, Close the Loop) in all residential neighbourhoods to increase community waste collection efficiency Set up low-carbon residential associations at all major housing estates (residential neighbourhoods) Promote urban farming involving the local communities and schools to increase local food production Promote compost from food and agro-waste involving the local communities and schools for the reduction of waste to landfill sites Encourage Waste-to-Energy Programmes for major oil palm plantations Introduce Waste-to-Wealth Programmes such as converting waste cooking oil to biodiesel, waste plastic to fuel, wastepaper to briquettes, etc

(Source: GCoM Asia, 2023)

Priority Action

Segamat has formulated 30 priority actions categorised into five thematic actions aligned with LCCF (GCoM Asia, 2023).




Penampang

City Profile

Population	121,934
Population Density	287 people/km ²
Land Area	425 km ²
Total Districts	4 districts
Programme Partnership	IUC Asia



Key economic activities:
Agriculture and Services




City Goals

Penampang District Council (MDPg) aims to become a frontrunner in carbon mitigation and climate adaptation, embodying a Low-Carbon Society model. This commitment entails fostering economic prosperity, embracing local values of coexistence with nature, and transitioning towards a simpler lifestyle that enhances the overall quality of life


(Source: IUC Asia, 2020)

Climate Profile



Rainfall

Average Annual	Average Increase (2075-2099)
2,5472 mm	2%







Local Temperature

Average	Increase RCP 4.5	Increase RCP 8.5
22.9°C – 24.0°C	30.4°C – 32.2°C	0.2°C per decade

(Source: IUC Asia, 2020)

Climate Risk

Climate Hazard	Risk Level	Most Relevant Assets	Vulnerable Populations Affected
 Flash/surface flood	High	<ul style="list-style-type: none"> Water supply and sanitation Transportation Food and agriculture Emergency services 	<ul style="list-style-type: none"> Marginalised groups Low-income households Persons living in sub-standard housing
 River flood	High	<ul style="list-style-type: none"> Water supply and sanitation Transportation Food and agriculture Emergency services Land use planning 	<ul style="list-style-type: none"> Marginalised groups Low-income households Persons living in sub-standard housing
 Rainstorm	Medium High	<ul style="list-style-type: none"> Transportation Food and agriculture Emergency services 	<ul style="list-style-type: none"> Low-income households Persons living in sub-standard housing
 Landslide	Medium	<ul style="list-style-type: none"> Transportation Environment, biodiversity, forestry Residential Emergency Land Use Planning 	<ul style="list-style-type: none"> Low-income households Persons living in sub-standard housing

Climate Hazard	Risk Level	Most Relevant Assets	Vulnerable Populations Affected
 Tropical storm	Medium Low	<ul style="list-style-type: none"> Food and agriculture Residential Emergency services 	<ul style="list-style-type: none"> Marginalised groups Low-income households Persons living in sub-standard housing





(Source: IUC Asia, 2020)

Adaptation Goals and Action Plan

Penampang has identified three primary goals of climate change adaptation (IUC Asia, 2020).

- Goal 1** Reduce property damage due to rainstorms and flooding by 50% by 2030 compared to 2017 levels
- Goal 2** Eliminate unregulated hill-cutting and deforestation by 2030
- Goal 3** Reduce downtime of utilities caused by tropical storms by 30% by 2030 compared to 2017 levels

There are four actions addressing Penampang's adaptation goals. These actions align with each climate hazard.

Climate Hazard	Adaptation Actions
 Tropical storm	<ul style="list-style-type: none"> Prepare disaster response plans for communities in disaster-prone areas Promote educational campaigns on flood and storm readiness
 Rainstorm	<ul style="list-style-type: none"> Complete a comprehensive hydrology study of the Moyog River area and develop and execute a drainage plan Implement and promote new policies to incentivise the construction of green roofs and vertical landscapes
 Flood	<ul style="list-style-type: none"> Protect existing Paddy Conservation Area zones Protect all existing green spaces and establish new multi-purpose green spaces that cannot be developed Organise "One Resident, One Tree" programme
 Landslide	<ul style="list-style-type: none"> Promote rainwater harvesting End all unlicensed hill-cutting and deforestation, especially along the Moyog River Prepare disaster response plans for communities in disaster-prone areas

(Source: IUC Asia, 2020)

GHG Inventory

Based on 2017 measurements, Penampang has emitted 455,416 tons of CO₂e (IUC Asia, 2020)

Sector	Stationary Energy	Transportation	Waste
Emissions (%)	59	25	16

(Source: IUC Asia, 2020)

Mitigation Target

Aligned with Malaysia’s NDC, Penampang has committed to reducing 45% of GHG emissions in 2030 compared to the 2010 baseline (IUC Asia, 2020).

Mitigation Actions

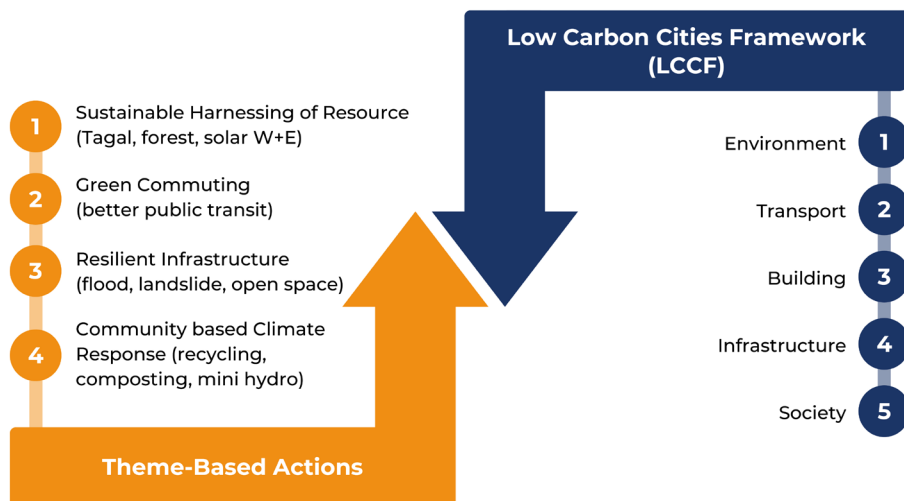
Penampang has formulated its mitigation actions, divided into three sectors based on the emissions sector.

Emission Sector	Mitigation Actions
 Stationary Energy	<ul style="list-style-type: none"> Promote the development of solar farms Install solar-powered streetlights throughout the district Improve the energy efficiency of Penampang District Council’s asset-owned buildings Promote the use of the Green Building certification (CASBEE, GBI, GreenRE, etc.).
 Transportation	<ul style="list-style-type: none"> Run district buses on recycled oil from food courts or other low-carbon energy sources Convert the district vehicle fleet to utilise B5 biofuel hybrid and electric vehicles (e.g. electric scooters) Establish unlimited free parking for low-carbon vehicles
 Waste	<ul style="list-style-type: none"> Establish a Reuse and Repair hub Partner with the private sector to construct a waste-to-energy plant Require city-wide waste separation with relevant incentives and penalties as well as distribute bins to residential areas

(Source: IUC Asia, 2020)

Priority Action

Penampang has formulated 43 priority actions categorised into four thematic actions and divided into two periods of implementation which are 2021-2025 and 2026-2030. These actions are aligned with the LCCF+S (IUC Asia, 2020).




Tawau

City Profile

Population	397,673
Population Density	65 people/ km ²
Land Area	6,125 km ²
Total Districts	25 districts
Programme Partnership	IUC Asia



Key economic activities:
Agriculture, Fisheries, Timber




Tawau Municipal Council (MPT) aims to become a competitive, sustainable, and equitable economic gateway for Sabah State

City Goals


(Source: IUC Asia, 2020)

Climate Profile



Rainfall

Average Annual	Average Increase (2075-2099)
3,0174mm	-6%








Local Temperature

Average	Increase RCP 4.5	Increase RCP 8.5
23.4°C – 24.1°C	29.3°C – 32.5°C	1.7°C

(Source: IUC Asia, 2020)

Climate Risk

Climate Hazard	Risk Level	Most Relevant Assets	Vulnerable Populations Affected
 Flash/surface flood	Medium High	<ul style="list-style-type: none"> Transportation Emergency services 	<ul style="list-style-type: none"> Low-income households
 Tropical storm	Medium	<ul style="list-style-type: none"> Transportation Food and agriculture Tourism Emergency Services 	<ul style="list-style-type: none"> Marginalised group Low-income households Persons living in sub-standard housing
 Storm surge	Medium	<ul style="list-style-type: none"> Food and agriculture Environment, biodiversity, forestry Commercial 	<ul style="list-style-type: none"> Low-income households
 River flood	Medium High	<ul style="list-style-type: none"> Water supply & sanitation Food and agriculture Waste management Residential Emergency services Land use planning 	<ul style="list-style-type: none"> Low-income households Persons living in sub-standard housing

Climate Hazard	Risk Level	Most Relevant Assets	Vulnerable Populations Affected
 Vector-borne disease	Medium Low	<ul style="list-style-type: none"> Residential Public health 	<ul style="list-style-type: none"> Children & youth Elderly Persons with chronic diseases Low-income households Person living in sub-standard housing





(Source: IUC Asia, 2020)

Adaptation Goals and Action Plan

Tawau has identified three primary goals for climate change adaptation (IUC Asia, 2020).

- Goal 1** Reduce property damage caused by monsoons and flooding by 50% by 2030
- Goal 2** Reduce the number of dengue cases by 50% by 2030
- Goal 3** Reduce downtime of utilities caused by tropical storms by 30% by 2030

These goals are translated into four groups of actions as follows

Climate Hazard	Adaptation Actions
 Flash/surface flood	<ul style="list-style-type: none"> Promote rainwater harvesting Support affected premises businesses and industries to create plans for flash flooding End all illegal rock quarrying and logging Identify links between existing green spaces for future land acquisition Organise 'One Resident, One Tree' programme
 Tropical storm	<ul style="list-style-type: none"> Promote educational campaigns on flood and storm readiness
 Storm surge	<ul style="list-style-type: none"> Protect existing conservation zones (river buffer and coastal reserve) by gazette Promote educational campaigns on flood and storm readiness
 Vector-borne disease	<ul style="list-style-type: none"> Promote educational campaigns on flood and storm readiness

(Source: IUC Asia, 2020)

GHG Inventory

Based on 2017 calculations, Tawau emitted around 1,561,104 tons of CO₂e (IUC Asia, 2020).

Sector	Stationary Energy	Transportation	Waste
Emissions (%)	59	25	16

(Source: IUC Asia, 2020)

Mitigation Target

In line with the national target, Tawau committed to reducing its GHG emissions by around 45% by 2030 from the 2010 baseline (IUC Asia, 2020).

Mitigation Actions

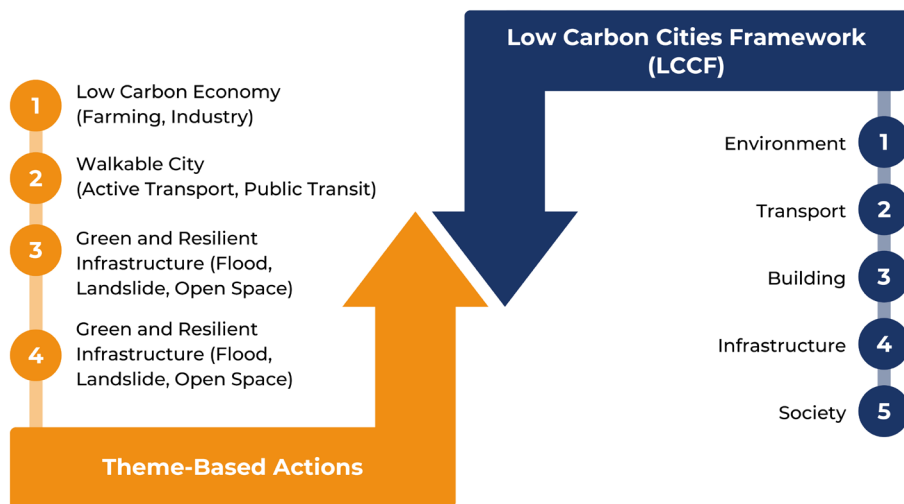
The mitigation actions are categorised into three sectors based on the emitting sectors.

Emission Sector	Mitigation Actions
 Stationary Energy	<ul style="list-style-type: none"> Promote low-carbon farming practices Install solar-powered streetlights throughout the town area and new development Improve the energy efficiency of MPT-owned buildings Promotion of green building construction (sustainable construction material, natural ventilation, and passive architecture)
 Transportation	<ul style="list-style-type: none"> Create dedicated bike lanes and establish pedestrian zones in the downtown area Convert MPT's vehicle fleet to low-carbon vehicles (Biofuel, NGS, hybrid or electric)
 Waste	<ul style="list-style-type: none"> Promote oil palm companies in using their waste to generate energy Require city-wide waste separation with relevant incentives and penalties and distribute bins to residential areas Partner with the private sector to construct a waste-to-energy plant /Incinerator

(Source: IUC Asia, 2020)

Priority Action

Tawau has formulated 35 action plans categorised into four thematic action plans divided into two working periods of implementation which are 2021-2025 and 2026-2030 (IUC Asia, 2020). These plans align with the LCCF+S



National Context: Malaysia

Malaysia, spanning approximately 330,345 km², is primarily situated in two regions which are the Southeast Asian peninsula and the northern part of Borneo Island. The average daily temperature ranges from 26 and 28 degrees Celsius. Climate change has resulted in temperature increases ranging from 0.19 to 0.3 degree Celsius per decade, varying across different regions of the country (World Bank, 2021).

According to INFORM RISK32 2023, Malaysia faces high exposure to floods Reports from the World Bank in 2021 and Malaysia's biennial report indicate a rising trend in climate hazards. However, Malaysia experiences a relatively low risk in terms of drought and epidemics, such as dengue diseases Despite having a relatively low vulnerability score, Malaysia still lacks coping capacity.

National Policies Supporting Climate Action

Malaysia has established 11 national-level policies carrying out climate change actions:

1. The 12th Malaysia Plan
2. National Policy on the Environment
3. National Policy on Climate Change
4. National Green Technology Policy
5. National Renewable Energy Policy and Action Plan
6. Policy and Mechanism on National Disaster and Relief Management
7. Green Technology Master plan
8. Low Carbon Cities Framework (LCCF)
9. National Low Carbon Cities Masterplan (NLCCM)
10. Forth National Physical Plan (NPP-4)






Adaptation Goals and Action Plan

Sectors	Goals and Plans
Water Security	Enhance water supply management, promote water conservation and efficiency, develop flood mitigation and early warning systems, and protect water catchment areas
Coastal	Integrate coastal zone management, restoring and conserving mangroves and coral reefs, conducting vulnerability assessments and mapping, and relocating coastal communities at risk
Agriculture and Food Supply	Promote climate-smart agriculture, diversify crops and livestock, improve irrigation and drainage systems, as well as strengthen food security and safety
Urban and Infrastructure Resilience	Improve urban planning and design, upgrade and retrofit infrastructure, enhance disaster risk reduction and management, as well as increase public awareness and participation

(Source: Government of Malaysia, 2021)

GHG Inventory

According to the 2016 baseline, Malaysia emits 75,488,480 tons of CO₂e excluding emissions from the Land Use, Land-use Change and Forestry (LULUCF) sector (NRECC Malaysia, 2022)

Sector	 Energy	 IPPU	 AFOLU	 AFOLU LULUCF	 Waste	Total emissions (without LULUCF)	Total emissions (with LULUCF)
GHG Emission (tons CO ₂ e)	251,695,020	27,348,830	10,627,720	-241,344,750	27,161,660	316,833,230	75,488,480
% GHG Emission	79.44	8.63	3.35	-76.17	8.57	100%	-

(Source: NRECC Malaysia, 2022)

Mitigation Target

Malaysia has set the target to reduce 45% of GHG emissions by 2030 compared to the 2005 baseline (NRECC Malaysia, 2022).

Mitigation Action Plan

Based on the synthesis of Malaysia's 12th Plan (2021), the government's approaches to reducing GHG emissions are as follows.

Approach	Key Actions
No Coal Power Plant	<ul style="list-style-type: none"> Renewable energy generation from solar, biomass, and biogas is targeted to increase to 31 % of the total installed capacity in the country by 2025
Carbon Pricing	<ul style="list-style-type: none"> State government authorities and the private sector could leverage DETS to execute carbon credit transactions at the domestic level Tax may also be levied on GHG emissions to encourage polluters to reduce the combustion of fossil fuels
Developing Electric Vehicle Technology	<ul style="list-style-type: none"> Develop energy-efficient vehicles (EEV) production industry to support environmentally friendly mobility initiatives Encourage investments in the production of EVs or their components and infrastructure support, including EV charging stations, as well as to drive consumer demand for EV vehicles Introduce a consumer-focused incentive package to attract investments into the EV ecosystem
Blue Economic Blueprint	<ul style="list-style-type: none"> Improve the ecological fiscal transfer mechanism to support the state government's efforts in conserving the forest areas Enhance sanctuaries for endangered wildlife such as tigers, tapirs, and elephants for conservation purposes

(Source: Government of Malaysia, 2021)

5.3 Thailand



Figure 11: Pilot Cities in Thailand Tagged with Climate Programmes

In Thailand, there are two climate programmes facilitated by UCLG ASPAC, namely the Integrated Urban Climate Action for Low-Carbon and Resilient Cities (Urban-Act) Project and the Global Covenant of Mayors for Climate & Energy Asia (GCoM Asia) Project. GCoM supports four cities in Thailand, providing the cities to develop Climate Action Plans (CAPs). The remaining three local entities are part of the Urban-Act programme (Figure 11).

Hua Hin

City Profile


Population	66,165
Population Density	766 people/km ²
Land Area	86.36 km ²
Total Districts	7 districts
Programme Partnership	GCoM Asia



Key economic activities:
Tourism, Agriculture, and Real Estate


(Source: GCoM Asia, 2024)

Climate Profile



Rainfall

Average Annual	Average Increase
1,956 mm	~-9%





Local Temperature

Mean Minimum	Mean Maximum	Increase
23.9°C – 32.6°C	32.6°C – 42.0°C	~1.9°C

(Source: GCoM Asia, 2024)

Climate Risk

Climate Hazard	Risk Level	Affected
 Drought	High	Water supply and people in poverty
 Increased Water Demand	Medium	Housing, tourism, and low-income people

(Source: GCoM Asia, 2024)

Adaptation Goals and Action Plan





Adaptation goals: Reduce the number of complaints regarding water quantity by 50% in 2027.

Adaptation Action	Operation Period	Target
Increase green and water absorption areas in the city	2024-2027	Sides and islands of secondary public roads and potential private and government areas under survey
Convert abandoned swamps into spare water supply swamps		Damaged and abandoned swamps
Provide one rainwater tank for each household		Underprivileged families in areas with short supply of water and suffering from poor quality water
Implement competition of model environmentally friendly hotels		Hotels in Muang Hua Hin Municipality
Establish environmentally and climate-friendly educational institutions		Schools affiliated with Muang Hua Hin Municipality and one other nonformal education school

(Source: GCoM Asia, 2024)

GHG Inventory





Total emissions: 127,547 tons CO₂e.

Sector	 Stationary Energy	 Transportation	 Waste	 AFOLU
Emissions (%)	54.16	25.65	19.57	0.61

(Source: GCoM Asia, 2024)





Mitigation Target

Hua Hin emits 379,240 tons of CO₂e based on the BaU 2030 scenario. The city aims to mitigate GHG emissions by approximately 19,499 tons of CO₂e, representing around a 5.18% reduction compared to the BaU 2030 scenario (GCoM Asia, 2024).

Sector	 Stationary Energy	 Transportation	 Waste	 AFOLU
Emissions BaU 2030 (%)	47.51	15.54	36.15	0.80
GHG Reduction	7.51	0.61	3.94	6.77

(Source: GCoM Asia, 2024)

Mitigation Actions

Emission Sector	Mitigation Actions
 Stationary Energy	<ul style="list-style-type: none"> • Replace fossil fuel with biogas • Replace public lighting with solar-powered LED lights • Replace cooking gas with biogas in households • Promote solar-powered households, industrial buildings, and government buildings • Push for energy efficiency in government, business, industrial, and households by 7% energy reduction
 Transportation	<ul style="list-style-type: none"> • Promote electronic vehicles (EV)
 Waste	<ul style="list-style-type: none"> • Implement organic waste separation for delivery to waste elimination centres
 AFOLU	<ul style="list-style-type: none"> • Expand mangrove forests • Expand urban forests

(Source: GCoM Asia, 2024)

Mae Hia

City Profile


Population	19,655
Population Density	805 people/km ²
Land Area	24.405 km ²
Total Districts	10 districts
Programme Partnership	GCoM Asia



Key economic activities:
Agriculture, Tourism, and Industry


(Source: GCoM Asia, 2024)

Climate Profile



Rainfall

Average Annual	Average Increase
1,100 mm	~-2%







Local Temperature

Mean Minimum	Mean Maximum	Increase
26.2°C	32.5°C	2°C

(Source: GCoM Asia, 2024)

Climate Risk

Climate Hazard	Risk Level	Affected
 <p>Extreme hot</p>	High	Agriculture and senior citizen.
 <p>Extreme wind</p>	High	Houses, structure and people in poverty.
 <p>Urban flood</p>	High	Tourism and people in poverty.
 <p>Wildfire</p>	Low	Agriculture, forestry, and people with chronic diseases.

(Source: GCoM Asia, 2024)

Adaptation Goals and Action Plan

Mae Hia defines four adaptation goals as follows (GCoM Asia, 2024).





1. **Goal 1.** No senior citizens will suffer from or die of heatstroke by 2027.
2. **Goal 2.** Reduced number of households suffering from floods by 2027.
3. **Goal 3.** Reduced loss caused by storms in 2027 as compared with 2022.
4. **Goal 4.** Municipal areas affected by wildfire will not be more than one rai in 2027.

Adaptation Action	Operation Period	Target
Model for senior citizens' safe zone	2025-2026	Centre for Promotion and Rehabilitation of Quality of Life of Senior Citizens and Disabled Persons, and new municipal buildings
Training in the management of household waste and wastewater	2024-2027	Seven hundred and seven households in 4 villages
Build drainage ditches in flood-risk areas	2024-2027	Flood risk areas in 2 villages
Build dredge streams to improve drainage ability.	2025-2027	Three main waterways
Conduct survey of infrastructure and buildings in the city with cooperation of people	2025-2027	All areas
Establish Ecoforest.	2024-2027	Village No. 2 and Village No. 3
Restore and improve forest fire barriers.	2024-2026	Fire-prone forest areas
Restore and develop life dams	2025-2027	<ul style="list-style-type: none"> • Mae Hia Luang Weir • Conduct a survey for building a new weir in the fire-risk areas

(Source: GCoM Asia, 2024)

GHG Inventory





Total emissions: 127,547 tons CO₂e in 2019.

Sector	 Stationary Energy	 Transportation	 Waste	 AFOLU
Emissions (%)	17.65	67.31	2.49	12.55

(Source: GCoM Asia, 2024)





Mitigation Target

Mae Hia will emit 59,204 tons CO₂e of GHG Emissions in 2030 based on the BaU 2030 scenario. Meanwhile, Mae Hia aims to mitigate the GHG emissions of around 11,884 tons CO₂e, equivalent to 20.07% against the BaU 2030 scenario (GCoM Asia, 2024).

Sector	 Stationary Energy	 Transportation	 Waste	 AFOLU
Emissions BaU 2030 (%)	41.54	23.28	8.14	27.06
GHG Reduction	32.06	1.90	9.69	20.42

(Source: GCoM Asia, 2024)

Mitigation Actions

Emission Sector	Mitigation Actions
 Stationary Energy	<ul style="list-style-type: none"> Replace public lighting with LED lights Push for a 10% power consumption reduction in government, industries, public sector, and household buildings Promote solar-powered households, industrial buildings, public sector, and government buildings
 Transportation	<ul style="list-style-type: none"> Promote EV Replace fossil fuel with biofuel by 3%
 Waste	<ul style="list-style-type: none"> Implement waste separation centres for soil improvement Produce biogas from food waste
 AFOLU	<ul style="list-style-type: none"> Increase forest areas in municipalities by 15% Increase green areas by 5% in cities

(Source: GCoM Asia, 2024)

Nonthaburi

City Profile


Population	250,957
Population Density	6,451 people/ km ²
Land Area	38.9 km ²
Total Districts	5 districts
Programme Partnership	GCoM Asia



Key economic activities:
Agriculture, Tourism, and Industry


(Source: GCoM Asia, 2024)

Climate Profile



Rainfall

Average Annual	Average Increase
1,200-1,400mm	~-3%




Local Temperature

Mean Minimum	Mean Maximum	Increase
23°C – 26°C	32°C – 35°C	~-0.1°C

(Source: GCoM Asia, 2024)

Climate Risk

Climate Hazard	Risk Level	Affected
 Urban flooding	High	Buildings, houses & structures, and people in poverty
Extremely	High	Health, energy, outdoor workers, and senior citizens

(Source: GCoM Asia, 2024)

Adaptation Goals and Action Plan





Adaptation goals: Reduce the number of complaints regarding water quantity and quality by 50% in 2027.

Adaptation Action	Operation Period	Target
Sourcing wastewater management	2023-2027	Owners and occupiers of pollution sources, namely households, food shops, business establishments and hazardous businesses
Competition of beautiful, clear water, and hazard mitigation canal		Communities near municipal canals
Create legislation requiring high buildings and housing developments to provide open spaces and green areas		All high buildings, business establishments and housing developments in Nonthaburi Municipality
Increase green areas and water absorption zones in communities affected by floods in 2021		Community and public areas affected by flood in 2021
Create climate-friendly communities, religious places, educational institutions, and government agencies		Communities, schools, religious places and government agencies
Provide training and welfare for outdoor workers of the municipality	2024-2027	Outdoor workers and local environment volunteers (LEVs) of the municipality
Train village health volunteers and caretakers in revival from heatstroke	2024-2025 and 2026-2027	VHV and caretakers

(Source: GCoM Asia, 2024)

GHG Inventory





Total of emissions: 1,176,949 tons CO₂e.

Sector	 Stationary Energy	 Transportation	 Waste	 AFOLU
Emissions (%)	53.05	34.35	11.62	0.08

(Source: GCoM Asia, 2024)





Mitigation Target

Nonthaburi emits 1,151,021 tons CO₂e of GHG emissions under the BaU 2030 Scenario. Meanwhile, Nonthaburi aims to mitigate the GHG emissions of around 117,612 tons CO₂e or around 10.22% against the BaU 2030 scenario (GCoM Asia, 2024).

Sector	 Stationary Energy	 Transportation	 Waste	 AFOLU
Emissions BaU 2030 (%)	642,878	351,161	156,988	-6
GHG Reduction	111,228	4,769	418	1,197

(Source: GCoM Asia, 2024)

Mitigation Actions

Emission Sector	Mitigation Actions
 Stationary Energy	<ul style="list-style-type: none"> • Replace public lighting with LED lights • Reduce power consumption by 10% in government, industries, and household buildings for energy efficiency • Promote solar-powered households, industrial buildings, and government buildings
 Transportation	<ul style="list-style-type: none"> • Promote EV
 Waste	<ul style="list-style-type: none"> • Implement waste management by reducing 10% of waste in landfill
 AFOLU	<ul style="list-style-type: none"> • Increase green areas by planting 70,000 trees in municipalities

(Source: GCoM Asia, 2024)

Suphan Buri

City Profile

Population	24,681
Population Density	2,738 people/ km ²
Land Area	9.013 km ²
Total Districts	10 districts
Programme Partnership	GCoM Asia



Key economic activities:
Agriculture, Tourism, and Industry



(Source: GCoM Asia, 2024)

Climate Profile

			
Rainfall		Local Temperature	
Average Annual	Average Increase	Average	Increase
900-1,200 mm	~8%	28.4°C	1.5°C

(Source: GCoM Asia, 2024)

Climate Risk

Climate Hazard	Risk Level	Affected
 River Flood	High	Buildings, houses & structures, and people in poverty
 Extreme Heat	High	Health sector, energy sector, senior citizens, and sick people.

(Source: GCoM Asia, 2024)

Adaptation Goals and Action Plan

Suphanburi has two adaptation goals as follows (GCoM Asia, 2024).





- Goal 1.** Reduce affected households due to flooding by 50% in 2027.
- Goal 2.** No vulnerable persons will suffer or die due to heatstroke by 2027.

Adaptation Action	Operation Period	Target
System improvement for preventing and resolving floods	2024-2027	<ul style="list-style-type: none"> Committees and people from 16 communities Government agencies and educational institutions (affiliates and non-affiliates) People previously suffering from flood and vulnerable persons
Low-carbon averting disaster educational institutions		<ul style="list-style-type: none"> Four educational institutions in municipal areas Suphan Buri Vocational College, Suphan Buri Technical College, and others
Tree conservation		<ul style="list-style-type: none"> Existing trees in Muang Suphan Buri Municipality Public places and open spaces requiring shading
Reduce GHG emissions for mitigation of global warming		<ul style="list-style-type: none"> General public

(Source: GCoM Asia, 2024)

GHG Inventory





Total emissions: 1,176,949 tons CO₂e.

Sector	 Stationary Energy	 Transportation	 Waste	 AFOLU
Emissions (%)	91.31	22.83	2.72	-0.03

(Source: GCoM Asia, 2024)





Mitigation Target

Suphanburi's emits around 500,528 tons of CO₂e under the BaU 2030 scenario. Meanwhile, the province has a target to mitigate its GHG emissions of around 111,647 tons CO₂e, equivalent to 22.31% (GCoM Asia, 2024).

Sector	 Stationary Energy	 Transportation	 Waste	 AFOLU
Emissions BaU 2030 (%)	91.99	4.25	3.88	0.00
GHG Reduction	23.26	0.17	20.45	3,466

(Source: GCoM Asia, 2024)

Mitigation Actions

Emission Sector	Mitigation Actions
 Stationary Energy	<ul style="list-style-type: none"> Replace public lighting with solar-powered LED lights. Promote solar-powered households, industrial buildings, and government buildings. Reduce power consumption by 20% in government, business, industrial, and households for energy efficiency.
 Transportation	<ul style="list-style-type: none"> Promote EV.
 Waste	<ul style="list-style-type: none"> Implement waste separation for RDF production.
 AFOLU	<ul style="list-style-type: none"> Increase green area by 10%

(Source: GCoM Asia, 2024)

Other Pilot Cities in Thailand

In addition to the four cities outlined above, UCLG ASPAC also supports two more cities, Chiang Mai and Phuket, as well as one province, Khon Kaen. The Urban-Act assists these local governments in developing CAPs and bankable climate projects.

National Context: Thailand

Thailand has a diverse climate influenced by its geographical features. The country features a tropical monsoon climate, characterised by three distinct seasons: hot, rainy, and cool. The average annual temperature ranges between 25 degrees Celcius to 30 degrees Celcius, with annual rainfall ranging from 1,528.8 to 1,759.3 over the past few decades. Thailand faces several climate-related risks, including floods, droughts, and tropical cyclones. By the end of the 21st century, temperature projections indicate an increase of around 1.8 degrees Celcius based on the RCP 4.5 scenario and 3.5 degrees Celcius based on the RCP 8.5 scenario. INFORM RISK32 2023 identifies Thailand as having a medium risk level for climate-related disasters, with high exposure to flooding and cyclones (World Bank and ADB, 2021) and (Government of Thailand, 2022).

Vision in Climate Change: Resiliency to the impacts of climate change and achieving low carbon growth through sustainable development.

National Policies Supporting Climate Action

- The 13th National Economic and Social Development Plan 2023-2027.
- National Energy Plan Framework 2022.
- Climate Change Master Plan B.E. 2558–2593 (2015-2050).
- Power Development Plan B.E. 2561–2580 (2018-2037).
- Thailand Smart Grid Development Master Plan B.E. 2558-2579 (2015-2036).
- Energy Efficiency Plan B.E. 2561–2580 (2018-2037).
- Alternative Energy Development Plan B.E. 2561–2580 (2018-2037).
- Master Plan for Sustainable Transport System and Mitigation of Climate Change Impacts (2013-2030).
- National Industrial Development Master Plan B.E. 2555–2574 (2012-2031).
- Waste Management Roadmap.
- Policy and Plan for Enhancement and Conservation of National Environmental Quality 2017 – 2036.
- Nationally Appropriate Mitigation Action (NAMA).

Adaptation Goals and Action Plan





Thailand's adaptation goals focus on improving the overall disaster management system, enhancing the people's capacity to cope with and adjust to harmful impacts caused by climate change, as well as developing preparedness and response systems for emerging and reemerging infectious diseases caused by climate change. Thailand divides the adaptation plan into 6 sectors as follows.

Sectors	Goals and Plans
Water Resource Management	Increase water security and reduce loss and damage from water-related disasters by developing mechanisms and approaches for integrated water resources management as well as building adaptive capacity and climate resilience to manage climate risks in water resources management
Agriculture and Food Security	Maintain food security by increasing the ability to respond to and manage climate risks in the agricultural sector
Tourism	Strengthen the capacity of the tourism sector towards climate resilience and sustainable growth by enhancing climate risk reduction and disaster management
Public Health	Enhance the public health system's capacity to manage health risks and reduce health impacts from climate change by developing health impact surveillance and prevention mechanisms as well as enhancing access to good quality public health services
Natural Resources Management	Sustainably manage natural resources and biodiversity to respond to climate change impacts by enhancing the conservation, rehabilitation, and sustainable use of natural resources and biodiversity as well as strengthening public participation
Human Settlements and Security	Enhance the capacity of individuals, communities, and cities to adapt to climate change impacts by developing tailored mechanisms to manage climate risks and impacts within the local context

(Source: Government of Thailand, 2022)

GHG Inventory

Based on the fourth Biennial Update Report (BUR), Thailand recorded two years of its GHG inventory excluding LULUCF in 2000 and 2019.




Sector	 Energy	 Agriculture	 IPPU	 Waste	Total
GHG Emission (tons CO ₂ e) in 2000	165,092,400	49,065,400	21,274,820	10,466,940	245,899,560
% GHG Emission in 2000	67	20	9	4	100
GHG Emission (tons CO ₂ e) in 2019	260,772,690.00	56,766,320.00	38,301,210.00	16,876,640	372,716,860
% GHG Emission in 2019	70.00	15.00	10.00	5	100

(Source: Government of Thailand, 2022)

Mitigation Goals and Plan




Thailand aims to unconditionally reduce 30% of GHG emissions unconditionally and conditionally by 40%. Thailand focuses on reducing GHG emissions and promoting a low-carbon society, supporting agricultural management to benefit from GHG reductions, accelerating the restoration of deteriorated forests, as well as expanding forest areas to function as carbon storage areas (Government of Thailand, 2022).

The goals and efforts aim to at least reduce 115,600,000 tons of CO₂e against the BaU 2030 scenarios with the details as follows.

Sector	 Energy and Transport	 IPPU	 Waste
Reduction target (tons CO ₂ e)	82,000,000	31,600,000	2,000,000
(%) Reduction Target	70.9	27.3	1.7

(Source: Government of Thailand, 2022)

To achieve the goals, Thailand has outlined key strategies in its 2021-2030 NDC roadmap as follows.

Sector	Key Strategies
 Energy and Transport	<ul style="list-style-type: none"> The Energy Efficiency Plan (EEP 2015) aims to reduce energy intensity (EI) by 30% in 2036 for industrial, business and government buildings, residential, as well as transportation sectors Alternative Energy Development Plan 2015 – 2036 (AEDP 2015) aims to increase the share of renewable energy consumption, including electricity, heat, and biofuels accounting for 30% of final energy consumption by 2036 Implement of Power Development Plan 2018 – 2037 (PDP 2018) Support and promote programmes in the transport sector Develop and improve laws supporting GHG reduction Develop measurement, reporting, and verification (MRV) mechanisms. Engage and strengthen the capacity of all agencies to reduce GHG emissions
 IPPU	<ul style="list-style-type: none"> Implement clinker substitution measures in two methods: the use of clinker substitutes in the hydraulic cement production process and the increased use of cement substitutes in ready-mixed concrete Implement refrigerant substitution measures in two methods: refrigerant modification under the RAC NAMA project and the proper disposal of waste and deteriorated refrigerant Implement measures to manage industrial wastewater: consistent with the potential to reduce GHG emissions according to the NDC goals guidelines
 Waste	<ul style="list-style-type: none"> Implement waste reduction Implement municipal and industrial wastewater management aimed at methane recovery from wastewater treatment, especially industrial wastewater Implement solid waste management for municipalities aimed at landfill gas utilisation, transforming waste to energy, composting, semi-aerobic landfills, anaerobic digestion, and mechanical biological treatment

(Source: Government of Thailand, 2022)

Efforts

Thailand has implemented its Nationally Appropriate Mitigation Actions (NAMA) mitigation measures to reduce emissions, reducing 56.54 MtCO₂e in 2020 primarily in the energy and transport sectors. Through ten implemented measures, Thailand has achieved a reduction of 15.40% from the BaU scenarios (Government of Thailand, 2022).

5.4 Vietnam




Figure 12: Pilot Cities in Vietnam Tagged with Climate Programmes

Vietnam has seven pilot cities (Figure 12) supported by two Global Covenant of Mayors for Climate & Energy (GCoM) programmes. Three cities were covered by the International Urban Cooperation (IUC) Asia Project, each with their climate strategies. The remaining four cities were supported to develop CAPs, in which they have been finalised.

Can Tho

City Profile



Population	1,235,954
Population Density	859 people/km ²
Land Area	1,439 km ²
Total Districts	9 districts
Programme Partnership	IUC Asia



Key economic activities:
Textiles/gularment, wood processing, mechanics, and electrical machines





(Source: IUC Asia, 2021)

Climate Profile

			
Rainfall	Local Temperature		
Average Annual¹	Mean Minimum³⁴	Mean Maximum³⁴	Increase²
1,675 mm	22.1°C – 25°C	29.3°C – 33.4°C	1°C -3.4°C

(Source: GCoM Asia, 2024)

Climate Risk

Climate Hazard			
			
Floods	River-bank erosion	Salinity intrusion	High tide
Very High	Moderate	Moderate	Very High

(Source: IUC Asia, 2021)

Adaptation Goals and Action Plan

Adaptation Goals





Element	Adaptation Goals
Population	<ul style="list-style-type: none"> Improve flood risk adaptation as well as enhance adaptive capacity for governmental agencies and local communities
Infrastructure	<ul style="list-style-type: none"> Develop of blue-green infrastructure Implement early warning systems to reduce natural disaster impact
Land use	<ul style="list-style-type: none"> Implement effective land use planning and management approved by a state agency

(Source: IUC Asia, 2021)

1. [Can Tho climate: weather by month, temperature, rain - Climates to Travel](#)




2. Based on National Proxy in World Bank Report (World Bank, 2020)

Adaptation actions

Hazard	Planned Actions		
	Short-term	Mid-term	Long-term
 Flood	<ul style="list-style-type: none"> Build capacity to adapt to floods Preserve natural canals within the city's core area Strengthen land use plan implementation 	<ul style="list-style-type: none"> Complete the constructions for flood prevention as part of the WB project Develop flood prevention plans for other suburban areas. Develop blue-green infrastructure constructions Conduct research and designing synchronised plans 	<ul style="list-style-type: none"> Implement general measures at the delta scale Improve the water drainage network Improve house design Implement integrated regional development
 Riverbank erosion	<ul style="list-style-type: none"> Build capacity for emergency response Resettle vulnerable communities Strengthen embankment construction supervision, management, and maintenance 	<ul style="list-style-type: none"> Invest in dyke construction at vulnerable locations Construct river embankments Plant native trees and shrubs along riverbanks 	<ul style="list-style-type: none"> Implement interprovincial coordination against exploitation Utilise alternative construction materials beyond sand
 Salinity intrusion	<ul style="list-style-type: none"> Enhance the response of management agencies and the community to salinity Enhance the existing monitoring and warning systems Develop an emergency plan for water supply security 	<ul style="list-style-type: none"> Invest in a comprehensive salinity monitoring and early warning system Develop adaptive agriculture production Implement adaptive water supply security Take research results into account 	<ul style="list-style-type: none"> Utilise desalination technology Change water source locations to mitigate salinity Engage in international water cooperation
 High tide	<ul style="list-style-type: none"> Build an early warning for high tides to mitigate their impact Improve water drainage conduits 	<ul style="list-style-type: none"> Improve transportation system in adapting to high tide Raise community awareness 	<ul style="list-style-type: none"> Implement measures at the delta scale Invest in a dyke system

GHG Inventory

Can Tho emits GHG approximately 4,016,783 tons of CO₂e based on the 2017 base year.

Sector	 Stationary Energy	 Transportation	 Waste
Emissions (%)	78	13	9

(Source: IUC Asia, 2021)

Mitigation Target

Can Tho aims to reduce its GHG emissions in line with the national agenda, targeting a 9% reduction compared to BaU 2030 through domestic resources. However, the NDC has increased to a more ambitious 27% reduction with international support (IUC Asia, 2021).

Mitigation Actions

Can Tho has yet defined any local mitigation actions. The city still focuses on formulating adaptation action plans.


Cao Lanh

City Profile

Population	166,065
Population Density	1,548 people/km ²
Land Area	107.27 km ²
Total Districts	15 districts
Programme Partnership	GCoM Asia



Key economic activities:
Trading and services, Industry, and Agriculture





City Goals

Improve the resilience and adaptation of Cao Lanh's natural, economic, and social systems. This includes reducing the vulnerability to hazards due to the impacts of temperature increase, shifts in rainfall patterns, and extreme weather. Leveraging the benefits brought by climate change, the city seeks to implement models designed to reduce GHG emissions aimed to transition economic activities toward a low-carbon economy in line with Vietnam's net-zero goal by 2050









(Source: GCoM Asia, 2023)

Climate Profile

			
Rainfall	Local Temperature		
Average Annual	Mean Minimum	Mean Maximum	Increase
2,657 mm	0.7 mm/year	26.4°C – 29.5°C	0.0146°C/year

(Source: GCoM Asia, 2023)

Climate Risk

Climate Hazard			
			
Floods	River landslide	Thunderstorm and tornado	Thunder
Significant	Significant	Significant	Significant
			
Storm surge	Inundation due to heavy rain	Drought	Storm & tropical depression
Light	Light	Light	Light

(Source: GCoM Asia, 2023)

Adaptation Goals and Action Plan





Adaptation goals: Enhance the resilience of the city's natural, economic, and social systems against recurrent climate risks such as heavy rain, flooding, river landslides thunderstorms, and other related risks. This will be achieved through the systematic implementation both of structural and non-structural solutions (GCoM Asia, 2023).

Adaptation actions:

- Invest in technical infrastructure to enhance the local drainage system.
- Upgrade and renovate transportation infrastructure in flood-prone areas.
- Explore and implement nature-based adaptation measures to mitigate landslides on both banks of the Tien River and strengthen agricultural production.

GHG Inventory

Total of emissions: 505,711 tons CO₂e based on 2020 base year (GCoM Asia, 2023).

Sector	 Transport	 Waste	 AFOLU	 Energy
Emissions (tons CO₂e)	63,994	82,947	9,968	348,802
Emissions (%)	12.65	16.4	1.97	68.97

(Source: GCoM Asia, 2023)

Mitigation Target

In line with Vietnam's national target, Cao Lahn commits to reducing 9% of GHG emissions.

GHG Emissions 2010 (tons CO ₂ e)	GHG Emissions 2020 (tons CO ₂ e)	GHG Emission 2030 (BaU Scenario) (tons CO ₂ e)	Reduction Target (tons CO ₂ e)
404,560	505,711	1,385,037	124,600

(Source: GCoM Asia, 2023)

Mitigation Actions

- Periodically monitor GHG emissions and assess sectors or regions with potentially high emissions. By identifying these areas, sector-specific solutions can be implemented to reduce GHG emissions in line with economic development and environmental protection.
- Promote green energy transformation in public transportation including intra-provincial and inter-provincial bus networks.
- Strengthen communication and education on efficient energy use, including the development and implementation of policies to support, encourage, and motivate efficient use of energy in all economic sectors, such as trade, services, transport, urban development, industry and agriculture.
- Strengthen waste management and reduction efforts in tandem with promoting the reuse and recycling of waste materials. Additionally, fostering research and the implementation of advanced waste treatment technologies can significantly contribute to reducing GHG emissions.
- Promote investment in modern low-carbon technologies and energy-efficient equipment for commercial buildings.
- Promote green building development and certification issuance in the city.

Priority Actions


Priority Action	Period
Legal education climate change regulations outlined in the Law on Environmental Protection 2020 and Decree 06/2022/ND-CP.	Up to 2025
Increase awareness of efficient energy consumption.	Up to 2025
Develop a comprehensive scheme for resource mobilisation to support the implementation of the city's priority climate actions.	Up to 2025
Implement measures to enhance local resilience against urban inundation including the construction and enhancement of urban drainage systems and sewers. Additionally, implement nature-based adaptation measures to mitigate landslides along the Tien River banks and in agricultural areas.	2026-2030
Conduct periodic GHG inventories within the city to establish a comprehensive database tracking GHG emissions and the efficacy of mitigation measures.	2026-2030
Implement solutions focusing on energy conservation, waste management, sustainable agriculture, and other initiatives to mitigate GHG emissions effectively.	2026-2030

(Source: GCoM Asia, 2023)

Da Nang

City Profile



Population	1,134,310
Population Density	883 people/km ²
Land Area	1,285 km ²
Total Districts	8 districts
Programme Partnership	IUC Asia



Key economic activities:
Textiles/garment, wood processing, mechanics, electrical machines





(Source: IUC Asia, 2021)

Climate Profile

			
Rainfall	Local Temperature		
Average Annual³	Mean Minimum³⁶	Mean Maximum³⁶	Increase³⁵
2,155 mm	19.2°C – 25.9°C	25.2°C – 35°C	1°C -3.4°C

(Source: IUC Asia, 2021)

Climate Risk

Climate Hazard			
			
Flood	River-bank erosion	Salinity	Sea level rise

(Source: IUC Asia, 2021)

Adaptation Goals and Action Plan

Adaptation Goals

Element	Adaptation Goals
Population	<ul style="list-style-type: none"> Strengthen the adaptive capacity of communities and households in Cam Le and Hoa Vang Districts to mitigate flood risks
Economy and Urban Investment	<ul style="list-style-type: none"> Improve knowledge and overall capacity to mitigate risks for agriculture, tourism, construction and urban management at the district and ward levels
Infrastructure	<ul style="list-style-type: none"> Improve road, drainage, and water supply infrastructures to address the impacts of climate hazards, particularly flooding and changing precipitation patterns, as well as other extreme events like typhoons
Land use	<ul style="list-style-type: none"> Review and improve land use management in rural and open spaces to address impacts from river and coastal erosion, as well as sea-level rise

(Source: IUC Asia, 2021)




3. <https://www.climatestotravel.com/climate/vietnam/da-nang>

Adaptation actions

- Disseminate knowledge and skills on natural disaster mitigation and control in schools.
- Invest in constructing and consolidating dykes and embankments to prevent riverbank and coastal erosion, while ensuring the safety of water reservoirs and irrigation lakes.
- Install and establish a specialised monitoring system for disaster prevention, including automatic monitoring of rain, water level, monitoring and warning equipment in frequently flooded areas.
- Review and develop plans and solutions to support relocation and stabilise the lives of people in areas prone to natural disasters.
- Optimise NbS through conserving plant varieties and animals, and apply science and technology in agricultural production in line with natural disasters, including planting, protecting, and restoring protective forests.

GHG Inventory

Da Nang emits approximately 3,432,483 tons of CO₂e based on the 2017 base year (IUC Asia, 2021).




Sector	 Stationary Energy	 Transportation	 Waste
Emissions (%)	76	13	11

(Source: IUC Asia, 2021)

Mitigation Target

In line with Vietnam's national agenda, Da Nang commits to reducing GHG emissions by around 9% compared to the 2030 BaU scenario.

Mitigation Actions

Sector	Mitigation Action
 Stationary Energy	<ul style="list-style-type: none"> • Promote and guide energy efficiency in daily activities, households, and city service establishments • Build projects and assist businesses in replacing outdated energy-consuming equipment with energy-saving alternatives • Develop and implement energy-saving and renewable energy models for industries to replicate in large energy-consuming establishments • Implement the ecological industrial model for a more sustainable industrial zone
 Transportation	<ul style="list-style-type: none"> • Invest and support to transition into green public transportation, including replacing existing buses with new ones compliant with Euro emission standards
 Waste	<ul style="list-style-type: none"> • Implement effective land use planning and management approved by a state agency

(Source: IUC Asia, 2021)


Hue

City Profile

Population	352,719
Population Density	1,324 people/ km ²
Land Area	266.46 km ²
Total Districts	29 districts
Programme Partnership	GCoM Asia



Key economic activities:
Tourism, trade, and services




City Goals


Strengthen the resilience of Hue to mitigate climate change impacts while leveraging on their benefits, implement GHG emissions reduction, and transition economic activities toward low carbon alternatives, aligning with the national target of achieving net zero emissions by 2050

(Source: GCoM Asia, 2023)

Climate Profile








Rainfall	
Average Annual	Average Increase
2,800 mm	50% under RCP4.5



Local Temperature		
Mean Minimum	Mean Maximum	Increase
20°C – 22°C	27°C – 31°C	1.9°C -2.5°C Under RCP4.5

(Source: GCoM Asia, 2023)

Climate Risk

Climate Hazard	Risk Level	Exposure
 Heavy rain/storm/flood	High	High
 Landslide	Medium High	-
 Heat	High	High
 Extreme cold	High	-
 Wildfire	Moderate	-

(Source: GCoM Asia, 2023)

Adaptation Goals and Action Plan





Adaptation goals: Strengthen the resilience of Hue’s natural systems and social infrastructure to climate risks such as floods, heavy rains, droughts storms, and other risks through coordinated implementation of both structural and non-structural solutions (GCoM Asia, 2023).

Adaptation actions:

- Provide real-time forecasts and alerts for floods.
- Raise officials’ and public understanding of climate change impacts on natural systems and social infrastructure.
- Develop disaster prevention and mitigation plans tailored to each industry, sector, and region.
- Improve adaptability of infrastructure, irrigation systems, socio-economic sectors and communities to climate change impacts.
- Integrate climate change adaptation content into the city’s socio-economic development master plan strategies.

GHG Inventory

Total of emissions: 1,957,980 tons CO₂e

Sector	 Static combustion Energy	 Transport	 Waste	 AFOLU
Emissions (tons CO ₂ e)	1,744,319	122,093	84,044	7,525
Emissions (%)	89.09	6	4.29	0.38

(Source: GCoM Asia, 2023)

Mitigation Target

In line with the national target, Hue commits to reduce 9% of GHG emissions.

GHG Emissions 2010 (tons CO ₂ e)	GHG Emissions 2020 (tons CO ₂ e)	GHG Emission 2030 (BaU Scenario) (tons CO ₂ e)	Reduction Target (tons CO ₂ e)
-	1,957,980	4,151,533	124,600

(Source: GCoM Asia, 2023)

Mitigation Actions

- Promote economical and efficient energy usage in production and daily activities through raising awareness, transferring and applying scientific and technological advancements, and restructuring energy-intensive sectors.
- Encourage organisations and households to invest in rooftop solar power systems.
- Accelerate the development of public transport networks, integrate different transportation modes and gradually transition from fossil fuels to renewable energy sources.
- Enhance integrated solid waste management, boost domestic and industrial waste collection and sorting rates at source, as well as implement waste treatment measures for methane recovery and energy generation.
- Prioritise the development of organic and low-carbon agriculture models aligned with sustainable agricultural goals.
- Increase investment in forest development and protection as well as green coverage in public areas.
- Gradually incorporate GHG emission reduction and absorption targets into the city's socio-economic development agendas.

Priority Actions

- Invest in riverbank and coastal erosion prevention infrastructure to safeguard residents in landslide-prone areas.
- Explore and implement nature-based solutions (NbS) for surface water management.
- Expand public and green spaces to mitigate the negative urban heat and heat shock effects.
- Develop smart agriculture and nature-based solutions for the agriculture and forestry sectors to adapt to climate change.
- Conduct regular GHG inventories and develop an emission database, especially for major emitters.
- Implement energy efficiency programmes targeting both production and daily activities, with a focus on energy-intensive sectors.
- Invest in public transportation infrastructure and pedestrian/cycling pathways within the city.
- Support installation of rooftop solar power systems for households and hospitality businesses.
- Establish an integrated solid waste management with renewable energy-powered collection and transportation systems as well as domestic waste treatment for composting to reduce GHG emissions.
- Launch a communication campaign to raise awareness about the climate change response in the city.
- Establish a resource mobilisation project to implement climate change responses until 2030.


Nam Dinh

City Profile

Population	249,267
Population Density	5,371 people/ km ²
Land Area	46.41 km ²
Total Districts	16 districts
Programme Partnership	GCoM Asia



Key economic activities:
Industry, construction, commerce and services, agriculture, forestry, and fishery




City Goals

Strengthen the resilience of Nam Dinh to mitigate the impacts of climate change through investment in the construction and enhancement of urban infrastructure while leveraging their benefits in resource mobilisation. Nam Dinh will implement integrated approaches to reduce GHG emissions in the city and transition economic activities toward low-carbon alternatives, contributing to the national target of net zero emissions by 2050


(Source: GCoM Asia, 2023)

Climate Profile



Rainfall

Average Annual	Average Increase ⁴
1,470 mm	5.1-11%







Local Temperature

Mean Minimum	Mean Maximum	Increase
19.5°C – 23°C	24°C – 39°C	0.7°C -2.4°C

(Source: GCoM Asia, 2023)

4. Under RCP 4.5

Climate Risk

Climate Hazard	Most Vulnerable Sectors	Most Vulnerable Populations	Percentage of the Exposed Populations	Impacts on Vulnerable Populations and Sectors
 <p>Heavy precipitation</p>	<ul style="list-style-type: none"> Commercial Education Emergency services Food & Agriculture Public health Residential Community & culture Transportation Waste management Water supply & sanitation 	<ul style="list-style-type: none"> Children & young people Elderly Low-income households Persons living in sub-standard housing Persons with disabilities Women & girls 	30-40%	Rainfall can cause displacement and lead to various hazards, including accidents and injuries such as contusions, fractures, electrocution, and disease outbreaks.
 <p>Storm</p>	<ul style="list-style-type: none"> Commercial Education Emergency services Food & Agriculture Public health Residential Community & culture Transportation Waste management Water supply & sanitation 	<ul style="list-style-type: none"> Children & young people Elderly Low-income households Persons living in sub-standard housing Persons with disabilities Women & girls 	30-40%	Storms can cause displacement which reduces the risk of death. However storms can also lead to accidents injuries, disease outbreaks, and infrastructure damage.
 <p>Urban inundation</p>	<ul style="list-style-type: none"> Transportation Waste management Water supply & sanitation Advertisement Education Emergency services Food & Agriculture Public health Residential Community & culture 	<ul style="list-style-type: none"> Outdoor workers Children & young people Elderly Low-income households Persons living in sub-standard housing Persons with disabilities Women & girls 	30-40%	Urban inundation can lead to traffic disruption and risk of compromised access to clean water. Moreover, untreated waste disposal may cause environmental pollution and potential disease outbreaks.
 <p>River flood</p>	<ul style="list-style-type: none"> Agriculture Fishery Education Emergency services Public health Residential Community & culture Transportation Waste management Water supply & sanitation 	<ul style="list-style-type: none"> Children & young people Elderly Low-income households Persons living in sub-standard housing Persons with disabilities Women & girls 	<10%	River floods may cause displacement, housing damage, production damage, and potential disease outbreaks.

(Source: GCoM Asia, 2023)

Adaptation Goals and Action Plan





Adaptation goals: Improve the resilience of Nam Dinh’s social infrastructure to climate risks such as urban inundation, extreme heat waves, and hurricanes through coordinated implementation of both structural and non-structural solutions.

Adaptation actions:

- Implement real-time forecasting and warning systems for urban inundation, along with assessing the potential damage to vulnerable elements.
- Raise officials’ and public understanding of climate change impacts on social infrastructure, integrating climate change adaptation solutions into the city’s socio-economic development plans and master plans.
- Actively plan and establish preconditions for disaster prevention and mitigation, focusing on climate hazards.
- Improve the resilience of transportation, irrigation, water supply, drainage infrastructure, and civil works to withstand the impacts of climate change.
- Ensure that the city’s socio-economic development plans and master plans are updated and supplemented with climate change adaptation strategies, especially concerning urban inundation, heat waves, and severe storms.

GHG Inventory

Total of emissions: 969,824 tons CO₂e based on 2020 base year.

Sector	 Stationary energy	 Transportation	 Waste	 AFOLU
Emissions (tons CO ₂ e)	767,922	103,049	98,853	4,206
Emissions (%)	79	11	10	0

(Source: GCoM Asia, 2023)

Mitigation Target

In line with Vietnam’s national target, Nam Dinh commits to reducing 9% of GHG emissions.

GHG Emissions 2010 (tons CO ₂ e)	GHG Emissions 2020 (tons CO ₂ e)	GHG Emission 2030 (BaU Scenario) (tons CO ₂ e)	Reduction Target (tons CO ₂ e)
380,776	969,824	1,289,702	116,073.18

(Source: GCoM Asia, 2023)

Mitigation Actions

- Establish a comprehensive database to monitor GHG emissions in the city.
- Increase investment in the construction of ecological and circular industrial parks and clusters.
- Promote energy-efficient technologies and business models through awareness- campaigns and technology transfer.
- Encourage investment in rooftop solar power systems for both organisations and households.
- Improve the efficiency of integrated solid waste management, focusing on increasing household and industrial waste collection and classification rates at the source.
- Implement waste treatment measures such as methane recovery, waste-to-energy conversion, and recycling.
- Prioritise the development of urban agricultural models with an emphasis on organic farming, using organic fertilisers from domestic solid waste treatment.
- Integrate GHG emission reduction and absorption targets into the city's socio-economic development plans.

Priority Actions


- Conduct a thorough investigation and evaluation to develop a real-time digital map of climate risks and flood maps.
- Invest in the construction of an urban drainage system to limit flooding during the rainy season.
- Research and implement nature-based solutions (NbS) for surface water management.
- Expand public and green spaces in the city.
- Conduct regular GHG inventories and develop a comprehensive GHG emission database, with a focus on major emitters.
- Implement energy efficiency programmes for both production and daily life.
- Install solar energy systems for lighting in low-income households.
- Enhance integrated solid waste management by implementing a waste sorting system at the source and centralised collection for waste-to-energy purposes.
- Develop and implement campaigns to raise awareness of climate change response initiatives.
- Mobilise resources to implement climate change adaptation and mitigation measures through dedicated projects.

City Profile

Population	81,857
Population Density	120,135 people/ km ²
Land Area	681.37 km ²
Total Districts	16 districts
Programme Partnership	GCoM Asia



Key economic activities:
Trade and service, Industry and construction, and Agriculture, forestry and fishery




City Goals

Sa Pa aims to become a proactive local responder to climate change, utilising natural resources effectively and sustainably while gradually reducing reliance on fossil fuels. The town envisions a shift towards renewable energy as the main energy source, fostering a balanced living environment and prioritising ecological preservation. Sa Pa seeks to cultivate a green, naturally harmonious, and environmentally friendly economy


(Source: GCoM Asia, 2023)

Climate Profile



Rainfall

Average Annual	Average Increase ³⁷
2,762 mm	Up to 73.1 %



Local Temperature

Mean Minimum	Mean Maximum	Increase ³⁷
10°C – 12°C	18°C – 20°C	2.3 – 2.4°C

(Source: GCoM Asia, 2023)

Climate Risk

Climate Hazard	Most Vulnerable Sectors	Most Vulnerable Populations	Percentage of the Exposed Populations
 Heavy precipitation	<ul style="list-style-type: none"> Agriculture & Forestry Aquaculture Water supply Waste management Transportation Storage of goods Education Health Social work Leisure and entertainment Trade and services Tourism 	<ul style="list-style-type: none"> Women and children Elderly Low-income households Outdoor workers People living in makeshift homes Persons with disabilities People involved in production and service providers 	30-40%

Climate Hazard	Most Vulnerable Sectors	Most Vulnerable Populations	Percentage of the Exposed Populations
 Snow and ice	<ul style="list-style-type: none"> • Agriculture & Forestry • Fishing • Water supply • Waste Management • Environment & Biodiversity • Transportation • Storage of goods • Education • Health • Social work • Leisure and entertainment • Trade and services • Tourism 	<ul style="list-style-type: none"> • Women and girls • Elderly • Indigenous population • People with vulnerable health • Low-income households • Outdoor workers • Persons with disabilities • People involved in production and service providers 	50-60%
 Extreme cold	<ul style="list-style-type: none"> • Husbandry and cultivation • Aquaculture • Transportation • Storage of goods • Education • Health • Social work • Leisure and entertainment • Trade and services • Tourism 	<ul style="list-style-type: none"> • Women and children • Elderly • Low-income households • Outdoor workers • People living in makeshift homes • Persons with disabilities 	70-80%
 Extreme wind	<ul style="list-style-type: none"> • Cultivation • Transportation • Storage of goods • Education • Health • Social work • Leisure and entertainment • Trade and services • Tourism 	<ul style="list-style-type: none"> • Women and children • Elderly • Low-income households • Outdoor workers • People living in makeshift homes • Persons with disabilities 	40-50%
 Landslide	<ul style="list-style-type: none"> • Transportation • Storage of goods • Education • Health • Social work • Trade and services • Tourism 	<ul style="list-style-type: none"> • Women and children • Elderly • Low-income households • Outdoor workers • People living in makeshift homes • Persons with disabilities 	20-30%
 Urban inundation	<ul style="list-style-type: none"> • Transportation • Storage of goods • Education • Health • Social work • Waste management • Leisure and entertainment • Trade and services • Tourism • Emergency services 	<ul style="list-style-type: none"> • Women and children • Elderly • Persons with disabilities • Tourists 	20-30%
 Drought	<ul style="list-style-type: none"> • Husbandry and cultivation • Aquaculture • Transportation • Storage of goods • Health • Forestry (forest fire) • Travel services 	<ul style="list-style-type: none"> • Women • Elderly • Households with farming as their main income • Outdoor workers 	50-60%
 Hail	<ul style="list-style-type: none"> • Agriculture • Transportation • Storage of goods • Education • Health 	<ul style="list-style-type: none"> • Households with farming as their main income • Students • Outdoor workers 	30-40%

(Source: GCoM Asia, 2023)

Adaptation Goals and Action Plan





Adaptation goals: Enhance the resilience of Sa Pa's natural, economic, and social systems to recurrent climate risks such as heavy rain, whirlwinds, floods, landslides, snow, ice, and prolonged heat waves. This entails implementing a comprehensive blend of both structural and non-structural solutions (GCoM Asia, 2023).

Adaptation actions:

- Conduct assessments of climate change impacts, vulnerability, risks, losses and damages across different regions, sectors, and population groups considering climate change scenarios and socio-economic developments.
- Prioritise investment and application of quantitative rain forecasting technologies for real-time warnings of flash floods, drainage floods, and landslides.
- Ensure the resilience of vital river and stream embankments, irrigation systems, drainage canals, and reservoirs to support agricultural production and community livelihoods, particularly during dry seasons.
- Implement sustainable livelihood development programmes, with a focus on agricultural and forestry models adapted to climate change.
- Provide education and capacity-building initiatives to enhance climate change adaptation and reduce disaster risks.

GHG Inventory

Total of emissions: 177,255 tons CO₂e based on 2020 base year.

Sector	 Stationary energy	 Transportation	 Waste	 AFOLU
Emissions (tons CO ₂ e)	60,129	22,650	17,325	77,151
Emissions (%)	33.92	12.78	9.77	43.53

(Source: GCoM Asia, 2023)

Mitigation Target

In line with Vietnam's national target, Sa Pa commits to reduce 9% of GHG emissions.

GHG Emissions 2010 (tons CO ₂ e)	GHG Emissions 2020 (tons CO ₂ e)	GHG Emission 2030 (BaU Scenario) (tons CO ₂ e)	Reduction Target (tons CO ₂ e)
149,423	177,255	1,162,352	104,611.68

(Source: GCoM Asia, 2023)

Mitigation Actions

- Implement regular GHG inventories and develop a comprehensive database of Sa Pa's emissions, categorised by sector and region.
- Improve energy efficiency in both industrial activities and daily life through increasing awareness, adopting advanced technologies, and restructuring transportation, trade, and service sectors.
- Encourage investment in rooftop solar power systems for both organisations and households.
- Expand and integrate public transportation networks, facilitating the transition from fossil fuels to renewable energy sources.
- Improve the efficiency of solid waste management by enhancing waste collection and sorting at the source, implementing methane recovery measures, and converting waste into organic fertilisers.
- Develop organic agriculture, regenerative agriculture, and agro-forestry models to enhance carbon sequestration capabilities.
- Increase investment in the preservation and expansion of natural forest areas to enhance carbon sequestration capacity within forest ecosystems.
- Promote education and awareness campaigns aimed at both production facilities and consumers to emphasise the importance of reducing GHG emissions.

Priority Actions

Priority Action	Period
Develop and integrate climate risk maps, including inundation maps and landslide maps using geographic information system (GIS) to identify vulnerable areas	Up to 2025
Identify flood-prone and landslide-prone areas to prioritise investment in projects aimed at mitigating these risks	Up to 2025
Invest in forest management and protection, forest fire prevention, and agroforestry models to promote sustainable agricultural development and mitigate climate risks	Up to 2025
Organise training courses to raise awareness among staff and stakeholders on GHG inventory and climate risk assessment	Up to 2025
Implement solutions to reduce GHG emissions in energy use, waste management, agriculture, and forestry while enhancing carbon sequestration capacity	Up to 2025
Renovate water supply and drainage systems to mitigate urban flooding and landslides using both construction solutions and nature-based solutions	2026-2030
Continue to implement communication programmes to educate officials and residents about their roles in climate change response, promoting sustainable development and positioning the town as a green tourism destination with low emission accommodations	2026-2030

(Source: GCoM Asia, 2023)

Tam Ky

City Profile

Population	122,374
Population Density	1,321 people/km ²
Land Area	92.63 km ²
Total Districts	19 districts
Programme Partnership	IUC Asia





Key economic activities:
Textiles/garment, wood processing, mechanics, and electrical machines




(Source: IUC Asia, 2021)

Key economic activities: Textiles/garment, wood processing, mechanics, and electrical machines.

Climate Profile

			
Rainfall	Local Temperature		
Average Annual⁵	Mean Minimum	Mean Maximum³⁸	Increase³⁵
2,853 mm	-	25.9°C	10C -3.4°C

Climate Risk

Climate Hazard		
 Flood	 Heatwave	 Rising Temperature

(Source: IUC Asia, 2021)

Adaptation Goals and Action Plan

Adaptation Goals

Element	Adaptation Goals
Population	Strengthen the adaptive capacity of communities and households, especially vulnerable groups such as infants, elderly people, street workers, particularly in flood-prone areas (Tam Thang commune, Tan Thanh, Phuoc Hoa, and Hoa Huong ward)
Infrastructure	Develop roads, power supply stations and electricity lines, water supply systems, and freshwater reservoirs
Land use	Develop a climate-resilient urban agriculture, particularly in flood-prone areas, as well as increasing green areas in the city

(Source: IUC Asia, 2021)




5. <https://en.climate-data.org/asia/vietnam/quang-nam-province/tam-ky-4257/>

Adaptation actions:

- Establish social housing and healthcare centres
- Implement children protection programme.
- Raise awareness on disaster risk reduction measures.
- Implement an early warning system.
- Conduct training sessions on the use modern communication devices for fishermen.
- Upgrading the drainage system.
- Implement a regular, integrated and event-based maintenance.
- Integrate climate risks in designing and construction process.
- Undergrounding the electricity line system for the city.

GHG Inventory

Total of emissions: 341,639 tons of CO₂e




Sector	 Stationary Energy	 Transportation	 Waste
Emissions (%)	79	13	8

(Source: IUC Asia, 2021)

Mitigation Target

In line with Vietnam’s national target. Tam Ky commits to reducing its GHG emissions by around 9% compared to the BaU 2030 scenario.

Mitigation Actions

Sector	Mitigation Action
 Stationary Energy	<ul style="list-style-type: none"> • Implement energy saving programme • Introduce solar panels and wind power stations in suitable communities
 Transportation	<ul style="list-style-type: none"> • Implement a public transportation programme • Improve bus infrastructure, services, and operations • Establish improved facilities for public transportation users and bikes, such as free bike parking stations and bike rental services • Improve fuel economy and reduce emissions from buses and/or light rails
 Waste	<ul style="list-style-type: none"> • Enhance clean water supply • Introduce water pricing and water conservation schemes • Implement water recycling and reclamation measures • Develop recycling or composting facilities • Implement waste prevention policies and programmes • Improve the efficiency of waste collection • Implement the separation of recyclables and organic waste from other types of waste

(Source: IUC Asia, 2021)

National Context: Vietnam

Vietnam, located in the eastern part of the Indochinese peninsula boasts a long coastline along the South China Sea. Vietnam's climate is heavily influenced by monsoons, featuring four distinct seasons in the north and two seasons in the south. The climate varies significantly between regions, influenced by factors such as topography, latitude, and proximity to the sea.

The average annual temperature ranges from 22 degrees Celcius to 27 degrees Celcius, and the average annual rainfall ranges from 1,500 mm to 3,000 mm. Climate projections indicate a temperature increase of approximately 1.0 degree Celcius to 3.4 degrees Celsius by the end of the 21st century, which could significantly impact human health, livelihoods, and ecosystems. According to INFORM RISK32 2023, Vietnam faces a relatively low to medium level of risk from climate-related disasters, with high exposure to floods in river and coastal areas, as well as cyclones. This risk is exacerbated by precipitation increases of 10% to 20% under scenarios of RCP 4.5 and 8.5 (World Bank, 2020).

National Policies Supporting Climate Action





- National Climate Change Strategy to 2050.
- Master plan for the Mekong Delta in the period of 2021-2030.
- Vision to 2050.
- National system of monitoring and evaluation of climate change adaptation activities.
- Circular No. 01/2022/TT-BTNMT detailing the implementation of the Law on Environmental Protection in response to climate change.
- National adaptation plan.
- Resolution No. 76/NQ-CP on natural disaster prevention and control
- Resolution No. 120/NQ-CP of the government on climate resilience and sustainable development of the Mekong Delta.
- Decree No. 119/2016/ND-CP of the Government on a number of policies on management, protection and sustainable development of coastal forests to respond to climate change.

Adaptation Goals and Action Plan

- Implement climate monitoring and early warning systems for natural disasters.
- Implement natural disaster response and flood prevention measures for major cities, including reinforcement of river dykes, sea dykes, and reservoir safety.
- Ensure food security.
- Ensure water security through sustainable management practices.
- Build climate-resilient communities.
- Protect and sustain developing forests, as well as preserving biodiversity.

GHG Inventory

Vietnam emitted around 316,734,960 tons of CO₂e in 2016, equal to 19.9% compared to the 2010 base year.

Sector	 Energy	 IPPU	 AFOLU	 Waste
Emissions (tons CO ₂ e)	205,832,200	46,094,640	44,069,740	20,738,380
Emissions (%)	65	14.6	13.9	6.5

(Source: Government of Vietnam, 2022)





Mitigation Target

Vietnam commits to reducing its GHG emissions by around 9% compared to the BaU 2030 scenario utilising domestic resources. Moreover, Vietnam has increased its NDC by around 27% with international support.

GHG Emissions 2014 (tons CO ₂ e)	GHG Emissions 2016 (tons CO ₂ e)	GHG Emission 2030 (BaU Scenario) (tons CO ₂ e)	Reduction Target (tons CO ₂ e) with domestic resource	Reduction Target (tons CO ₂ e) with international support
284,000,000	316,734,960	927,900,000	83,511,000	67,643,910

(Source: Government of Vietnam, 2022)

Mitigation Actions

Sector	Mitigation Action
 <p>Energy</p>	<ul style="list-style-type: none"> Invest in energy-saving and energy-efficient projects for production, manufacturing, renovation, and conversion Utilise energy-efficient household appliances as well as electrical equipment in industries and commerce Implement energy efficiency measures in industries Promote the development of renewable energy sources Implement energy efficiency measures in transportation Shift from private to public means of transport Shift from conventional fuels to biofuel, natural gas and electricity Enhance technology in manufacturing construction materials Reduce clinker content and implement other measures to reduce GHG emissions in cement production Develop and utilise energy-saving construction materials and green materials in housing and commercial sectors
 <p>Agriculture</p>	<ul style="list-style-type: none"> Implement management and technological solutions in agriculture and animal husbandry practices Utilise technology to treat and reuse of by-products and waste in agriculture and livestock production
 <p>LULUCF</p>	<ul style="list-style-type: none"> Conserve forests and forest land to increase carbon sequestration and forest certification Planting and developing forests Define areas for restoring natural forests Develop agroforestry models to enhance carbon stocks and land conservation
 <p>Waste</p>	<ul style="list-style-type: none"> Implement measures to manage, develop, and apply technology for the treatment of domestic solid waste, ordinary industrial solid waste, and special solid waste
 <p>Industrial process (IP)</p>	<ul style="list-style-type: none"> Implement measures for grinding blast furnace slag, fly ash, pozzolana, and limestone to replace clinker in cement production Reduce the consumption of hydrofluorocarbons (HFCs)

(Source: Government of Vietnam, 2022)

5.5 Philippines

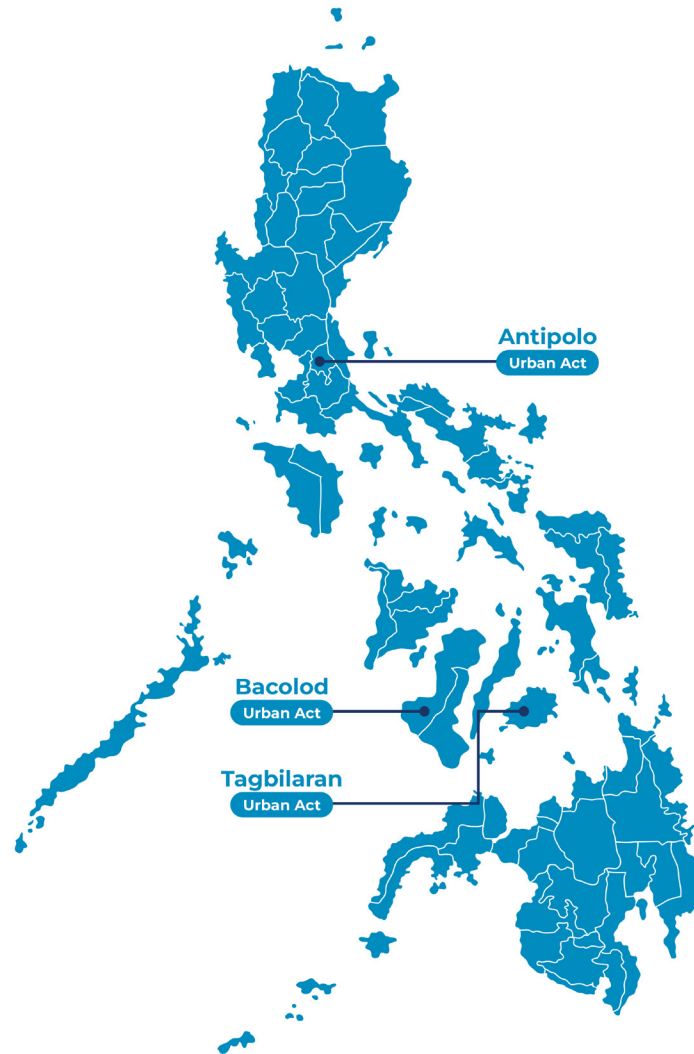


Figure 13: Pilot Cities in the Philippines Tagged with Climate Programmes

In the Philippines, UCLG ASPAC supports three cities in developing CAPs through the Urban-Act programme (Figure 13), namely Antipolo, Bacolod, and Tagbilaran. These cities are in the early stages of identifying their needs to develop the plans.

National Context: Philippines

The Philippines, an archipelago in Southeast Asia, boasts a tropical maritime climate characterised by high temperatures and humidity levels. The country experiences distinct wet and dry seasons, with an average temperature of 27 degrees Celcius throughout the year. Rainfall varies widely across regions, ranging from 960 mm to 4,050 mm annually. Projections indicate a temperature increase of approximately 1.9 degrees Celcius based on the RCP 4.5 scenario while based on RCP 8.5 is 3.2 degrees Celcius by the end of the 21st century. The country is vulnerable to climate-related risks, such as typhoons, floods, and landslides. According to INFORM RISK32 2023, the Philippines faces a medium to high risk of climate-related disasters, with significant exposure to typhoons and flooding (World Bank and ADB, 2021).

Vision on Climate Change Framework: “A climate risk-resilient Philippines with healthy, safe, prosperous and self-reliant communities, and thriving and productive ecosystems.”

The goal of the Climate Change Framework is to build the adaptive capacity of communities, increase the resilience of natural ecosystems to climate change, and optimise mitigation opportunities towards more sustainable development.

National Policies Supporting Climate Action

- Climate Change Act of 2009, Republic Act No. 9729
- Amended Climate Change Act, Republic Act No. 10174
- National Framework Strategy on Climate Change 2010-2022
- National Climate Change Action Plan 2011-2028
- Philippine Development Plan 2017-2022
- Philippine Energy Plan 2018-2040
- Philippine National Security Policy 2017-2022
- National Climate Risk Management Framework of 2019
- Sustainable Finance Policy Framework of 2020

Adaptation Goals and Plan

The Philippines’ long-term objective in adaptation is to build the communities’ adaptive capacity and increase the resilience of natural ecosystems to climate change (Office of the President Climate Change Commission, 2010). In line with those objectives, the country established the seven thematic areas of government action to address climate change (Climate Change Commission, 2011).

Sectors	Description
Food security	Ensure availability, stability, accessibility, and affordability of safe and healthy food amidst climate change
Water sufficiency	Implement a comprehensive review and subsequent restructuring of the entire water sector governance. This includes assessing the resilience of major water resources and infrastructures, balancing supply and demand, ensuring water quality management, and fostering conservation efforts
Ecological and Environmental stability	Protect and rehabilitate critical ecosystems as well as the restoration of ecological services
Human security	Mitigate the risks of women and men to the impacts of climate change and natural disasters
Climate-friendly industries and services	Prioritise the creation of green jobs and sustainable consumption and production practices. Emphasise on the development of sustainable cities and municipalities
Sustainable energy	Promote and expand energy efficiency and conservation, alongside the development of sustainable and renewable energy sources. Support the development of environmentally sustainable transport and the climate-resilient rehabilitation of energy infrastructures
Knowledge and capacity development	Enhance the science of climate change, capacity for climate change adaptation, mitigation and disaster risk reduction at the local and community level, as well as establish gendered climate change knowledge management accessible to all sectors at the national and local levels

(Source: Climate Change Commission, 2011)







The Philippines will implement adaptation measures across various sectors, including those mentioned above. The country will also strive to adopt equitable adaptation and mitigation strategies. The Philippines has taken several measures developed into several key strategies as follows (Office of the President Climate Change Commission, 2010) (Government of Philippines, 2021).

Measures	Key Strategies
Enhanced Vulnerability and Adaptation Assessments	<ul style="list-style-type: none"> • Develop targeted vulnerability assessment tools • Address gaps in existing approaches • Increase knowledge dissemination for adaptation in marginalised sectors
Integrated Ecosystem-based Management	<ul style="list-style-type: none"> • River Basin Management: Restore watersheds through enhanced governance, bolster ecosystem services, and implement comprehensive river basin management strategies, fostering inclusive partnerships for sustainable climate resilience and biodiversity conservation • Coastal and Marine System: Establish marine reserve networks with the community to replenish biodiversity, prioritise protection of key marine ecosystems, strengthen multi-sectoral coastal management, and enhance ecotourism while managing and expanding the carbon sink potential of marine ecosystems for mitigation purposes • Biodiversity: Establish national standards and indicators for biodiversity monitoring, enhance coordination across sectors for conservation and climate adaptation, protect vulnerable ecosystems and species, build institutional capacities, establish a scientific basis for climate impacts on biodiversity, and secure sustainable funding for adaptation programmes
Water Governance and Management	<ul style="list-style-type: none"> • Improve water governance for climate resilience • Integrate adaptation measures into water policies • Reform fragmented water sector institutions • Develop innovative financing for community water management • Develop climate-proof water infrastructure • Adopt low-cost adaptation technologies • Build capacity for Integrated Water Resources Management (IWRM) • Provide science-based water information for decision-makers
Climate-Responsive Agriculture	<ul style="list-style-type: none"> • Enhance ecosystem resilience through management and conservation, including eco-friendly economic activities such as ecotourism • Boost agricultural resilience with climate-sensitive technologies and infrastructure, while supporting vulnerable communities • Enhance the fishery sector's resilience via habitat restoration and sustainable technologies • Increase investments in aquaculture and food production • Improve crop insurance for weather-related risks • Strengthen community-based resource management for sustainability
Climate-Responsive Health Sector	<ul style="list-style-type: none"> • Assess health sector vulnerability to climate change • Enhance climate-responsiveness of public health systems • Establish mechanisms for disease control and surveillance in climate-sensitive conditions
Climate-Proofing Infrastructure	<ul style="list-style-type: none"> • Set baseline data for infrastructure climate adaptation • Collaborate with diverse stakeholders on developing adaptation plans • Integrate climate adaptation into infrastructure policy and planning
Disaster Risk Reduction	<ul style="list-style-type: none"> • Implement responsive policies for disaster risk reduction • Utilise the best available tools for risk management • Build capacity for disaster preparedness • Enhance monitoring and early warning systems • Integrate climate and disaster risk planning into development processes

(Source: Office of the President Climate Change Commission, 2010)

GHG Inventory

In the year 2000, the Philippines emitted approximately 21,767,410 tons of CO₂e with LUCF included. Without considering LUCF, the emissions amounted to around 126,878,780 tons of CO₂e (Office of the President Climate Change Commission, 2010). Subsequently, the Philippines included the transport sector in 2018 (Climate Change Office-Climate Change Commission Republic of Philippines, 2018). In 2010, the Philippines emitted 144,353,000 tons of CO₂e without LUCF and 107,346,000 tons of CO₂e with LUCF. By 2020, the number of emissions has reached 1,98 Mt CO₂e (Government of Philippines, 2021).

Sector	GHG Emission (tCO ₂ e) in 2000	% GHG Emission in 2000	GHG Emission (tCO ₂ e) in 2010	% GHG Emission in 2010
 Energy	69,667,240	55	53,105,000.00	37
 Industrial Processes	8,609,780	7	8,363,000.00	6
 Agriculture	37,002,690	29	43,152,000.00	30
 Waste	11,599,070	9	15,559,000.00	11
 Transport	-	-	24,174,000.00	17
 LUCF	-105,111,370		037,007,000.00	
Total with LUCF	21,767,410		107,346,000	
Total Without LUCF	126,878,780		144,353,000	

(Source: Office of the President Climate Change Commission, 2010 and Climate Change Office-Climate Change Commission Republic of Philippines, 2018)

Mitigation Goals and Plan






According to the Philippines' NDC statement, the country has set a target to reduce GHG emissions by approximately 2.71% in unconditional conditions and 72.29% in conditional conditions by 2030. (Government of Philippines, 2021). These targets aim to mitigate the BaU 2030 scenario which projected around 3,340.3 Mt CO₂e of emissions. The long-term objective is to facilitate the transition to sustainable development by reducing GHG emissions.



Sector	Key Strategy
 <p>Energy</p>	<ul style="list-style-type: none"> Enhance energy efficiency and conservation while ensuring a stable, long-term reliable power supply through reinforcement of energy infrastructure, diversification of energy sources, and conducting research and development (R&D) in new technologies Maintain a competitive energy investment climate Increase utilisation of alternative fuels and other energy conservation programmes Promote the use and development of renewable and alternative energy sources, such as geothermal and hydropower plants Double renewable energy capacity from 4,500 MW to 9,000 MW in 2030. Implement energy-efficient measures for buildings, ranging from residential areas to government and private sector buildings
 <p>Transport</p>	<ul style="list-style-type: none"> Implement Public Utility Vehicle Modernisation Phase 1 Implement Motor Vehicle Inspection System Phase 1 BRT Cebu and Quezon Avenue Build Rail projects under the BBB Programme Convert public utility vehicles to LPG and renewable energy sources
 <p>Water</p>	<ul style="list-style-type: none"> Expand Wastewater Treatment Facilities in compliance with Supreme Court Mandamus on Manila Bay
 <p>IPPU</p>	<ul style="list-style-type: none"> Substitute clinker with supplementary cementitious materials in cement production Shift to Low-Global Warming Potential (GWP) refrigerants
 <p>LUCF</p>	<ul style="list-style-type: none"> Review and formulate policies to enhance forestry's emission reduction and carbon stock efforts, while ensuring adherence to social and environmental safeguards in REDD+ implementation. Enhance REDD+ governance through appropriate institutional setups, engaging stakeholders for equitable benefit sharing with local units and communities Foster a watershed-focused approach for REDD+, enhancing forest protection, carbon stocks, and biodiversity sustainably Collaborate on a science-driven REDD+ research agenda to identify deforestation drivers, national baselines, and socio-policy aspects Implement subnational REDD+ MRV systems, scaling up to a national level, and bolstering capacities and resources Develop a national REDD+ communication strategy and capacity-building initiative to engage stakeholders effectively Pursue diverse funding avenues for REDD+, ensuring financial resilience and supporting local sustainability programmes
 <p>Waste Management</p>	<ul style="list-style-type: none"> Enhance the implementation of the Ecological Solid Waste Management Act Promote best practices in waste management, involving all categories of waste Strengthen advocacy for proper waste management to effectively communicate and mobilise the public to address climate change

(Source: Office of the President Climate Change Commission, 2010 and Climate Change Office-Climate Change Commission Republic of Philippines, 2018)






5.6 Other Southeast Asian Countries



Brunei Darussalam

Target by Sector		
 <p>Energy</p> <ol style="list-style-type: none"> 1. Optimise renewable energy share in the power generation mix by 2035. 2. Achieve at least a 10% reduction of GHG emissions in the power sector through energy efficiency and conservation. 3. Implement carbon pricing on all industrial facilities by 2025. 	 <p>Transport</p> <p>Aim for a 60% electric vehicle share of total annual vehicle sales by 2035.</p>	 <p>Forestry</p> <p>Increase forest reserves by enhancing the carbon sink through reforestation, with a target of planting 500,000 trees by 2035.</p>
	 <p>Industrial</p> <p>Strive to achieve zero routine flaring and reduce other industrial emissions by adopting the 'As Low As Reasonable Possible' (ALARP) principle.</p>	 <p>Waste</p> <p>Target a reduction in municipal waste to landfills to 1kg per person per day by 2035.</p>


Nature Target	Renewable Energy Mix Target
 <p>Forest reserves increased from 41% to 55% by 2035</p>	 <p>Target 30% renewable energy generation by 2035</p>

Cambodia





Target by Sector		
 <p>Energy Aim for a 21.3% reduction in GHG emissions by 2030 compared to the BAU projection, equivalent to 38.1 MtCO₂e.</p>	 <p>Agriculture Aim for a 9.6% reduction in GHG emissions by 2030 compared to the BAU projection, equivalent to 6.2 MtCO₂e.</p>	 <p>Food and Land Use (FOLU): Strive for a 59.1% reduction in GHG emissions by 2030 compared to the BAU projection, equivalent to 38.1 MtCO₂e.</p>
	 <p>Industry (IPPU) Target a 9.1% reduction in GHG emissions by 2030 compared to the BAU projection, equivalent to 5.9 MtCO₂e.</p>	 <p>Waste Target a 0.9% reduction in GHG emissions by 2030 compared to BAU projection, equivalent to 0.6 MtCO₂e.</p>

Nature Target	Renewable Energy Mix Target
 <p>Increase forest cover to 60% of total land area by 2030 and eliminate net loss in natural forests, mangroves, and seagrass cover by 2028.</p>	 <p>25% generation by 2030.</p>





Myanmar

Nature Target	Renewable Energy Mix Target
 <p>Increase the scope of forests under public protection to 30% of the total area by 2030.</p>	 <p>Aim for more than 39% of electricity generation share to come from renewable sources by 2030.</p>

Lao PDR

Target by Sector	
 <p>Address climate change at the highest policy level under the National Strategy (2018-2037).</p>	 <p>Put forward ambitious energy targets in the Power Development Plan (PDP), Alternative Energy Development Plan (AEDP), and Energy Efficiency Plan (EEP).</p>
Nature Target	Renewable Energy Mix Target
 <p>Increase forest cover to 70% of total land area by 2030.</p>	 <p>Strive for 30% of energy consumption to be sourced from renewable sources by 2025.</p>

Singapore

Target by Sector	
 <p>Aim to achieve 350 MWp of solar energy capacity by 2020 and at least 2 GWp by 2030.</p>	 <p>Implement a vehicle quota system to cap vehicle growth, setting the zero-growth rate for cars and motorcycles.</p>
Nature Target	Renewable Energy Mix Target
 <p>Plant 1 million more trees by 2030 and add 130 hectares of new parks by 2026.</p>	 <p>Target 2GWp of solar energy capacity solar energy by 2030 and 4GW of low-carbon imports by 2035.</p>

(Curated from: Bain & Company, Temasek, GenZero, and Amazon Web Services, 2023 and Yurnaidi, et al., 2021)

5.7 Regional Context: ASEAN

At COP25, the Association of Southeast Asian Nations (ASEAN) member states pledged their commitment to the Paris Agreement (PA), serving as a collective goal in fighting climate change. The pledge reaffirmed the member states' commitment to the United Nations Framework Convention on Climate Change (UNFCCC) with the detailed efforts outlined below (ASEAN, 2021).

- Implement measures to address climate change under the ASEAN Socio-Cultural Community (ASCC) Blueprint 2025.
- Promote sustainable management of forests, emphasising the importance of conservation, and enhancement of forest carbon stocks in developing countries through the Reducing Emissions from Deforestation and Forest Degradation (REDD+) framework.
- Align efforts to reduce energy intensity in line with the ASEAN Plan of Action for Energy Cooperation (APAEC) 2016-2025.
- Disseminate information on the ASEAN Regional Strategy on Sustainable Land Transport and the ASEAN Fuel Economy Roadmap for the Transport Sector 2018-2025, and the Guidelines for Sustainable Land Transport Indicators on Energy Efficiency and Greenhouse Gas Emissions in ASEAN.
- Strengthen ASEAN's capacity to manage climate-related disasters through existing mechanisms under the ASEAN Agreement on Disaster Management and Emergency Response (AADMER).
- Implement Phase 2 of the Plan of Action of the ASEAN Disaster Risk Financing and Insurance (ADRFI) and establish the Southeast Asia Disaster Risk Insurance Facility (SEADRIF) to enhance the financial resilience of AMS by improving disaster risk assessment, financing, and insurance solutions.
- Foster collaboration with ASEAN dialogue and sectoral dialogue partners, development partners, as well as other external stakeholders to enhance climate action in the ASEAN region.

06. City Initiatives: Reducing GHG Emissions and Aligning with National Climate Commitments

As of 2023, 28 Global Covenant of Mayors for Climate & Energy Southeast Asia (GCoM SEA) pilot cities in Indonesia, Vietnam, Malaysia, and Thailand participating in UCLG ASPAC's climate programmes have formulated comprehensive Climate Action Plans (CAPs). Serving as a strategic roadmap, these documents outline the cities' efforts to reduce greenhouse gas (GHG) emissions. This chapter offers a comprehensive overview of their GHG reduction efforts, comparing them against the Business as Usual (BaU) 2030 emissions scenario. Furthermore, the chapter examines how these cities contribute to Nationally Determined Contributions (NDCs) and explores the potential impacts of increased city participation in climate initiatives.

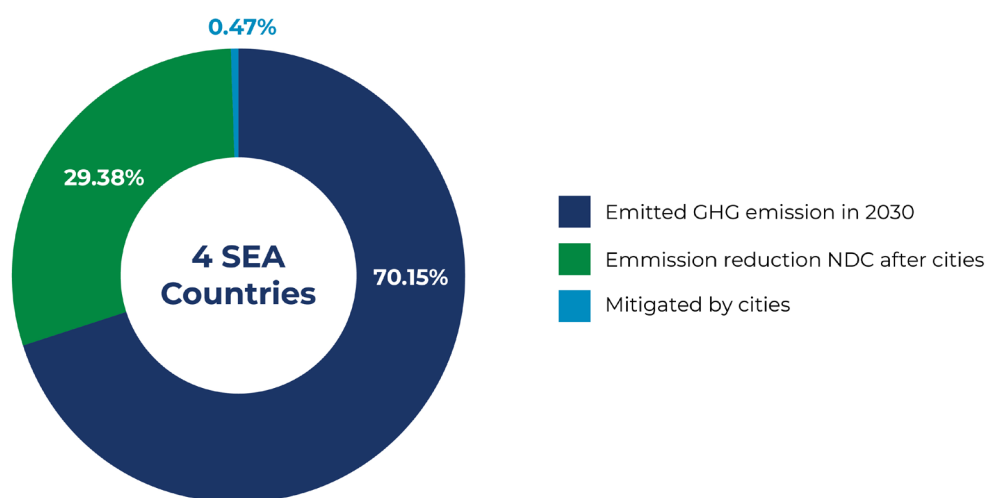


Figure 14: GHG Emission Reduction Contributions of Pilot Cities to the NDCs in 4 Studied SEA Countries

According to BaU 2030, the four observed SEA countries (Indonesia, Malaysia, Thailand, Vietnam) will collectively emit more than 4.8 billion tons of carbon dioxide equivalent (CO₂e). To combat this scenario, the countries have committed to reducing the GHG emissions of around 1.4 billion tons of CO₂e or around 29.85% by 2030. Through the combined climate efforts of the 28 pilot cities, it is possible to achieve 0.47% of GHG emissions reduction. This reduction translates to approximately 1.57% of the total emissions reduction targets outlined in the Nationally Determined Contributions (NDCs) of the respective countries, equating to around 22.6 million tons of CO₂e (Figure 14).

Figure 15 shows the contribution of the pilot cities in reducing GHG emissions against the BaU 2030 scenario. This study shows that Malaysia leads the effort in reducing GHG emissions, followed by Indonesia, Vietnam, and Thailand. Indonesia has the highest recorded emissions of the four countries, while its mitigation efforts remain comparatively behind Malaysia.

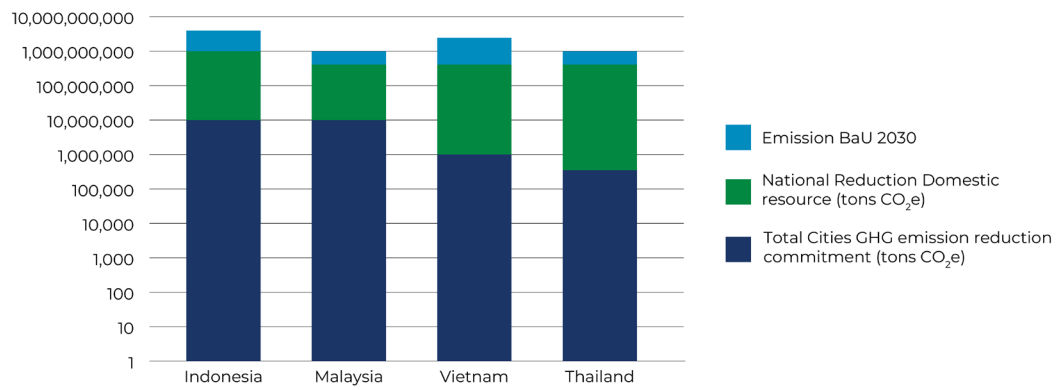


Figure 15: GHG Emission Reductions of Pilot Cities in 4 Studied SEA Countries Compared to BaU 2030 (in Logarithmic Scale)

Further details for each country’s emission projections and mitigation efforts are explained below in the sub-chapters.

6.1 Indonesia

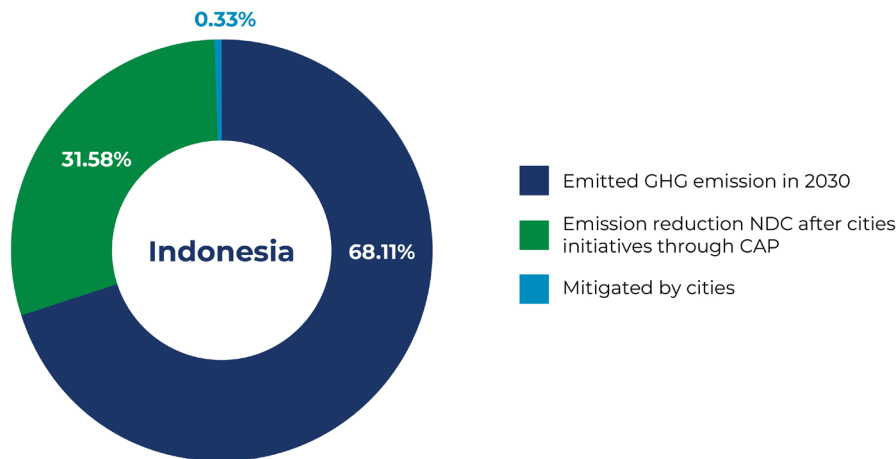


Figure 16: Indonesian Pilot Cities' Support to Unconditional NDC of Indonesia

According to the BaU 2030 scenario, Indonesia is projected to generate 2.87 billion tons of CO₂e emission. In response, Indonesia pledged to reduce their GHG emission by roughly 31.89% unconditionally and 43.2% conditionally. Nine pilot cities contribute to the commitment to reducing GHG emissions by around 10,647,185 tons of CO₂e. The combined initiatives of these 9 cities contribute to a reduction of around 0.33% against the BaU 2030 scenario (Figure 16). The involvement of these nine cities provides support equivalent to around 1.16% of Indonesia's unconditional NDC.

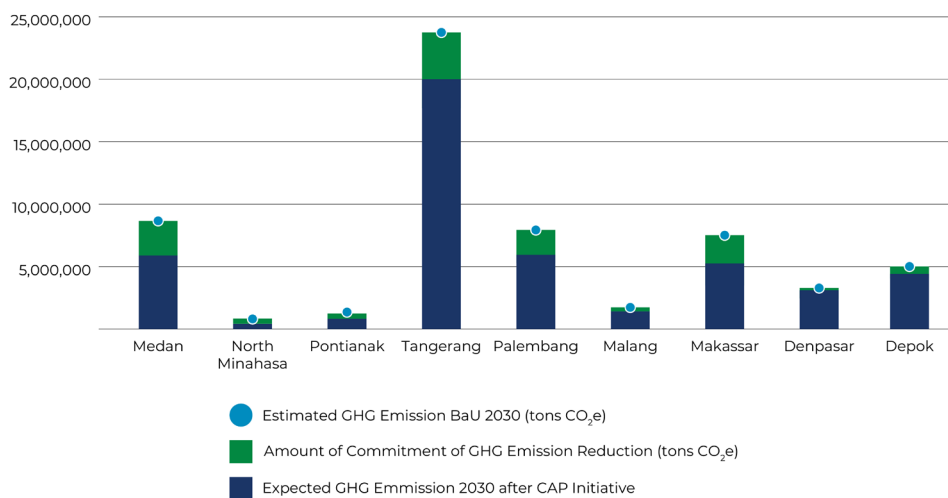


Figure 17: GHG Emission Reductions of Indonesian Pilot Cities

Among the 20 pilot cities in UCLG ASPAC's climate programmes in Indonesia, 9 have explicitly outlined their mitigation targets. On average, these 9 cities have successfully achieved a noteworthy reduction of approximately 17.84% in greenhouse gas (GHG) emissions compared to the Business as Usual (BaU) 2030 scenario. Medan demonstrates the highest proportional commitment, aiming to reduce GHG emissions by an impressive 27.8%. Tangerang City demonstrates a substantial commitment, pledging to reduce around 4 million tons of CO₂e, accounting for approximately 17.5% of their projected BaU emissions. Conversely, Denpasar displays the least proportional commitment at around 8%. Additionally, North Minahasa exhibits the lowest commitment to reducing GHG emissions, accounting for approximately 185 thousand tons of CO₂e, or 27.7% of their 2030 BaU scenario followed by Malang and Pontianak (Figure 17).

6.2 Malaysia

According to BaU 2030, Malaysia is estimated to emit around 469 million tons of CO₂e. In response, Malaysia has committed to reducing GHG emissions by around 45% of the BaU scenario or around 211.1 million CO₂e. In supporting the goal, the Malaysian pilot cities are capable of reducing 2.40% GHG emissions compared to the BaU 2030 scenario. The combined efforts contribute to Malaysia's NDC by around 5.34% or around 11.28 million tons of CO₂e (Figure 18).

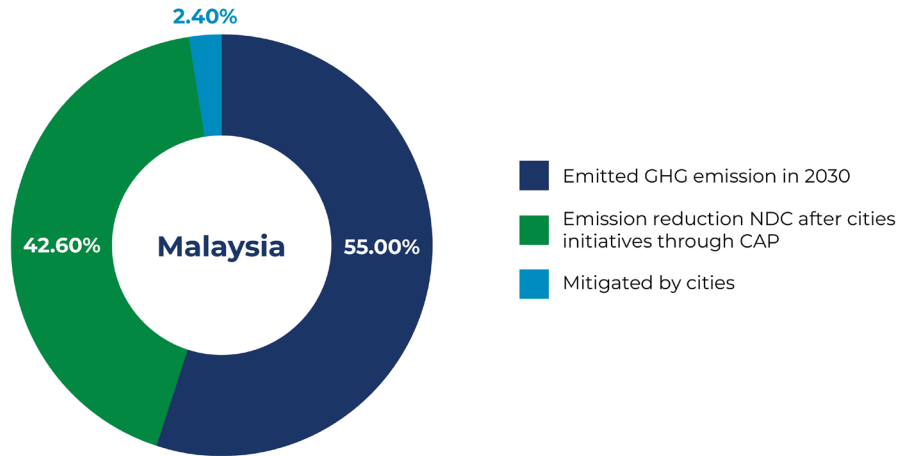


Figure 18: Malaysian Pilot Cities' Support to Unconditional NDC of Malaysia

The 8 pilot cities in Malaysia, collectively demonstrate a strong commitment to reducing GHG emissions by 2030. Their GHG emissions under BaU scenarios range from 674,471.10 to 7,220,629.58 tons of CO₂e. Iskandar Putri records the highest emissions among the cities, while Penampang exhibits the lowest. The cities' commitments to reduction vary, with Iskandar Putri leading at a 63% reduction commitment, followed by Muar and Hang Tuah Jaya at 50% and 63% respectively (Figure 19). On average, Malaysia's pilot cities commit to a reduction of 47.125% in GHG emissions, resulting in a substantial total reduction commitment of 11,284,205.16 tons of CO₂e. This collective effort signifies a significant step towards achieving Malaysia's emission reduction targets by 2030.

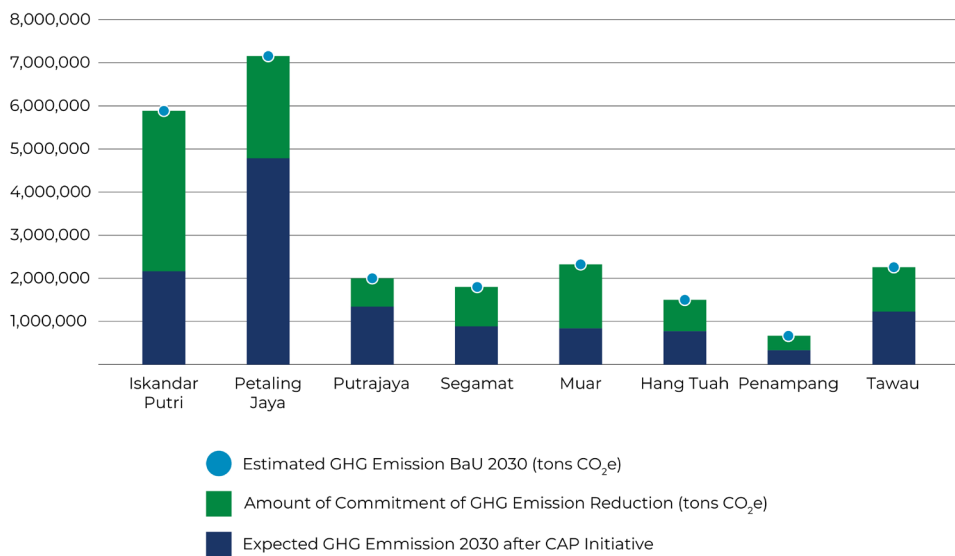


Figure 19: GHG Emission Reductions of Malaysian Pilot Cities

6.3 Thailand

Thailand's BaU 2030 scenario expect an emission output of 555 million tons of CO₂ e. Thailand has pledged a significant reduction of 29.95%, equivalent to around 166.5 million tons of CO₂ e. This ambition undertaking forms a pivotal part of Thailand's NDC, showcasing the nation's dedication to substantial climate action.

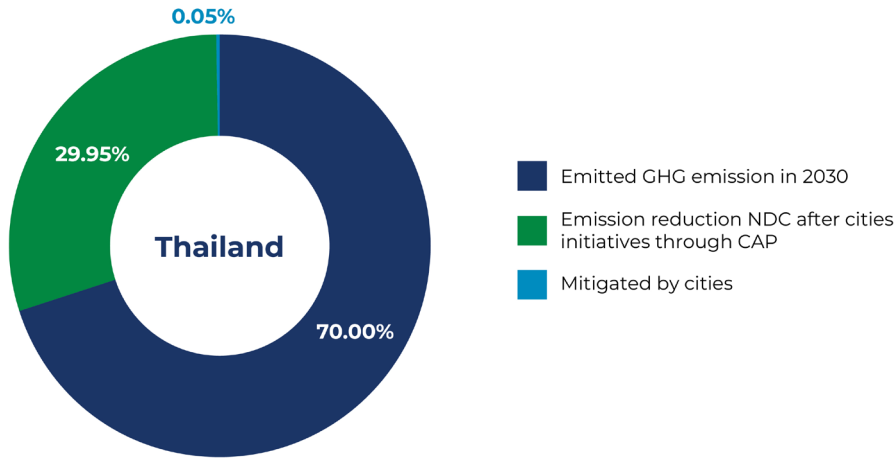


Figure 20: Thai Pilot Cities' Support to Unconditional NDC of Thailand

In alignment with Thailand's national targets, the 4 pilot cities in Thailand collectively contribute to a 0.05% reduction in GHG emissions by 2030 (Figure 20). This translates to 260,642 tons of CO₂ e mitigated through collaborative city-level initiatives. Furthermore, the collective efforts of these cities lead to a significant contribution of 0.16% towards Thailand's overarching NDC target.

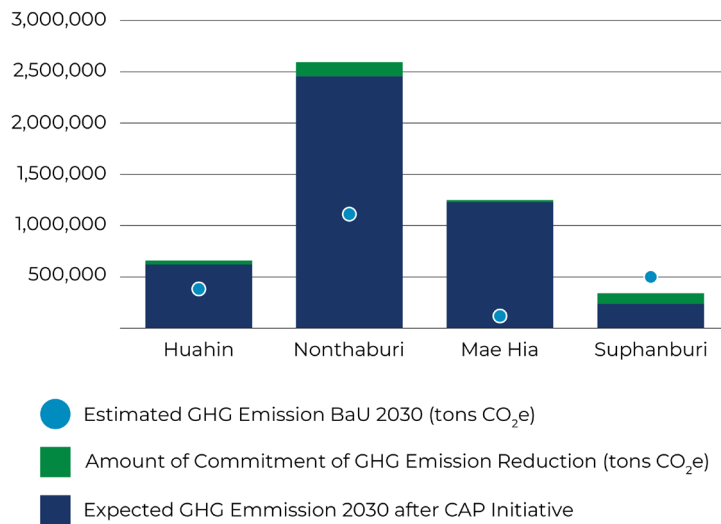


Figure 21: GHG Emission Reductions of Thai Pilot Cities

As indicated by the BaU 2030 estimates, each city engages with distinct emission scenarios. Nonthaburi, a significant urban centre, faces a substantial BaU 2030 emission estimate of 1,151,021.00 tons of CO₂e. However, Nonthaburi demonstrates its commitment by aiming to reduce emissions by 117,612.00 tons, contributing to an anticipated emission reduction of 1,033,409.00 tons of CO₂e by 2030 (Figure 21). In general, the average GHG reduction commitment across these cities stands at a commendable 14.445% against the BaU 2030 scenario.

6.4 Vietnam

Vietnam's BaU 2030 scenario anticipates a significant emission of 927,900,000 tons of CO₂e. In response to these estimates, Vietnam has undertaken a noteworthy pledge to reduce GHG emissions by 15.8%, equivalent to a reduction of approximately 146,608,200 tons of CO₂e. This cities' collective effort aligns with the country's NDC, showcasing a resolute commitment to sustainable environmental practices.

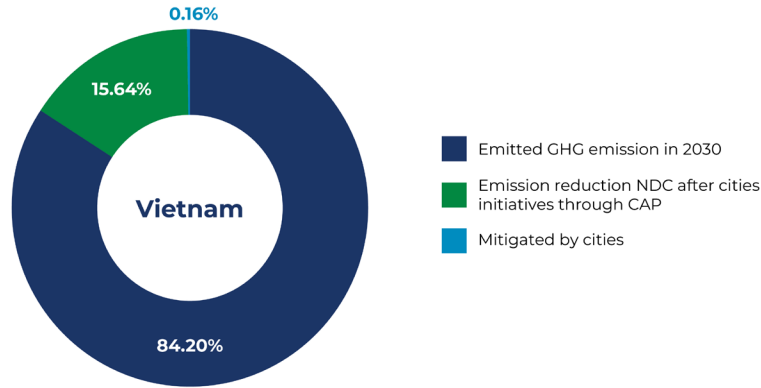


Figure 22: Vietnamese Pilot Cities' Support to Unconditional NDC of Vietnam

The collective effort of the 7 pilot cities in Vietnam marks a meaningful contribution, amounting to a 0.16% reduction in GHG emissions by 2030 (Figure 22). This equates to a mitigation of a substantial 1,483,657.67 tons of CO₂e. Furthermore, the cities' collaborative initiative translates into a significant 1.01% contribution to Vietnam's overarching NDC targets. This localised approach highlights the instrumental role of cities in the national pursuit of climate resilience, emphasising the effectiveness of decentralised initiatives in achieving broader environmental targets.

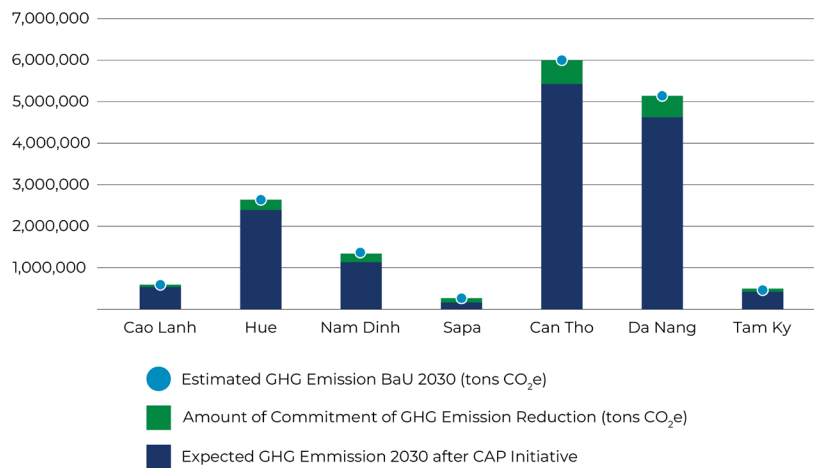


Figure 23: GHG Emission Reductions of Vietnamese Pilot Cities

Adhering to the BaU 2030 scenario, these cities face diverse emissions scenarios. For instance, Da Nang, as a bustling urban centre, faces a substantial BaU 2030 emission estimate of 5,083,507.32 tons of CO₂e. However, in a remarkable commitment to environmental conservation, the city aims to reduce 457,515.66 tons of CO₂e, contributing to an expected emission reduction of 4,625,991.66 tons by 2030 (Figure 23). Collectively, these cities align their reduction commitments, reaching 9% across the board, with the nation's broader climate action agenda outlined in their NDC.

6.5 Cities in Action: Unlocking GHG Reduction Potential with Increased Engagement of Cities

The Power of Cities in Reducing GHG Emissions against BaU 2030 in SEA Countries (%)				
No of Cities	Thailand	Vietnam	Indonesia	Malaysia
878	10.54			
800	9.60			
707	8.48	16.26		
700	8.40	16.10		
600	7.20	13.80		
514	6.17	11.82	19.02	
500	6.00	11.50	18.50	
400	4.80	9.20	14.80	
300	3.60	6.90	11.10	
200	2.40	4.60	7.40	
150	1.80	3.45	5.55	
149	1.79	3.43	5.51	44.85
100	1.20	2.30	3.70	30.10
50	0.60	1.15	1.85	15.05
40	0.48	0.92	1.48	12.04
30	0.36	0.69	1.11	9.03
20	0.24	0.46	0.74	6.02
10	0.12	0.23	0.37	3.01
5	0.06	0.12	0.19	1.51
4	0.05	0.09	0.15	1.20
3	0.04	0.07	0.11	0.90
2	0.02	0.05	0.07	0.60
1	0.01	0.02	0.04	0.30

Figure 24: The Hypothetical Assumption of Increased Engagement of Cities to Reduce GHG Emissions against the Countries' BaU Scenario 2030

Acknowledging the collective mission among SEA countries to reduce GHG emissions and limit the temperature increase to 1.5°C from pre-industrial levels, the ambitious goal for carbon reduction by 2030 becomes imperative for the betterment of the Earth. Recognising that achieving this goal requires more than efforts at the national level, the involvement of cities and local governments emerges as a pivotal factor in this critical endeavour. Cities, as illustrated in previous chapters, serve as hubs of urbanisation and major economic contributors, significantly influencing GHG emissions. Hence, immediate and robust actions are essential.

Twenty-eight cities designated as pilot projects by UCLG ASPAC, with significant support from GCoM, have committed to various measures outlined in their respective CAPs. Countries such as Indonesia, Malaysia, Vietnam, and Thailand exhibit notable progress in GHG emission reduction efforts. While the analysis is limited to 28 cities across the four countries in SEA, it provides a comprehensive overview of how cities can contribute to GHG reduction against BaU 2030 and align with NDCs.

If more cities were to adopt climate initiatives, they could collectively contribute to reducing emissions against the BaU 2030 scenario. For instance, a city in Indonesia could reduce approximately 0.01% against Indonesia's BaU 2030 scenario, while in Vietnam, it could be around 0.02%, and in Thailand, 0.04%. Extending this logic, if all 514 local governments in Indonesia embraced climate initiatives, they could collectively reduce Indonesia's BaU 2030 emissions by roughly 19.02%, a significant proportion of the enhanced NDC. Similarly, expanding climate initiatives to 878 local governments in Thailand could contribute approximately 10.54% of GHG emission reduction from Thailand's BaU 2030 scenario (Figure 24).

In Malaysia, the involvement of all 149 second-level administrations could lead to a substantial reduction of approximately 44.85% against Malaysia's BaU 2030 scenario, nearing the country's NDC target of 45%. The positive impacts of the cities' initiatives extend to Vietnam, where engagement from all 707 second-level administrations could potentially reduce GHG emissions by 16.26%, surpassing Vietnam's NDC of 15.8% (Figure 24). Dividing the responsibility for climate action among cities can provide significant support for SEA countries in achieving their NDCs. Therefore, policies that offer flexibility for cities capable of taking climate action are encouraged.

07. The Gaps in the Efforts

Cities in Southeast Asia (SEA) have committed to reducing their greenhouse gas (GHG) emissions, reflecting a shared goal for sustainability. To realise this, these cities must clearly outline their actions. This chapter aims to identify the gap between the proposed action plans and the efforts launched. Examining the gaps through Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis will highlight the challenges faced by cities in the region.

7.1 Indonesia

Table 2: SWOT Analysis from the CAPs of Indonesian Pilot Cities

Strength	Weakness
<ul style="list-style-type: none"> • Nine of 20 pilot cities have a Climate Action Plan (CAP), while the remaining cities are currently developing their CAPs. • Nine pilot cities have a GHG emission inventory. • Nine pilot cities have pledged to reduce GHG emissions by approximately around 17.83%. • CAPs have emphasised a clear focus on reducing GHG emissions. • Clear vision in adaptation and mitigation. • Align with regional development planning. • Clear focus on actionable measures, primarily on enhancing energy efficiency in buildings and street lighting. • Relatively comprehensive and robust government action plan. • Most of the action plans can be carried on by domestic resources. • Numerous interconnected products of local development planning. • Four cities have progressed one step closer to implementation. The cities have engaged with development partners and received grants to further advance their actions. 	<ul style="list-style-type: none"> • Lack of direct connection between adaptation and mitigation efforts. • Lack of innovative actions. • Lack of community-based climate actions. • No clear statement regarding the need for collaborations in conducting climate actions. • No clear estimations of GHG emission reduction from each planned action. • Adaptation milestones are relatively hard to measure. • The weight of planned actions is heavily reliant on the government. • No clear tactical timeline with measurable achievements. • Some cities stated domestic budget funding, while the majority did not specify. It is highly probable that most only rely on domestic resources.
Opportunity	Threat
<ul style="list-style-type: none"> • There are 3 climate programmes supported by UCLG ASPAC assisting 20 cities to develop CAPs. • There are development partners able to enhance the government's capacities. • Engagement with multi-stakeholders to conduct climate action. • Formation of climate action plan forum. • Integrating various components of development planning. • Action plans can be mainstreamed into the new local development plan. • There are many opportunities to receive technical assistance. • Endorsement of the action plan policies to become regulations to ensure sustainability. • Availability of financing beyond domestic resources. • Elaborating force majeure issues in the action plans to accelerate the actions. • Experiences and knowledge sharing between cities that have advanced their actions to encourage other cities. • Exploring funding and facilitating connections to businesses. 	<ul style="list-style-type: none"> • The sustainability of the plan and programmes. • Lack of progress to implementation due to the primary focus on technical assistance in pre-feasibility study (PFS) and/or feasibility study (FS). • Force majeure circumstances such as catastrophic disasters halt climate action due to resource limitations. • Lack of acknowledgement of collaborative action in the action plan creates obstacles that reduce the pace of the action. • All levels of government in Indonesia are undergoing a transition period. Hence, most new local development plans are due process.

Based on the SWOT analysis of Indonesia’s CAPs (Table 2), the gaps in Indonesia’s climate efforts are mainly in capacity and engagement with other stakeholders. Beyond that, Indonesia’s primary concern lies in integrating action between mitigation and adaptation. Therefore, the main opportunity to bridge this gap is engagement with development partners and communities to enhance the climate action plans.

7.2 Malaysia

Table 3: SWOT Analysis from the CAPs of Malaysian Pilot Cities

Strength	Weakness
<ul style="list-style-type: none"> • Eight pilot cities possess comprehensive climate action plans. • The average of the pledged mitigation target is high at 47.125%, making it the highest average among all. • The action plans in both adaptation and mitigation are clear and robust. • There are integrated actions between adaptation and mitigation. • The actions have acknowledged the engagement of other stakeholders outside the government. • The policy alignment from national to regional and local levels is robust. • Two cities have progressed one step closer to implementation. The cities have engaged with development partners and received a grant to further advance their action. • There are innovative actions planned. 	<ul style="list-style-type: none"> • Lack of acknowledgement of community-based action. • No clear estimation of GHG emission reduction from each planned action. • Adaptation milestones are relatively hard to measure. • No clear tactical timeline with measurable achievement. • The focus is mainly on energy efficiency. • There are several actions implemented outside the NDC sector calculations. • Lack of acknowledgement of collaborative action beyond energy efficiency. • Funding source is not stated.
Opportunity	Threat
<ul style="list-style-type: none"> • Collaborative action with multi-stakeholders to ensure goal achievement. • Endorse more community-based action. • Engaging with stakeholders beyond the government in other designated sectors apart from energy efficiency. • Implementing NDC sector actions. • Experiences and knowledge sharing between cities that have advanced their actions to encourage other cities. • Elaborating force majeure issues in the action plans to accelerate the actions. • Exploring funding and facilitating connections to businesses. 	<ul style="list-style-type: none"> • The ambitious climate targets and actions may encounter implementation challenges, potentially hindering the achievement of the goals. • The actions outside NDC sector calculation are at risk to be left behind. • Force majeure circumstances such as catastrophic disasters can halt climate actions due to resource limitations.

The SWOT analysis (Table 3) highlights Malaysia’s primary concern as the gap in integrating mitigation and adaptation. Given that many actions may not be included in the NDC, addressing this issue is crucial to mitigate the risk of the discontinuation of planned actions.

7.3 Thailand

Table 4: SWOT Analysis from the CAPs of Thai Pilot Cities

Strength	Weakness
<ul style="list-style-type: none"> • Four cities have CAPs. • The CAPs include tactical actions and a timeline with achievable milestones. • The targets are ambitious with detailed action. • The actions mentioned other stakeholders beyond the government. • Adaptation action is relatively robust and attainable. 	<ul style="list-style-type: none"> • The mitigation actions mainly focus on energy. • No innovative action in the transport sector beyond promoting Electric Vehicles (EV). • The CAPs do not address Industrial Processes and Product Use (IPPU) emissions and actions. • Funding relatively relies on the domestic budget. • Lack of acknowledgement of collaborative action beyond energy efficiency. • Lack of integrated adaptation and mitigation actions. • There is no available analysis regarding the need for support from development partners.
Opportunity	Threat
<ul style="list-style-type: none"> • Development partners can easily understand the cities' needs and tailor assistance to meet their defined needs. • Development partners can facilitate community-based climate action initiatives. • Exploring funding and facilitating connections to businesses. • Development partners may have a shared interest in monitoring the plans and assisting the city in maintaining ambitious targets and action plans. • Collaborate with development partners to delve deeper into the Agriculture, Forestry, and Other Land Use (AFOLU) sector. • Collaborate with development partners to further explore innovative actions in waste management and transport. • Assisting the cities in developing the IPPU sector. • The CAPs can serve as a valuable bargaining tool for engagement with development partners and businesses. 	<ul style="list-style-type: none"> • The targets are ambitious, and without strong and consistent political will, they are at risk of being discontinued. • Force majeure circumstances such as catastrophic disasters can halt climate actions due to resource limitations.

The SWOT analysis (Table 4), underlines that cities in Thailand demonstrate clear action plans with tactical timelines and comprehensive explanations. These strong CAPs can be easily understood by development partners and can serve as a blueprint for replication by other cities. The CAPs from Thailand can be seamlessly translated into a business pitch. However, Thailand still needs to further explore innovative actions. Cities in Thailand have not calculated IPPU emissions, despite the national sector showing interest in IPPU.

7.4 Vietnam

Table 5: SWOT Analysis from the CAPs of Vietnamese Pilot Cities

Strength	Weakness
<ul style="list-style-type: none"> • Four cities have complete CAP documents. • Seven cities have targets for mitigation. • Clear focus and action plans for adaptation. • The adopted targets align with the national target. • Strong actions in adaptation. • Two cities have taken significant steps towards implementation by engaging with the financing parties. • There is a set timeline to execute the actions. • The required support has been outlined for developing partners. 	<ul style="list-style-type: none"> • Three cities have CAPs comprising climate strategies (not a complete document). • Actions are primarily focused on adaptation. • Limited ambition in terms of mitigation efforts. • No clear estimation of GHG emission reduction from each planned action. • Adaptation milestones are relatively hard to measure. • No clear tactical timeline with measurable achievement. • Mitigation actions are relatively normative compared to adaptation measures. • Lack of acknowledgement of community-based actions.
Opportunity	Threat
<ul style="list-style-type: none"> • Enhancing the integration of adaptation and mitigation actions. • Capacity building to refine programmes. • Experiences and knowledge sharing between cities that have advanced their actions to encourage other cities. • Elaborating force majeure issues in the action plans to accelerate the actions. • Development partners have an opportunity to provide support based on the cities' identified needs. • Development partners can assist with community engagement to initiate climate action efforts. • Engaging national-level stakeholders in focused discussions to strengthen mitigation actions for cities. • Exploring funding and facilitating connections to businesses. 	<ul style="list-style-type: none"> • Mitigation actions are reliant on national directives. • Force majeure circumstances such as catastrophic disasters halt climate actions due to resource limitations.

The SWOT analysis above (Table 5) indicates that Vietnam's primary concern is the disproportionate focus on adaptation within the action plan. While cities are relatively independent in pursuing adaptation efforts, mitigation actions are still largely dependent on national directives. The gap in national involvement should be addressed with support from development partners to enhance the capacity of both parties.

7.5 Further Action GAP

Beyond CAP development, some cities have been moving forward in the effort to implement their planned actions. To date, more than 14 cities across SEA have commenced their efforts to implement the actions (Figure 25).



Figure 25: Status of Advance Pilot Cities Beyond The CAP

However, through extensive discussions in various events with cities, this study found several recurring gaps in pursuing their action plans. The gaps are:

- Detailing on needs.
- Detailing benefits for all parties.
- Detailing the source of funding or funding scheme.
- Detailing on the investment pitching.
- Defining on stage of project.
- Lack of understanding and implementation of business process.

The SWOT analyses provides an evaluation of the CAPs of the 4 countries. First, there are gaps in detailing action plans into tactical timelines with achievable measurements. Second, the CAPs still exhibit gaps in terms of community engagement in climate action. Third, the funding source still depends on the domestic budget and there is a lack of definition regarding funding beyond domestic resources. Fourth, innovative actions are lacking in most CAPs. Fifth, the CAPs lack consideration of force majeure circumstances caused by climate disasters. The cities face challenges in accessing methods to increase their own capacities for climate action, particularly in formulating innovative actions. The primary factor causing the cities' lack of capacity is the limited exposure to information regarding funding opportunities and accessibility.

By having the current CAPs, cities have a firm direction towards low-carbon, resilient, and sustainable development. The possession of CAPs gives cities a big advantage as a bargaining tool to pursue more funding opportunities for actions beyond domestic resources.

08. Recommendations

The recommendations listed below are derived from the Strengths, Weaknesses, Opportunities, and Threats (SWOT) analyses in the previous chapter, outlined to fill the gaps in cities' Climate Action Plans (CAPs) in efforts to strengthen their climate actions. Climate action is not subject only to the city to bear alone. This study provides tailored recommendations for cities, development partners, and the general public through SWOT analyses offering a holistic perspective for effective climate action planning.

8.1 General Recommendations

The general recommendations are derived from common issues across the cities in the four countries of the study area.

- 1. Detailed Action Plans:** Develop comprehensive action plans with detailed tactical timelines and measurable achievements to enhance implementation effectiveness.
- 2. Community Engagement:** Strengthen community engagement strategies within climate action plans to ensure local support and participation.
- 3. Funding Beyond Domestic Resources:** Explore and clearly define funding sources beyond domestic budgets to ensure sustainable financial support for climate initiatives.
- 4. Force Majeure Consideration:** Address force majeure issues in climate action plans to prepare for potential disruptions caused by climate disasters.
- 5. Capacity Building:** Increase capacity through knowledge sharing, collaboration with development partners, and targeted initiatives for cities and national governments.
- 6. Innovative Actions:** Encourage and incorporate innovative actions within climate plans to foster creative solutions and sustainability.

8.2 Specific Recommendations

The specific recommendations are derived from specific issues belonging to cities in each country. The recommendations are served in groups of countries.

Indonesia

- 1. Integration of Mitigation and Adaptation:** Strengthen the link between adaptation and mitigation actions for a more holistic approach to climate action.
- 2. Community Engagement:** Emphasise community-based climate actions to ensure local involvement and support.
- 3. Detailed Measurement and Reporting:** Establish a clear estimation of greenhouse gas (GHG) emission reduction from each planned action to monitor progress effectively.
- 4. Collaboration and Partnerships:** State clearly the need for collaboration and seek support from development partners to enhance capacity and implementation.
- 5. Innovation Focus:** Encourage innovative actions within the climate action plan for more effective and sustainable solutions.

Malaysia

- 1. Community-Based Action:** Acknowledge and incorporate community-based actions to enhance the effectiveness and acceptance of climate initiatives.
- 2. Detailed Estimation of Emission Reduction:** Provide a clear estimation of GHG emission reduction from each planned action for transparent reporting and accountability.
- 3. Tactical Timelines:** Develop clear tactical timelines with measurable achievements to track and assess progress in a structured manner.
- 4. Diversification of Focus:** Diversify the focus beyond energy efficiency as well as acknowledging collaborative actions in various sectors for a comprehensive approach.
- 5. Funding Source Declaration:** State funding sources ensure transparency and explore opportunities beyond domestic budgets.

Thailand

- 1. Innovative Action Exploration:** Encourage cities to explore innovative actions, especially in the waste and transport sectors as well as ensure comprehensive coverage beyond energy efficiency, including Industrial Processes and Product Use (IPPU) calculations.
- 2. Development Partner Engagement:** Leverage the clarity of CAPs for effective communication with development partners, encouraging support for community-based climate actions and exploration of funding opportunities.
- 3. Political Will Reinforcement:** Address the threats of ambitious targets by reinforcing strong and consistent political will. Ensure commitment to achieving set goals, especially in the absence of force majeure circumstances.

Vietnam

- 1. Mitigation Ambition:** Increase focus and ambition on mitigation actions to balance the heavy weight of adaptation efforts.
- 2. Detailed Estimation and Measurement:** Provide clear estimations of GHG emission reduction and establish measurable achievements for both adaptation and mitigation.
- 3. National-Level Engagement:** Engage national-level stakeholders in discussions to strengthen the alignment of mitigation actions with national goals.
- 4. Force Majeure Consideration:** Include force majeure considerations in the climate action plans to address potential disruptions due to climate disasters.
- 5. Capacity Building through Development Partners:** Collaborate with development partners to enhance capacities for both cities and the national government in implementing climate actions.

Development Partners

Climate actions will not be robust without the support of development partners. Based on the SWOT analyses, this study recommends that development partners offer support to cities and countries in the following points.

1. Capacity Building Support

- Prioritise capacity building, particularly in accessing information on funding opportunities and enhancing innovative actions for both mitigation and adaptation. Provide support to cities in seeking assistance for capacity enhancement.
- Provide targeted capacity-building programmes for cities, focusing on detailed needs analysis, collaboration, and community-based climate actions.

2. Integrated Mitigation and Adaptation Assistance: Assist Indonesian cities in integrating mitigation and adaptation actions. Support them in establishing clear estimation methods for GHG emission reductions and developing measurable achievement timelines.

3. Government Transition Facilitation: Facilitate a smooth transition for cities during a government shift, including offering support to ensure the continuity of climate action plans while involving the local governments in the process.

4. Diverse Funding Advocacy

- Advocate for diverse funding sources beyond domestic budgets by exploring partnerships, development programmes, and business collaborations for sustained financial support.
- Push for the exploration of collaborative funding sources to cities, emphasising partnerships with businesses and non-profits. Provide guidance on reporting metrics for GHG emission reductions.
- Provide guidance for cities on explicitly stating funding sources and exploring diverse funding opportunities. Encourage engagement with businesses and development partners for sustainable financial support.

5. National Involvement Advocacy: Advocate for increased national involvement in mitigation actions by facilitating collaboration between cities and national entities for a more balanced and comprehensive approach.

6. Detailed Reporting Assistance: Assist cities in establishing clear metrics for estimating GHG emission reduction from each planned action. Development partners can provide support in developing measurable achievement timelines for both adaptation and mitigation.

7. Political Will Reinforcement Support: Support cities in reinforcing strong and consistent political will to achieve ambitious targets, including strategies to ensure commitment in the absence of force majeure.

8. Communication Enhancement: Enhance communication between development partners and cities, emphasising clarity in CAPs, encouraging support for community-based climate

9. Innovation Promotion: Advocate for the exploration of innovative actions in cities, particularly in the waste and transport sectors. Encourage the inclusion of IPPU calculations in the national interest to ensure a comprehensive approach.

10. Advocacy for Force Majeure Planning: Advocate for the inclusion of force majeure considerations in CAPs. Support cities in developing strategies to address challenges arising from catastrophic events.

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