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Towards strengthening cooperation for urban resilience in ASEAN

Scoping Paper focusing on aspects in climate change
adaptation, disaster risk management and sustainable
urban development

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Executive Summary

Urban resilience in the ASEAN context: Definition and conceptualisation

Academic literature reveals a **wealth of definitions** of the term urban resilience from different disciplines. UN-Habitat's current definition covers many relevant aspects and integrates both a scientific and practitioner's perspective: Urban resilience is the "measurable ability of any urban system, with its inhabitants, to maintain continuity through all shocks and stresses, while positively adapting and transforming toward sustainability".

Resilience and urban resilience are seldomly explicitly defined in ASEAN-related papers, **and not uniformly defined or conceptualised in the ASEAN context.**

UN-HABITAT states that "resilience is a catalyst for sustainable urban development. It ensures development gains are not lost when cities face shocks and urban residents can flourish in a safe environment while addressing major challenges such as climate change and rapid urbanisation" (UN Habitat 2022). Many resilience definitions exist, and some focus more strongly on aspects of climate change, the urban context or disaster management. **Across definitions, some recurring aspects of resilience can be highlighted:**

- Resilience is understood as an ability or capacity of a system and/or inhabitants to absorb and withstand all kinds of disturbances.
- Resilience is about thriving – sustainably and long-term.
- Resilience is about mitigating known risks and being able to respond to and recover from those risks we cannot predict or avoid.

The understanding and definition of resilience and urban resilience are evolving, as indicated by the Intergovernmental Panel on Climate Change's Working Group II Contribution (Impacts, Adaptation, and Vulnerability) to the Sixth Assessment Report (AR6). That contribution highlights a forward-thinking way for integrated implementation of climate change adaptation and climate change mitigation: climate resilient development. This refers to the process of implementing greenhouse gas mitigation and adaptation measures to support sustainable development for all, which also includes considerations of ecosystem health and biodiversity conservation to ensure the continued existence of healthy natural systems.

Thus, it is clear that urban resilience is a huge topic covering a multitude of fields. We address small segments thereof: This study focuses on **contributing to more effectively combining climate change adaptation (CCA), disaster risk management (DRM) and sustainable urban development through increasing cooperation, integration and action in ASEAN. We further focus on three specific ASEAN Working Groups (AWGs):** the AWG on Environmentally Sustainable Cities (AWGESC), the AWG on Climate Change (AWGCC), as well as the ASEAN Committee on Disaster Management Working Group on Prevention and Mitigation (ACDM WG P&M). **We focus on selected topics of the three AWGs, not all, and thereby focus on selected aspects within CCA, disaster risk and sustainable urban development.** The study only loosely touches climate change mitigation and biodiversity conservation. It highlights a few selected synergies and links of the study's aspects in focus with mitigation and biodiversity conservation, as well as the need to ensure co-benefits with these topics, and the need to avoid negative trade-offs as much as possible from the outset.

The study highlights opportunities for strengthening cooperation for urban resilience across policy levels, sectors, and the region.

Strengthening urban resilience is deeply linked to reducing the actual causes of climate change (i.e. climate change mitigation). **Climate change mitigation is not in focus in this study**, due to the study's focus elsewhere, as indicated above. **Effective, transformative, and deep climate change mitigation is crucial.** It must be an integral and comprehensive part of an approach to strengthening urban resilience and to resilient development.

Climate-related key risks

The ASEAN region faces **multiple climate and natural disaster risks and vulnerabilities, as well as rapid levels of urbanisation.** Based on a literature review of select scientific and grey literature, the most prevalent observed climate and natural hazard risks for each ASEAN Member State (AMS) were identified. Across all AMS, **risks from floods, heat, droughts, storm events, and wildfires** are the most widespread. However, these do not equally apply to urban and rural areas and therefore require further differentiation in future research. Other important risks include risks from volcanic eruptions, earthquakes, landslides and tsunamis. Risks can be exacerbated through the cascading and cumulative effects of multiple natural hazards occurring simultaneously or in short sequence. The most prevalent observed risks within each AMS and background information on each country's urbanization developments are discussed in detail in Appendix A and summarized in Table 2 of Section 3.2. They both are based on the literature review.

Climate-related "key risks" for urban areas in the ASEAN region as a whole were selected based on key risks identified and discussed in the WG II Contribution to the latest IPCC's AR6 published in 2022. Key risks can be understood as potentially severe risks with adverse consequences for humans and social-ecological systems due to the interaction of climate related hazards with vulnerabilities of societies and systems exposed. From the key risks highlighted in the latest IPCC report, **five were systematically selected to focus on in this paper, based on their explicit importance for urban areas in general and for the ASEAN region more specifically, now and in the future.** These are:

1. Risks to population from increased heat
2. Heat stress, mortality, and morbidity from exposure to extreme heat and heatwaves
3. We jointly treat key risks 1 and 2
4. Urban infrastructure at risk of damage from flooding and severe storms
5. Risk to life and property due to sea level rise and coastal flooding
6. Health risks from air pollution exposure in cities

A discussion of these selected key risks can be found in Section 3.2.2 Findings on selected climate-related “key risks” for urban areas in the ASEAN region. It is crucial to note that not all important key risks for urban areas in ASEAN were analysed (see Sections 3.2.2 Findings on selected climate-related “key risks” for urban areas in the ASEAN region., 1.5., and 7).

ASEAN policy landscape: urban resilience, climate change, and disaster management

The existing ASEAN policy landscape includes a wide range of initiatives, programmes, and networks targeting climate change, natural disaster risks, sustainable urbanisation, and urban resilience (directly or indirectly). Crucial documents (including policies, strategies, work plans, and reports) were identified in the **three core areas CCA, sustainable urbanisation and DRM**. This was **in accordance with the study’s focus on certain aspects therein, and within the three AWGs** – AWGCC, AWGESC and the ACDM WG P&M. A detailed discussion of how urban resilience is conceptualised and addressed in these documents and initiatives and how they relate to or interact with each other can be found in Section 4 Policy landscape on urban resilience, climate, and disaster risks in ASEAN.

The **Action Plans of the three AWGs** have been found to be central for the analysis, each of them providing insights into the strategic priorities and activities with regard to the three core themes, and (urban) resilience in particular. The **ASEAN Sustainable Urbanisation Strategy** further constitutes a central strategy for urban development in ASEAN, promoting resilience against disaster risks and potential impacts of climate change through integrated planning and development. **Various initiatives and programmes in the region address urban resilience and sustainable urbanisation through establishing partnerships and networks** to move closer to the goals of ensuring **environmental sustainability**. While many of the documents highlight the importance of building urban resilience and, in some cases, propose concrete actions for how to reach that in the respective context, it was found that no common understanding or definition of the concept has been reached yet.

Gap analysis

The analysis **compares the existing policy responses in the field of urban resilience with five systematically selected key climate-related risks and aims at identifying gaps**. It first assesses whether a selection of risks for urban areas relating to climate change and natural disasters are generally addressed in the reviewed policy documents. It then assesses whether the selected key climate-related risks for urban areas in the ASEAN region (discussed in Section 3.2.2 Findings on selected climate-related “key risks” for urban areas in the ASEAN region) are addressed. Finally, it investigates whether key aspects of climate resilient development are considered. Identified gaps are summarized in the following, for a detailed discussion, see Section 5.2 Addressing selected “key risks” for urban areas in the ASEAN region.

Awareness of climate-related risks and risks from natural disasters: Overall, climate-related and disaster risks and vulnerabilities are addressed in a number of ASEAN strategies and initiatives, yet are missing in a number of others. The **connection to urban resilience is often not explicitly drawn**. Risks are often addressed in a generalised manner, and a more differentiated approach to risks in urban settings is frequently lacking.

Selected key risks 1 and 2 – Increased heat, extreme heat and heatwaves: There is still **insufficient awareness** of the increasing risk to population from increased heat, and mortality and morbidity from exposure to extreme heat and heatwaves. This is especially the case against the background of further future **climate change-related increases** of these risks in urban areas. This suggests that these key risks are currently systematically underestimated, which is problematic in view of current and projected risk increases, and required risk reduction. There are **also gaps in reducing as well as assessing these risks**. Generally, institutional and strategic **linkages between human health and extreme heat and potential solutions are currently mostly missing in the reviewed documents**. For example, heat and resulting health risks are not mentioned in screened ASEAN Health Cluster Work Programmes and the ASEAN Post-2015 Health Development Agenda (2021-2025). There is also a **gap of assessing risks from heat in urban areas** specifically.

Selected key risk 3 – Air pollution: Ambient air pollution from haze has been addressed on an ASEAN level by the Roadmap on ASEAN Cooperation towards Transboundary Haze Pollution Control with Means of Implementation. Although touched upon in several strategies and initiatives, **ambient air pollution from other sources (mainly fossil fuel usage)** and household air pollution have not been addressed to the same extent. **No targeted, regional action towards reducing air pollution has been proposed yet**. ASEAN strategies and programmes relating to health, such as the ASEAN Post-2015 Health Development Agenda (2021–2025) and the Health Cluster Work Programmes, consider environmental health risks generally but **do not target air pollution explicitly**.

Selected key risks 4 and 5 – Increased flooding and sea level rise: Overall, the literature review revealed a **high awareness for observed hazards and risks from flooding** in ASEAN. Risks related to inland and coastal flooding are among the most frequently addressed risks throughout ASEAN documents. Key topics addressed include risks for infrastructure and appropriate flood management systems. Flood is also often addressed as a natural hazard and approached from a disaster risk reduction (DRR) perspective. At the same time, it is important to highlight shortcomings: Turning to **projected future increases in risks from flooding, the awareness and concreteness in addressing these risks is clearly lower and requires action**. Only half of the ten reviewed documents acknowledge future risk increases in some way. Sea-level rise is only mentioned in two documents out of ten. Furthermore, the context is missing in the ten reviewed documents as to what and who is projected to be at increasing risk, where the risks occur, from which type of flooding in urban areas the risks arise, and which impact dimensions are assessed (e.g. loss of life, economic losses). Finally, **risk assessments and responses across ASEAN were seldomly tailored to urban areas and characteristics**. More urban specificity and differentiation in this regard would contribute to further targeted reduction efforts of current and future risks from different types of flooding in urban areas.

Climate resilient development: A number of ASEAN documents address both mitigation and adaptation, of which some acknowledge the need to combine measures from both mitigation and adaptation. However, **the integration of biodiversity is often overlooked** and possible **synergies between CCA, DRR, climate change mitigation, and biodiversity conservation are not fully explored**. This issue is taken up in the latest ASEAN Work Programme on Urban Biodiversity and Greenery 2022–2032, which recognises the need to implement a mix of measures that tackle all three areas – climate change mitigation, adaptation, and biodiversity – to develop in a climate-resilient way. In this regard, special attention is given to **nature-based solutions** due to their potential to provide (co-)benefits for various aspects of sustainable development.

Implementation challenges and opportunities for policy responses

A strong ASEAN community, ongoing technological development, and the great number of potential synergies between different ASEAN goals related to urban resilience create multiple opportunities for activities and measures to enhance urban resilience in the region. However, translating ASEAN strategies into action has been met by challenges in the past. Implementation challenges and opportunities were synthesised and grouped according to the categories for implementation barriers used in the ASEAN Sustainable Urbanisation Strategy, thereby ensuring comparability with previous analyses.

Coordination: An insufficient demarcation of roles and responsibilities has been identified as an important implementation challenge, including the challenge of finding suitable Lead Implementation Bodies and insufficient clarity on the distribution of roles and responsibilities on different policy levels (especially ASEAN vs. national level). The at times lacking **alignment of policy initiatives and strategies, and insufficient prioritization**, is another important factor that needs to be improved in order to lower the risks of duplication and to make use of the various existing synergy opportunities. Additionally, **using the momentum of COVID-19 recovery strategies** and including urban resilience aspects in recovery measures is a major opportunity to further steer the ASEAN region towards climate-resilient development. Finally, **strengthening stakeholder engagement and participatory approaches** in ASEAN bodies and agencies also bears various opportunities to improve the implementation of policy responses.

Implementation capacity: Shortcomings in human resources were stressed, especially on the ASEAN and sub-national levels. **Skill gaps and lacking technical expertise**, predominantly in sub-national bodies and agencies, further adversely affect progress in urban resilience. Closing skill gaps and strengthening technical expertise in the field of urban resilience, especially regarding risk assess-

ments as well as urban resilience planning and management, can be major opportunities for AMS. If such measures also reach the sub-national levels, they have the potential to increase the capacity for action of local actors, driving the educational level, and creating new employment opportunities. **Making use of the existing expertise within ASEAN** could additionally strengthen the region.

Strategic planning: The lack of **long-term measures and initiatives** was identified as key challenge for successful long-term policy responses, observable especially for projects with major external financing. A coordinated approach to **monitoring and evaluation** as an important part of the implementation cycle is further missing for ASEAN activities. Additional implementation challenges appear at **sub-national level strategic planning**. Promoting the development of long-term strategies for sustainable development at city (or other sub-national) level as well as mainstreaming DRR and CCA, and other resilience aspects, into urban planning were identified as key opportunities.

Data quality and dissemination of information: The **availability of high-quality data** is crucial to perform quantitative analyses and to design appropriate risk management strategies. Supporting data acquisition, improving data quality, and strengthening open-data use will enable data-driven, evidence-based urban policies and planning. A lack of **relevant information**, as well as a need for improved **knowledge and methods dissemination** were additionally highlighted as challenges to policy implementation.

Fiscal capacity: The **lack of financial resources, as well as the lack of direct financial control by local governments and cities**, pose challenges for policy implementation. The **diversification of financing sources** has the potential to help alleviate the general problem of scarce financial resources for the implementation of ASEAN strategies and initiatives. This could entail encouraging more private sector investments and increasing accessibility of innovative financing mechanisms.

Recommendations

Urban resilience is a huge topic. This project and the Scoping Paper focus on aspects in a few select segments of urban resilience - on contributing to more effectively combining CCA, DRM and sustainable urban development through increasing cooperation, integration and action in ASEAN - thereby focusing on three AWGs. The ASEAN region and its Member States have already established important elements to strengthen urban resilience, and promote regional collaboration in these segments. However, this paper demonstrates that there is need for action to further strengthen urban resilience. Based on the identified gaps in regional policy responses and on identified opportunities and challenges for implementation, a range of recommendations are presented to contribute to tackling these gaps and challenges. Thereby the study also highlights opportunities for cooperation across policy levels, sectors, and the region. The recommendations are structured in three thematic clusters:

1. Supporting integration across sectors and governance levels

This cluster aims at increasing collaboration across sectors and policy levels, thereby promoting the integration of the select topics in focus under urban resilience. Integration suggestions include integrating urban resilience with national and subnational level strategic planning, integrating CCA and DRR into urban planning, and better linking disaster risk reduction and climate action with health. The cluster targets vertical as well as horizontal cooperation. Recommendations further include suggestions for implementing processes to track progress in urban resilience across the region.

2. Promoting and mainstreaming responses to selected key risks

This set of recommendations focuses on responses to the selected climate-related key risks to urban areas in ASEAN identified in the

WG II's contribution to the latest IPCC Assessment Report. Recommendations include suggestions to further address health risks from heat and from air pollution, which are both projected to increase in the future. Recommendations further include more prominently integrating future risks from flooding in urban areas and to more strongly differentiate between flood types and flood risk contexts. Lastly, it is recommended to promote nature-based solutions and make use of co-benefits for, and to avoid trade-offs with, climate change mitigation and biodiversity conservation.

3. Capacity building and implementation

The last set of recommendations considers capacity building and implementation. Recommendations target funding and financial strategies, as well as possible improvements in capacity building and improving the dissemination of knowledge and methods.

Each recommendation either aims to contribute to closing gaps identified in the gap analysis, or targets identified implementation challenges and opportunities. Thereby it is key to coherently integrate and coordinate actions based on recommendations – with existing and upcoming programmes, initiatives and strategies, as well as between recommendations.

Thereby special attention should be given to achieving synergies and “co-benefits” between recommendations and other fields, and between recommendations themselves. This particularly applies for benefiting climate change mitigation (especially for reducing GHG emissions), air pollution reduction, and biodiversity conservation, due to the great importance of these topics. While the aim should be on achieving synergies, trade-offs can often occur in real world circumstances. Special attention should be also be given to avoiding these trade-offs as much as possible at the outset, e.g. not exacerbating GHG emissions and air pollution. Wisdom and discretion are required in dealing with trade-offs, e.g. when they are absolutely unavoidable.



Supporting integration across sectors and governance levels

- **Recommendation 1:** Improve cross-sectoral collaboration and coordination on urban resilience
- **Recommendation 2:** Better link and integrate health, DRR and climate action for strengthening urban resilience
- **Recommendation 3:** Promote the integration of urban resilience into national and sub-national level strategic planning and vice versa
- **Recommendation 4:** Enable and accelerate the joint integration of DRR and CCA, and their mainstreaming, into urban planning
- **Recommendation 5:** Measure, monitor and evaluate progress in urban resilience



Promoting and mainstreaming responses to selected key risks

- **Recommendation 6:** Mainstream action reducing health risks from heat – in accordance with the size of the current and increasing risks in urban areas
- **Recommendation 7:** Address health risks from high air pollution concentrations in urban areas
- **Recommendation 8:** For flood risks to urban areas, integrate differentiated future projections and risk reduction more prominently into corresponding ASEAN approaches
- **Recommendation 9:** Promote NbS measures to increase resilience and simultaneously provide mitigation and adaptation benefits



Capacity building and implementation

- **Recommendation 10:** Improve access to finance and develop financing strategies
- **Recommendation 11:** Invest in capacity building
- **Recommendation 12:** Strengthen the dissemination of relevant knowledge and methods

Thematic clusters and overview of the recommendations

A detailed description of each recommendation, including ideas for implementation, can be found in Section 7 Recommendations.

Although our analysis goes beyond the original scope of the paper, it is important to note that some further important climate-related key risks for urban areas in ASEAN were not analysed. It is recommended to follow up on them, e.g. with conducting a similar investigation and gap analysis on at least the four key risks for urban areas which we have omitted, in a complementary study or follow up study. Further details are provided in Section 3.2.2 Findings on selected climate-related “key risks” for urban areas in the ASEAN region and Section 1.5 Limitations and further delimitation of the study.

Furthermore, due to its focus and the project aims, the Scoping Paper has a strong focus on the regional level. However, strengthening urban resilience locally and prioritizing action has to be considered from the individual city’s perspective. Cities’ priorities regarding strengthening urban resilience vary. These priorities are very likely only partly reflected by recommendations concluding this study, and much more specific. Identifying which combinations of recommendations may be especially relevant for certain cities, or city types, is well beyond the scope of this project, yet a very relevant question. It is therefore recommended that local policy makers in ASEAN match and tailor the recommendations to individual cities’ situations where necessary.

Project context

This Scoping Paper was developed as part of the **project “Cooperation for Resilience in Urban Centres”**, which builds on supporting the **ASEAN-Germany Development Partnership**. Using the information basis provided by this scoping study, and directly building on its recommendations, another strategic document is developed within the scope of this project: **“Strengthening Urban Resilience in ASEAN Through Cooperation – Guidelines in 11 Action Areas focusing on aspects in climate change adaptation, disaster risk management and sustainable urban development”** (further referred to as **“Guidelines”**). Underpinned by the Scoping Paper’s findings and recommendations, further discussions and workshops were conducted with multiple actor groups to identify concrete Action Areas included in these Guidelines, helping to strengthen urban resilience in ASEAN within the project’s particular focus. These discussions and workshops were with representatives of ASEAN AWGs, 2nd and 3rd tier cities, city networks, development partners and academic institutions.

While the Scoping Paper provides a solid knowledge base, the Guidelines help to guide, and support, action to strengthen urban resilience and close identified gaps in 11 Action Areas. In these regards, the Guidelines outline key strategic priorities, activities, and entry points for implementation.

Limitations and further delimitation of the study

The scope, delimitation, and limitations of the study are important to be aware of for framing and contextualizing the recommendations. They are also very useful for delimiting both the study and follow-up analyses. Therefore, we recommend to read the discussion of limitations and further delimitation provided by Section 1.5 Limitations and further delimitation of the study), and Figure 1 with its corresponding text in Section 1.2 Rationale and objectives). This includes delimitations regarding what is beyond the study’s scope, and some limitations within its scope. In consequence, it needs to be stressed that the study and concluding recommendations address a few parts of what is required to strengthen urban resilience in ASEAN overall. **We address a few selected segments of urban resilience. And within these segments of urban resilience the study focuses on selected topics of the three AWGs in focus, not all – climate change mitigation is not in focus due to the study’s focus**, for example (we highlight a few links and synergies with it). Despite great care, further ASEAN documents and literature exist which were not included in the review process, and which should complement this review and the implementation of the recommendations.

Content

Executive Summary	II
1 Introduction	14
1.1 Background information on the project	14
1.2 Rationale and objectives	15
1.3 Approach and Methodology	17
1.4 Structure	18
1.5 The scope in more detail, and limitations	19
2 Urban Resilience: Definition and Conceptualisation in view of AWGs	21
3 Select risks to urban resilience in ASEAN	25
3.1 Terminology	25
3.2 Selected risks related to climate change, natural disasters and rapid urbanisation in ASEAN	26
4 Policy landscape on urban resilience, focusing on aspects within climate change, sustainable cities and disaster risk reduction in ASEAN	34
4.1 Existing policy documents in ASEAN	34
4.2 Initiatives, programmes and networks on sustainable urbanisation and urban resilience	41
5 Gap analysis: Addressing risks and vulnerabilities for urban areas in ASEAN	44
5.1 Addressing climate-related risks and risks from natural disasters	45
5.2 Addressing selected “key risks” for urban areas in the ASEAN region	46
5.3 Climate resilient development (CRD): considering climate change mitigation and biodiversity conservation	48
6 Implementation challenges and opportunities for policy responses	49
6.1 Coordination	50
6.2 Implementing capacity	51
6.3 Strategic planning	52
6.4 Data quality and dissemination of information	53
6.5 Fiscal capacity	54
7 Recommendations	55
7.1 Supporting integration across sectors and governance levels	56
7.2 Promoting and mainstreaming responses to selected key risks	61
7.3 Capacity building and implementation	68
Publication bibliography	71
Appendix: Natural hazards and resulting current risks in ASEAN Member States from a selected literature review	82

List of Figures

Figure 1: a) Schematic scope of the Scoping Paper with regard to a conceptualization of urban resilience, highlighted in yellow (adapted from UN Habitat (2018)) b) Components of urban systems (adapted from Collier et al. (2014)), components partly addressed by the recommendations are outlined in yellow	16
Figure 2: Overview of policy responses in ASEAN (eclipses indicating the thematic focus of the documents, i.e. climate change, sustainable cities or DRR)	35
Figure 3: Six priority areas and eighteen sub-areas of the ASUS	38
Figure 4: Thematic clusters and overview of the recommendations	56

List of Tables

Table 1: Overview of consultations conducted in the scope of the project, as of November 2022	18
Table 2: Most observed climate and natural disasters in AMS - based on the overview of climate and natural disaster risks in AMS from a select literature review (see Appendix A)	26
Table 3: 2030 projections for the impact of sea-level rise and flooding on population and affected areas for Bangkok, Jakarta and Manila (Wang and Kim 2021)	31
Table 4: Percent of total deaths attributable to air pollution per ASEAN Member State, for both sexes and all ages in 2019. Air pollution here includes particulate matter air pollution and ambient ozone pollution (The Lancet 2022)	32
Table 5: Select topics and whether they are addressed in ASEAN documents that are most relevant for urban resilience (general topics in light blue, specific risks in dark blue)	44

List of Boxes

Box 1: Selected climate-related key risks for urban areas in the ASEAN region which we focus on, the method of selection, and why we focus on this selection	26
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List of Abbreviations

AADMER	ASEAN Agreement on Disaster Management and Emergency Response
AWP	AADMER Work Programme
ACB	ASEAN Centre for Biodiversity
ACDM	ASEAN Committee on Disaster Management
ACDM WG P&M	ACDM Working Group on Prevention and Mitigation
ACRF	ASEAN Comprehensive Recovery Framework
AEC	ASEAN Economic Community
AG-DPC	ASEAN-Germany Development Partnership Committee
AHA Centre	ASEAN Coordinating Centre for Humanitarian Assistance on Disaster Management
AIESC	ASEAN Initiative on Environmentally Sustainable Cities
AMS	ASEAN Member States
AOMP	Adjustment of Orientation Master Plan Viet Nam
APSC	ASEAN Political-Security Community
AR6	Sixth Assessment Report IPCC, 2022
ASCC	ASEAN Socio-Cultural Community
ASCCR	ASEAN State of Climate Change Report
ASCF	ASEAN Smart Cities Framework
ASCN	ASEAN Smart Cities Network
ASEAN	Association of Southeast Asian Nations
ASEC	ASEAN Secretariat
ASOEN	ASEAN Senior Officials on Environment
ASPEN	ASEAN Strategic Plan on Environment
ASUS	ASEAN Sustainable Urbanisation Strategy
ATR	Ministry of Agrarian Affairs and Spatial Planning (Indonesia)
AURF	ASEAN Urban Resilience Forum
AWG	ASEAN Working Group
AWGCC	ASEAN Working Group on Climate Change
AWGESC	ASEAN Working Group on Environmentally Sustainable Cities
BNPB Indonesia	National Disaster Management Authority (Indonesia)
CCA	Climate Change Adaptation
CLC Singapore	Centre for Liveable Cities Singapore
CRD	Climate Resilient Development
DHUP Lao PDR	Department of Housing and Urban Planning (Lao PDR)
DPW Myanmar	Department of Public Works (Myanmar)
DPWT Lao PDR	Division of Public Works and Transport (Lao PDR)
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
DUHD Myanmar	Department of Urban and Housing Development (Myanmar)
ESC	Environmentally Sustainable Cities
GIC	Geoinformatics Center of the Asian Institute of Technology
HLS-SC	High-level Seminar on Sustainable Cities
IGES	Institute for Global Environmental Strategies
IMCCC Singapore	Inter-Ministerial Committee on Climate Change Singapore
IPCC	Intergovernmental Panel on Climate Change

JAIF	Japan-ASEAN Integration Fund
JICA	Japan International Cooperation Agency
LGU	Local Government Unit
M&E	Monitoring and Evaluation
MLSW Lao PDR	Ministry of Labour and Social Welfare (Lao PDR)
MoE Cambodia	Ministry of Environment (Cambodia)
MONARES	Monitoring von Anpassungsmaßnahmen und Klimaresilienz in Städten
MoNRE Lao PDR	Ministry of Natural Resources and the Environment (Lao PDR)
MPWT Lao PDR	Ministry of Public Works and Transport (Lao PDR)
MSE	Ministry of Sustainability and the Environment (Singapore)
NbS	Nature-based Solutions
NC	National Coordinator
NCCAP Philippines	National Climate Change Adaptation Plan
NCCS Singapore	National Climate Change Secretariat (Singapore)
NCDM Cambodia	National Committee on Disaster Management (Cambodia)
NCSDD Cambodia	National Council for Sustainable Development (Cambodia)
NDMC Brunei Darussalam	National Disaster Management Centre (Brunei Darussalam)
NESDP Thailand	National Economic and Social Development Plan Thailand
NFP	National Focal Point
NGGAP Viet Nam	National Green Growth Action Plan Viet Nam
NGGS Viet Nam	National Green Growth Strategy Viet Nam
NSEDP Lao PDR	National Socio-Economic Development Plan Lao PDR
NUDHF Philippines	National Urban Development and Housing Framework Philippines
NUDP Viet Nam	National Urban Development Programme Viet Nam
NUDS Viet Nam	National Urban Development Strategy
NUP Myanmar	National Urban Policy Myanmar
NUP Philippines	National Urban Policy Philippines
NUUP Viet Nam	National Urban Upgrading Programme Viet Nam
OPWT Lao PDR	Office of Public Works and Transport (Lao PDR)
PCA	Practical Cooperation Areas
PDP	Philippine Development Plan
PIU	Project Implementation Unit
PTI Lao PDR	Public Works and Transport Institute (Lao PDR)
PUB Singapore	National Water Agency (Singapore)
RKN Brunei Darussalam	National Development Plan Brunei Darussalam
SDG	Sustainable Development Goal
SDG-FC	SDG Frontrunner Cities Programme
SEDS Viet Nam	Socio-economic Development Strategy Viet Nam
SFDRR	Sendai Framework for Disaster Risk Reduction from 2015–2030
SGAC	Smart Green ASEAN Cities Programme
SLR	Sea-level rise
UN	United Nations
UNCDF	United Nation Capital Development Fund
UNDRR	United Nations Office for Disaster Risk Reduction
WG	Working Group
WG II	Working Group II Impacts, Adaptation and Vulnerability

1 Introduction

1.1 Background information on the project

This Scoping Paper was developed within the project **Cooperation for Resilience in Urban Centres** within the framework of ASEAN-Germany cooperation.

The primary project aim is to support in **establishing urban resilience as a more integrative, synergistic, holistic, and coherent concept within ASEAN to more effectively combine climate change adaptation (CCA), disaster risk management (DRM), and sustainable urban development** through increasing cooperation, integration and action in ASEAN. The focus lies on three ASEAN Working Groups (AWGs): ASEAN Working Group on Climate Change (AWGCC), ASEAN Working Group on Environmentally Sustainable Cities (AWGESC), and ASEAN Committee on Disaster Management, Working Group on Prevention and Mitigation (ACDM WG P&M). The project focuses on strengthening political dialogue and cooperation structures at various levels, namely (1) between the ASEAN Member States (AMS) and Germany; (2) between different AMS; and (3) between the AMS, cities, and possibly other key players, such as donors, academia, and civil society.

These efforts will contribute to further strengthen ASEAN-Germany cooperation and help lend greater political importance to urban resilience. Reinforcing urban resilience can make a significant contribution towards achieving the Paris Agreement and the 2030 Agenda for Sustainable Development or the Sustainable Development Goals (SDGs).

The project was established to support the ASEAN-Germany Development Partnership, which was formalised on 23 January 2017 with the convening of the first **ASEAN-Germany Development Partnership**

Committee (AG-DPC) Meeting at the ASEAN Secretariat (ASEC), Jakarta. The second meeting in March 2018 adopted a framework for future cooperation titled “Practical Cooperation Areas (PCA) for ASEAN-Germany Development Partnership 2018-2022”, which serves as a basis for cooperation in areas, such as political-security, economic, and socio-cultural cooperation. Climate change and disaster management feature prominently in the latter area of cooperation.

The project builds on the results of the ASEAN-Germany Development Partnership’s “**Expert Forum on Creating Pathways for Urban Resilience**”, which took place in Singapore in November 2018. The conference represented a first milestone in the concretisation of the ASEAN-Germany partnership in the area of urban resilience. An intensive preparation and coordination process with the ASEC, the respective Chairs and National Focal Points (NFPs) of the relevant AWGs, and the forum with its participants identified the following **priorities and recommendations**:

- Better anchoring the issue of urban resilience within ASEAN and linking it to global policy processes (i.e., Paris Agreement, 2030 Agenda/SDGs, Sendai Framework for Disaster Risk Reduction from 2015-2030 (SFDRR), and other relevant policies)
- Creating regular knowledge exchange formats on climate change and ESC between the participating AWGs and ASEAN Sectoral Bodies
- Raising political awareness of the issue with respect to second- and third-tier cities, in particular by improving the communication of challenges and presenting context-specific solutions

1.2 Rationale and objectives

Prominence in global development frameworks:

In the past two decades, resilience has gained substantial traction in the sustainability and international development discourses on global to local levels. For the United Nations (UN), for example, “urban resilience has gained greater prominence over the past decade in international development discourse and has emerged as one of the core principles of sustainable urban development in the global development frameworks and targets, including: Implementing the New Urban Agenda, the Paris Agreement, the Sustainable Development Goals, and the Sendai Framework for Disaster Risk Reduction from 2015–2030 (SFDRR)” (UN Habitat n.d.). The New Urban Agenda has pledged to build resilience of cities towards disasters and climate change impacts through urban planning, development planning design, and infrastructure (UN 2017). The adaptation goal of the Paris Agreement is “enhancing adaptive capacity, strengthening resilience, and reducing vulnerability to climate change” (UN 2015a). The SDG 11 of the 2030 Agenda for Sustainable Development is to “make cities and human settlements inclusive, safe, resilient, and sustainable” (UN 2021). An instrumental component in the goal that the SFDRR pursues is to prevent new and reduce existing disaster risk through implementing a roster of measures that strengthen resilience.

Increasing prominence in ASEAN: In ASEAN, urban resilience has become more visible in the past decade, for example in prominent strategic publications addressing urbanisation, disaster risks, and climate change. The direct linkages of the concepts are evident on multiple counts. One example is the ASEAN Socio-Cultural Community (ASCC) Blueprint 2025, which integrates a disaster resilient and climate adaptive ASEAN in its vision of resilience (ASEAN Secretariat 2016b). Similarly, the ASEAN Agreement on Disaster Management and Emergency Response (AADMER) and subsequent AADMER Work Programmes (AWP) (ASEAN Secretariat 2010, 2020a) highlight the relevance of resilience in the context of disasters. The final report of the project “Building Disaster and Climate Resilient Cities in ASEAN”,

which was developed under Concept Note 18 of the AWP Phase 2, focuses on DRR and CCA measures in urban development, land use planning processes, and building regulations (JICA 2018a). The project established the ASEAN Urban Resilience Forum (AURF), which aims at supporting policy development on DRR and CCA in ASEAN (JICA 2017).

These developments highlight the intent and need for increased cooperation in building urban resilience, and motivate our project Cooperation for Resilience in Urban Centres, and this Scoping Paper in particular.

The **main purpose** of this scoping study is to identify the current direction, gaps, and opportunities for action related to increasing cooperation for urban resilience in ASEAN, as well as to provide recommendations to contribute to strengthening both such action and urban resilience. Urban resilience is a huge topic covering a multitude of fields. As per our scope, this study **addresses and focuses on small segments of urban resilience in ASEAN:** on contributing to **more effectively combining climate change adaptation, disaster risk management and sustainable urban development through increasing cooperation, integration and action in ASEAN.** Thereby the study also **highlights opportunities for cooperation across policy levels, sectors, and the region.** We **focus on three specific AWGs:** AWGESC, AWGCC, as well as ACDM and **address some of the topics within the AWGs in focus, not all.**

Within this focus, this scoping study aims to fulfil the following objectives in particular:

- Review the current state of play in selected scientific and grey literature with respect to urban resilience, DRR, and CCA and clarify the concept of resilience;

- Document natural hazards and related risks that the AMS face at national and local levels according to a selected literature review;
- Review the existing urban resilience policies, strategies, reports, and initiatives that were developed in ASEAN at the regional level to date and provide an overview of national level policy responses;
- Identify major challenges (implementation challenges and thematic gaps) as well as opportunities related to urban resilience responses in ASEAN;
- On this basis, provide recommendations for further action to contribute to strengthening responses on urban resilience in ASEAN; and
- Lay a solid information basis for the further activities carried out within the project.

Focus on a few segments within the vast topic of urban resilience: Urban resilience is built on multiple pillars, such as resilient infrastructure and services, urban governance, urban economy and

society, urban planning, and DRM. At the same time, urban resilience can target various components of the complex urban system, for example health services, energy, water, and education. It also includes multiple cross-sectoral aspects, such as CCA and climate change mitigation. As indicated above, this paper focuses on a few selected segments of the comprehensive concept of urban resilience, and within these segments some of the topics of the AWGs in question, not all. The scope of the Scoping Paper with regard to one conceptualization of urban resilience and components of the urban system is schematically depicted in Figure 1.

Use of Scoping Paper results in the larger project context: Using the information basis provided by this scoping study, and directly building on its recommendations, another strategic document is developed within the scope of this project: **“Strengthening Urban Resilience in ASEAN through Cooperation – Guidelines in 11 Action Areas focusing on aspects in climate change adaptation, disaster risk management and sustainable urban development”** (further referred to as **“Guidelines”**). For helping to strengthen urban resilience in ASEAN within this particular focus, further discussions and

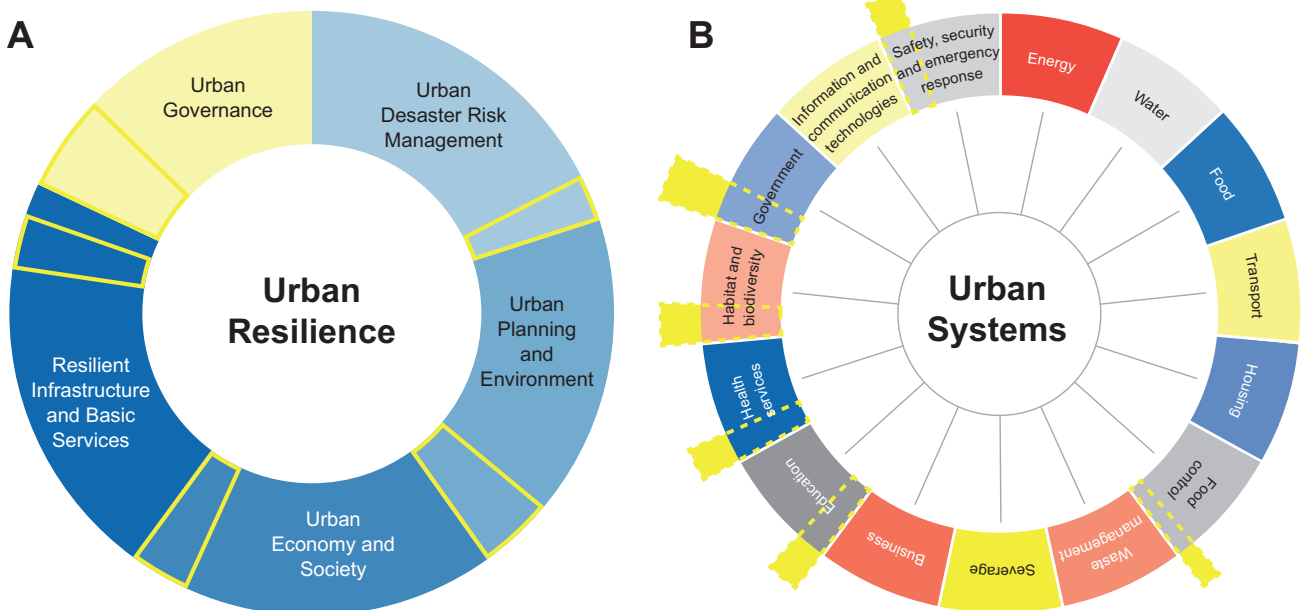


Figure 1: a) Schematic scope of the Scoping Paper with regard to a conceptualization of urban resilience, highlighted in yellow (adapted from UN Habitat (2018)) b) Components of urban systems (adapted from Collier et al. (2014)), components partly addressed by the recommendations are outlined in yellow

workshops with representatives of ASEAN AWGs, 2nd and 3rd tier cities, city networks, development partners and academic institutions were used to identify concrete Action Areas included in the Guidelines. While the Scoping Paper provides a solid knowledge base, the Guidelines aid in guiding and supporting action to strengthen urban resilience and closing identified gaps – within the project’s focus on integration and cooperation in CCA, DRM and sustainable urban development. The Guidelines do so by outlining key strategic priorities, concrete activities, and entry points for implementation.

Need and opportunity for integrating coherently and synergizing: As it is highlighted in the IPCC Sixth Assessment Report (AR6), multiple climate hazards will occur simultaneously more often and may reinforce each other, resulting in increased impacts and risks to nature and people, cascading across sectors and regions (IPCC 2022b). The challenge is “to scale current adaptation action, especially in most exposed areas and for most vulnerable populations, as well as **move beyond adapting to single risks alone**” (Shaw et al. 2022, p. 1534). This statement also applies to the conclusions and recommendations in this Scoping Paper. This also means tackling multiple risks simultaneously.

Achieving synergies and “co-benefits”, avoiding trade-offs: Special attention should be given to achieving synergies and co-benefits between recommendations and other fields, and between recommendations themselves. Examples are synergies with climate change mitigation, air pollution reduction, and biodiversity conservation, due to the great importance of these topics. For example, expanding nature-based solutions and green infrastructure for reducing risks to population from increased heat through cooling of public spaces and buildings can also lead to ‘co-benefits’ in the form of reduced GHG emissions. While the aim should be on generating co-benefits, trade-offs often occur in real world circumstances. **Special attention should be also be given to avoiding these trade-offs as much as possible**, e.g. not exacerbating GHG emissions and air pollution. Wisdom and discretion are required here, e.g. when trade-offs are clearly unavoidable.

Therefore, our recommendations need to be seen in view of other strategies, programmes, policies, plan etc. to strengthen urban resilience in ASEAN. While each recommendation is an approach to contribute to closing specific identified gaps from the gap analysis and tackling identified challenges, we want to highlight the importance of identifying and using synergies between these proposed recommendations and their measures. Importantly, both of these points on coherent integration help to avoid negative trade-offs, fragmentation, and untargeted and inefficient use of resources.

1.3 Approach and Methodology

To fulfil these objectives, the study followed a **three-step approach**:

1. A brief introduction to the understanding and conceptualisation of urban resilience in international and regional discourse; and identification of selected risks to urban resilience;
2. Identifying where ASEAN stands in terms of urban resilience responses, their challenges and opportunities, and gaps; and
3. Proposing recommendations for filling the gaps and for strengthening and advancing action on urban resilience in ASEAN

To support the three-step approach, various information sources were used. **Desk research**, including subsequent qualitative assessment of academic literature, reports, scientific and policy papers on urban resilience, CCA, and DRR in ASEAN was conducted.

In addition, the outcomes of three **workshops** with representatives of AWGs, second- and third-tier cities, city networks, development partners, and academic institutions were used as valuable insights particularly for Section 6 Implementation challenges and opportunities for policy responses and 7 Recommendations. The workshops were conducted in the scope of the project and focused on understanding the urban resilience cooperation context, as well as identifying syn-

ergies, challenges, and opportunities for cooperation on urban resilience within the project's focus between relevant ASEAN stakeholders.

As an additional means of providing information for these sections, **interviews** with representatives of relevant AWGs (i.e. AWGESC, AWGCC and ACDM WG P&M), development partners, city networks

and ASEAN cities were conducted. The choice of interview partners was guided by consultations and recommendations from the ASEC. A total of 10 interviews were conducted, which are listed in Table 1. Interviews lasted between 45 minutes to an hour and covered topics related to the relevance of various thematic areas, key challenges and opportunities for urban resilience action, as well as synergies with other stakeholders.

Table 1: Overview of consultations conducted in the scope of the project, as of November 2022

#	Date	Institution (and Position of Interview Partner)	Country
1	15 August 2021	Institute for Global Environmental Strategies (IGES)	
2	06 September 2021	National Council for Sustainable Development, Ministry of Environment (AWGCC Chair)	Cambodia
3	06 September 2021	Department of Disaster Management and Mitigation (ACDM WG P&M Vice-Chair)	Thailand
4	09 September 2021	Pollution Control and Cleansing Department, Yangon City Development Committee (AWGESC NFP)	Myanmar
5	09 September 2021	International Biodiversity Conservation, National Parks Board	Singapore
6	09 November 2021	Nippon Koei, Team Lead Concept Note 18 of the AADMER Work Programme Phase 2 (2013-2015) project "Building Disaster and Climate Resilient Cities in ASEAN"	
7	17 November 2021	Social Environment Division, Department of Environmental Quality Promotion, Ministry of Natural Resources and Environment (AWGESC NFP)	Lao PDR
8	17 November 2021	Pollution Control Division, Environmental Conservation Department, Ministry of Natural Resources and Environmental Conservation (AWGESC NFP)	Myanmar
9	26 November 2021	Urban Environment and Area Planning Division, Office of Natural Resources and Environmental Policy and Planning (AWGESC NFP)	Thailand
10	25 February 2022	ASEAN Connectivity Division, ASEC	

1.4 Structure

Section 1 Introduction describes the background, objectives, and methodology of this study. Using a selection of the literature, **Section 2 Urban Resilience: Definition and Conceptualisation in view of AWGs** outlines how urban resilience is framed and conceptualised in the international and ASEAN discourse. **Section 3 Select risks to urban resilience in ASEAN** takes a closer look at the terms risk and vulnerability and identifies some of the key climate

and disaster risks and vulnerabilities for ASEAN. **Section 4 Policy landscape on urban resilience, climate, and disaster risks in ASEAN** provides an overview of ASEAN policy responses on urban resilience, including strategies, reports, initiatives, and programmes. These are structured along three major thematic areas, namely climate change, sustainable cities, and DRR, and it is investigated how urban resilience is addressed in these documents. **Section**

5 Gap analysis: Addressing risks and vulnerabilities for urban areas in ASEAN identifies some crucial gaps in addressing some risks and vulnerabilities for urban spaces in ASEAN based on the selected literature. **Section 6 Implementation challenges and opportunities for policy responses** presents challenges for implementing the policy responses identified in the previous section. This part builds on the findings from the ASEAN Sustainable Urbanisation Strategy (ASUS), which highlights five key implementation barriers for urban resilience (ASEAN Secretariat 2018):

1. Coordination (e.g., roles and responsibilities, alignment of policy initiatives, and strategies);
2. Implementing Capacity (e.g., human resource capacities, skill and technical expertise);
3. Strategic Planning (e.g., longevity of measures, monitoring, and evaluation);
4. Information Failures (e.g., quality of data, knowledge dissemination); and
5. Fiscal Capacity (e.g., financing sources)

The analysis is extended to also cover important implementation opportunities. By drawing on the ASUS implementation barriers for classification, comparability with previous analyses was ensured. Based on the previous sections, **Section 7 Recommendations** provides recommendations for strengthening action on urban resilience in ASEAN

1.5 The scope in more detail, and limitations

This Scoping Paper is more comprehensive in scope and depth than originally planned. Like all studies, the paper comes with limitations. It is important to be aware of them, especially when contextualizing the recommendations, and following up on the paper. Limitations also further outline the study's scope, and

lead to selected steps to follow up on with further analysis. We list some valuable such follow-up steps in part of the upcoming Guidelines document (see Section 1.2 Rationale and objectives).

We begin with some outlines based on what is outside of this study's scope. First, urban resilience is much more encompassing than the (important) segments and the AWGs this study focuses on¹ (see Figure 1 and the corresponding text in Section 1.2 Rationale and objectives). This paper focuses on a few selected segments of urban resilience. **In consequence, it needs to be stressed that the recommendations concluding this study address a small part of what is required to strengthen urban resilience in ASEAN overall.**

For example, climate change mitigation is only loosely touched, and only in some instances, as the Scoping Paper focuses on the adaptation aspects of climate change. The Scoping Paper highlights a few links and synergies with mitigation, and the need to ensure co-benefits, not negative trade-offs, with mitigation. Effective, transformative climate change mitigation is crucial. Also, it must be an integral and comprehensive part of an approach to strengthening urban resilience and to resilient development (see Section 2 Urban Resilience: Definition and Conceptualisation in view of AWGs). Therefore, it is highly recommended to accordingly follow up with deep mitigation action, and to complement this paper's findings with strong mitigation recommendations for action in the context of strengthening urban resilience in ASEAN.

Another example is that a holistic approach to urban resilience must also consider how a just and equitable transition towards resilience can be achieved, advancing sustainable development for all. An investigation of possible social and economic frameworks required to support a just transition was beyond the scope of this study. This, however, needs to be considered when addressing urban resilience in the future.

¹ Contributing to more effectively combining climate change adaptation, disaster risk management and sustainable urban development through increasing cooperation, integration and action in ASEAN - thereby focusing on three AWGs.

Limitations exist within the scope of this study. ASEAN has produced numerous policy documents, strategies, action plans and initiatives related to urban resilience, CCA, DRR, and disaster management. The Scoping Paper findings are based on a substantive selection of documents from an extensive literature review and in close consultation with ASEC. Nevertheless, due the large scope of the field of urban resilience important topics and aspects are surely addressed in ASEAN documents beyond the review. Further existing literature should complement this review and be considered for the implementation of the recommendations.

The next limitation is that the study addresses some selected topics of the three AWGs in focus, not all. For example, while we focus on selected climate-related hazards, both full risk spectrums of natural disasters and climate change must be considered in an overall picture. **So the recommendations cannot claim to be complete within the segments of urban resilience in focus here. Further action is required to strengthen urban resilience in ASEAN in the segments addressed** – well beyond this study's scope of recommendations.

Next, the Section 3.2.2 Findings on selected climate-related “key risks” for urban areas in the ASEAN region does not investigate all such risks for the region. For example, it does not investigate the risk to water security due to urban droughts. Therefore, it is crucial to conduct the same investigations and gap analysis in a follow-up study on at least the four key risks for urban areas which we have omitted (see Section 3.2.2 Findings on selected climate-related “key risks” for urban areas in the ASEAN region). This way, recommendations for contributing to reducing these risks can additionally be derived.

Next, due to COVID-19 restrictions, the majority of planned live in-person formats within the project were conducted online (the final conference was live in-person). This led to developing the Scoping Paper mostly remotely, and made it more challenging to thoroughly integrate local and city-level perspectives. In a wealth of workshops and interviews, much effort was made to incorporate experiences and perspectives of AWGs, 2nd and 3rd tier cities, and city networks. Yet this limitation needs to be acknowledged for a study which addresses urban aspects.

2 Urban Resilience: Definition and Conceptualisation in view of AWGs

In recent decades, the understanding and definition of resilience and urban resilience have evolved. Academic literature reveals a wealth of definitions of the term urban resilience from different disciplines. Despite becoming a popular term in academic and grey literature, the conceptual interpretation of the term urban resilience is still highly diverse (McPhearson and Orr 2019).

UN-habitat's revised definition of urban resilience integrates both a scientific and practitioner's perspective: Urban resilience is the "measurable ability of any urban system, with its inhabitants, to maintain continuity through all shocks and stresses, while positively adapting and transforming toward sustainability. Resilience is a catalyst for sustainable urban development. It ensures development gains are not lost when cities face shocks and urban residents can flourish in a safe environment while addressing major challenges such as climate change and rapid urbanisation"² (UN Habitat 2022).

Resilience and urban resilience are seldomly defined in ASEAN-related papers, and not uniformly defined or conceptualised in the ASEAN context. Exceptions are the ASCC Blueprint 2025, which understands resilience as achieving "an enhanced capacity to collectively respond and adapt to current challenges

and emerging threats" (ASEAN Secretariat 2016b, p. 14), and The Future of Asian and Pacific Cities report (2020), which defines urban resilience as "the capacity for urban systems and settlements to absorb, utilize or even benefit from perturbations, shocks and stresses" (UN ESCAP 2020, p. 36).

What follows are three further exemplary definitions of resilience, each focusing on a particular thematic aspect and relating to the subject-focus of this study.

- 1. Climate change:** The definition from the Intergovernmental Panel on Climate Change (IPCC) focuses on building resilience to impacts of climate change. Resilience is defined as "the capacity of interconnected social, economic, and ecological systems to cope with a hazardous event, trend, or disturbance, responding or reorganising in ways that maintain their essential function, identity, and structure. Resilience is a positive attribute when it maintains capacity for adaptation, learning, and/or transformation" (IPCC 2022a, p. 2920).
- 2. Sustainable Cities:** The following definition focuses on urban resilience. Based on a comprehensive review of existing definitions of urban resilience in their widely cited article,

² Further: "A resilient city assesses, plans and acts to prepare for and respond to all hazards – sudden and slow-onset, expected and unexpected – especially those stemming from climate change" (UN Habitat 2022).

Meerow et al. (2016) propose a new definition to advance conceptual clarity and consistency: Urban resilience refers to “the ability of an urban system – and all its constituent socio-ecological and socio-technical networks across temporal and spatial scales – to maintain or rapidly return to desired functions in the face of a disturbance, to adapt to change, and to quickly transform systems that limit current or future adaptive capacity” (Meerow et al. 2016, p. 39).

3. Disaster Management: The AADMER defines disaster management as “the range of activities, prior to, during and after the disaster, designed to maintain control over disasters and to provide a framework for helping at-risk persons and/ or communities to avoid, minimise or recover from the impact of the disaster” (ASEAN Secretariat 2009, p.4).

Conceptual understanding of urban resilience.

It is clear that each of these definitions of resilience contains a wealth of aspects. Firstly, we highlight some recurring aspects to understand in more detail what resilience is about, and secondly, how to build it.

- Resilience is understood as an ability or capacity of a system and/or inhabitants to absorb and withstand all kinds of disturbances. In this document’s framing, these disturbances include, for example, disasters, adverse climate impacts – regardless of whether they cause disasters or not – or rapid urbanisation.
- Crucially, resilience is about thriving – sustainably and long-term. It is not only about maintaining continuity through disturbances or restoring a baseline situation, it is also about simultaneously improving, adapting, and transforming a system in terms of sustainability and human well-being (see also MONARES (2019)). For example, measurably reducing the risk of flooding with measures that simultaneously improve livelihoods. Increasingly, absorbing or adapting to changes of the Anthropocene is insufficient, highlighting the ability to

evolve or transform with change as important aspect of resilience (Reyers et al. (2018)).

- Resilience is about mitigating known risks and being able to respond to and recover from those risks we cannot predict or avoid (UN 2017; The Resilience Shift 2022).

Second, what are some of the prominent requirements for building resilience in practice?

- Resilience is built by holistic, systemic, and integrated thinking and practice – across sectors and fields of action (e.g. water, health, and transport), disciplines (e.g., hydrology, urban planning, and architecture), and communities (e.g. academia, planning, and civil communities).
- This integration is underpinned by collaboration and knowledge transfer across sectors, disciplines, and communities (e.g. academia, planning, and civil communities).
- Resilience is built by managing deep uncertainties. An example is explicitly pricing risks of climate change impacts into financial and economic decisions.

Disaster Risk Reduction (DRR) and CCA: Obviously, the concept of resilience is linked to DRR and CCA. The links are extensively discussed in the literature (Mysiak 2021). Yet because DRR and adaptation are central to the AWGs in focus, we outline some of these links, as well as select aims and added values of integrating DRR and CCA.

Similarities: DRR and CCA are central dimensions of all spheres of government and society (Mysiak 2021). They target resilience both as a precondition and as an outcome of risk-informed development. Multiple risks, i.e. climate-related disaster risks, are addressed by both concepts. These include, for example, risks from flooding caused by storm surges. Existing linkages are evident in definitions of the two terms.³ Both share similar ideas, and provide similar and complementary approaches: both DRR

³ Like for resilience, conceptual variance exists for the terms DRR and CCA.

and CCA aim at preventing, reducing, and managing risk, i.e. potential adverse consequences:

- **DRR:** The UNDRR states that “DRR is aimed at preventing new and reducing existing disaster risk and managing residual risk, all of which contribute to strengthening resilience and therefore to the achievement of sustainable development. Annotation: Disaster risk reduction is the policy objective of disaster risk management, and its goals and objectives are defined in disaster risk reduction strategies and plans” (UNDRR 2020a, p. 8).⁴
- **Adaptation:** The IPCC defines adaptation as “in human systems, the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities. In natural systems, the process of adjustment to actual climate and its effects; human intervention may facilitate adjustment to expected climate and its effects” (IPCC 2022a, p. 2898).

At the same time, the concepts have clear differences. Those disaster risks, which are not climate-related, are not directly addressed by CCA. An example is risks from flooding caused by earthquakes or tsunamis.

What is the aim of integrating DRR and CCA?

DRR and CCA promise to provide synergies and added value when integrated and present themselves as crucial for the achievement of resilience and the SDGs (Mysiak 2021; Proact Network 2008). The integration of DRR and CCA aims to enhance the overall resilience of communities and systems to the combined challenges posed by natural disas-

ters and climate change. The integration recognizes the interconnected nature of these two phenomena and seeks to address their commonalities to achieve more effective and sustainable outcomes. Resilience is built through, inter alia, effective DRR and CCA and aims to integrate DRR, CCA, and development. This is nicely done in the ASUS, in which urban resilience explicitly comprises (promoting resilience against) disaster risk and potential impacts of climate change (e.g. city flood defences, early warning systems) (ASEAN Secretariat 2018). Step by step approaches to integrating DRR and CCA are available, for example from UNDRR (UNDRR 2020a).⁵

What are selected key added values of integrating DRR and CCA in view of resilience?

- The integration of DRR and CCA can improve the impact and effectiveness of policy decisions. Stand-alone CCA measures, which do not include risks towards natural disasters as well as DRR, would lead to fragmented and non-holistic policy decisions. Integrating DRR and CCA into national level policy and coordination can contribute to advancing risk-informed, climate-smart, and sustainable development (Mysiak 2021). For example, mainstreaming DRM as well as climate adaptation aspects into urban planning and development plans can help utilizing synergies and move from a reactive approach to an approach more focussed on disaster prevention (JICA 2018a).
- By integrating different types of knowledge and methodologies, enabling diverse funding options, and working in non-silos, various hazards and their potentially disastrous outcomes and impacts on human-environmental systems

⁴ A global, agreed policy of DRR is set out in the UN endorsed SFDRR 2015-2030, adopted in March 2015, whose expected outcome over the next 15 years is: “The substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries” (UN 2015b, p. 12).

⁵ An integration of both approaches could be achieved by the following steps: “1. Develop capacities for national policy development and implementation that promotes coherence and synergy between CCA, DRR, and Health EDRM. 2. Build a coherent risk governance system that takes an all-hazards approach. 3. Understand how climate change, natural, biological and technological hazards affect each other. 4. Develop financing strategies for climate and disaster risk-informed investment. 5. Prioritize support to co-efficient disaster and health risk management and adaptation measures. 6. Coordinate data collection, assessment, implementation, monitoring and” (UNDRR 2020a, p. 8.).

could be managed more effectively and uncertainties could be reduced to a more manageable scope (UNDRR 2020a; Mysiak 2021). Further, potential benefits are the improved knowledge base that provides synergies for both policy arenas, and improved preparedness and response to disasters (EEA 2017).

- By integrating DRR and CCA, additional intersections and synergies of the two are better exploited, potentially leading, for example, to increased efficiency in human and financial resources (EEA 2017).
- Integrating DRR and CCA can provide the opportunity for better collaboration of communities and networks, both from the scientific and policy context. This can help solve or avoid a silo approach in addressing issues around urban planning and increasing resilience.

Even though systematic linkages and promising synergies between DRR and CCA are fully evident, there are challenges for integrating DRR and CCA in practice. Case-by-case differences need to be taken into account – spatial and temporal scales, the knowledge base, norm systems, interpretations of terminology, differing contextualisation in cities, and varying institutional and governance responsibilities in cities (Birkmann and Teichman 2010; Solecki et al. 2011).

Climate change mitigation: Considering climate change impacts, adaptation and DRR, strengthening urban resilience is obviously deeply linked to reducing the actual causes of climate change (i.e. mitigation) in urban settings. However, the integration of managing both causes and risks of climate-related impacts is only slowly gaining momentum in implementation.

Due to the project's focus, the Scoping Paper only loosely touches climate change mitigation. It highlights a few selected synergies and links of the report's focal aspects with mitigation, the need to ensure co-benefits, and the need to avoid negative trade-offs as much as possible from the outset. Effective and transformative climate change mitigation is crucial. Also, it must be part of a holistic approach to urban resilience for climate resilient development. Strengthening urban resilience is deeply linked to reducing and mitigating the actual causes of climate change, which should be integrated with CCA measures and their enabling conditions to advance climate resilient development (IPCC 2022c). Urban settlements are currently responsible for approximately 70% of global emissions and are therefore key to limit the impacts of climate change (Lwasa et al. 2022). Many potential synergies with sustainable urban development exist, e.g. with regard to energy efficiency, access to electricity, urban planning with more green spaces, reduced air pollution, and demand-side mitigation including shifts to sustainable healthy diets (IPCC 2022c). It is highly recommended to tackle mitigation comprehensively in the context of urban resilience as well, using the abundant links and synergies – and also to follow up on how to complement this type of study with strong climate mitigation recommendations.

The IPCC WG II report recently highlighted a forward-thinking way for integrated implementation of CCA and mitigation: climate resilient development (CRD). CRD refers to “the process of implementing greenhouse gas mitigation and adaptation measures to support sustainable development for all” (IPCC 2022a, p. 2903). Measures for reducing climate risks and greenhouse gas emissions, as well as enhancing biodiversity, are combined in a process to achieve the Sustainable Development Goals (SDGs).

3 Select risks to urban resilience in ASEAN

3.1 Terminology

Establishing an understanding of the terms risk and vulnerability is important. While they are commonplace in academic and policy contexts, there is no general agreement on their definitions. Furthermore, the terms are not uniformly understood nor used. Risk and vulnerability are approached in this section from a climate change impacts perspective and a disaster management perspective.

Risk: At the core of the IPCC's risk definition is the potential for adverse consequences. In more detail, risk is "the potential for adverse consequences for human or ecological systems, recognising the diversity of values and objectives associated with such systems. In the context of climate change, risks can arise from potential impacts of climate change as well as human responses to climate change"⁶ (Reisinger et al. 2020, p. 4). The UNDRR defines disaster risk as "the potential loss of life, injury, or destroyed or damaged assets which could occur to a system, society or a community in a specific period of time, determined probabilistically as a function of hazard, exposure, vulnerability and capacity" (UNDRR 2020b, p. 11).

The term "**key risk**" as it used by the IPCC WG II is defined in Section 3.2.2 Findings on selected climate-related "key risks" for urban areas in the ASEAN region.

Vulnerability: The IPCC defines vulnerability as "the propensity or predisposition to be adversely affected. [It] encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt" (IPCC 2022a, p. 2927). UNDRR defines vulnerability as "the conditions determined by physical, social, economic and environmental factors or processes which increase the susceptibility of an individual, a community, assets or systems to the impacts of hazards" (UNDRR 2022).

Risk and vulnerability are closely related, but they are clearly not the same thing. Therefore, the terms must not be used interchangeably.

⁶ Relevant adverse consequences include those on lives, livelihoods, health and wellbeing, economic, social and cultural assets and investments, infrastructure, services (including ecosystem services), ecosystems and species. The full definition of risk can be found in IPCC 2022a).

3.2 Selected risks related to climate change, natural disasters and rapid urbanisation in ASEAN

The ASEAN region is facing multiple climate and disaster risks and rapid levels of urbanisation. This section outlines a selection of such risks based on a literature review of select scientific and grey literature. Section 3.2.1 (Aggregated findings from literature review for ASEAN Member States) focuses on certain climate and disaster risks observed in AMS. Section 3.2.2 (Findings on selected climate-related “key risks” for urban areas in the ASEAN region) selects climate-related so-called “key risks” from the WG II Contribution (Impacts, Adaptation, and Vulnerability) to the IPCC’s AR6 in 2022, which are particularly relevant for urban areas in Southeast Asia. Then a selection of these key risks for urban areas in Southeast Asia was investigated.

3.2.1 Aggregated findings from literature review for ASEAN Member States

This section focuses on climate and natural disaster risks that are observed in AMS according to select literature. AMS are facing multiple climate and

disaster risks as well as rising levels of urbanisation throughout. Based on a literature review of select scientific and grey literature (all sources are provided in the Appendix A), these risks are outlined for each of the ten AMS (Appendix A), with a focus on how climate change affects its urban areas. The most widespread current risks from climate and natural disasters at member state level from this review are summarized in Table 2.

In Section 3.2.1, Aggregated findings from literature review for ASEAN Member States, we do not evaluate the correct and consistent use of the term “risk” within and across documents. In some cases, the use of a different term might be more adequate, i.e. “hazard”. However, most documents do not provide a clear definition for the term “risk”, while verification of the use of the term lies outside of the scope of this study. Therefore, we transmit those inherent inconsistencies. The risk is taken up and listed as such, if it is mentioned as risk in the analysed documents.

Table 2: Most observed climate and natural disasters in AMS - based on the overview of climate and natural disaster risks in AMS from a select literature review (see Appendix A)

	Floods	Heat	Droughts	Wildfires	Storms	Earth- quakes	Tsunamis	Land- slides	Volcanic eruptions
Brunei Darussalam	x	x		x				x	
Cambodia	x	x	x	x					
Indonesia	x	x	x	x		x	x	x	x
Lao PDR	x		x	x	x				
Malaysia	x	x	x	x	x	x	x		
Myanmar	x	x		x	x				
Philippines	x	x			x	x			
Singapore	x	x	x						
Thailand	x	x	x	x					
Viet Nam	x	x							

The most prevalent risks in AMS are floods, droughts, heat and storms.⁷ However, these do not equally apply to urban and rural areas (and to urban areas as such) and therefore require further differentiation. Hazards from urbanisation are not included in this particular overview. Climate and disaster risks for each AMS are discussed in more detail in Appendix A.

3.2.2 Findings on selected climate-related “key risks” for urban areas in the ASEAN region

The science is clear in showing that Southeast Asia is already squarely inside observed, i.e. detected, climate change. The 2022 publication of the WG II Contribution (Impacts, Adaptation, and Vulnerability) to the IPCC’s AR6 comprehensively assesses in clear terms the existing and increasing climate risks globally, and in Southeast Asia.

For example, the assessment concludes that in all cities and urban areas globally, the risk faced by people and assets from hazards associated with climate change has increased (Dodman et al. 2022). Furthermore, “globally, the most rapid growth in urban vulnerability and exposure has been in cities and settlements where adaptive capacity is limited – especially in unplanned and informal settlements in low- and middle-income nations and in smaller and medium-sized urban centres” (Dodman et al. 2022, p. 909).

The WG II summary for policymakers makes it clear that “climate change risks to cities, settlements and

key infrastructure will rise rapidly in the mid- and long-term with further global warming, especially in places already exposed to high temperatures, along coastlines, or with high vulnerabilities” (IPCC 2022c, p. 15). Further, “Asian urban areas are considered high-risk locations from projected climate, extreme events, unplanned urbanisation, rapid land use change, but also sites of ongoing adaptation” (Shaw et al. 2022, p. 1460).

Building on the seminal IPCC WG II contribution, Section 3.2.2 Findings on selected climate-related “key risks” for urban areas in the ASEAN region has the following focus: it narrows down a **selection of those climate-related “key risks” which were a) identified by WG II and b) which are particularly relevant for urban areas in Southeast Asia**. Then, a **selection of these climate-related key risks for urban areas in Southeast Asia was investigated**. Our investigation of five key risks includes citing some scientific findings from four WG II chapters – those in Footnote 10 and the Summary for Policy Makers. Regarding climate impacts and risks, the citations include both observed findings (mostly increases) as well as findings based on future projections. These findings substantiate, emphasise and illustrate the key risks. Importantly, Box 1 defines the term “**key risk**”, lists the key risks which we focus on, the method for selecting them, and why we focus on this selection. There are further key risks for urban areas identified by the WG II with high relevance for ASEAN, which we do not cover in this paper. Box 1 lists examples, and gives a follow-up recommendation in regards to this omission.

⁷ Section 3.2.1 Aggregated findings from literature review for ASEAN Member States provides a very brief overview for each AMS. Further differentiation for the types of each climate and natural disaster is not made in this section. A more detailed analysis on selected climate-related risks is provided in this paper starting in Section 3.2.2 Findings on selected climate-related “key risks” for urban areas in the ASEAN region.

What is understood by “key risks”?

Key risks are “potentially severe risks meriting society’s full attention globally and regionally across sectors, in order to inform judgements about dangerous anthropogenic interference with the climate system” (Ara Begum et al. 2022, p. 144). They “have potentially severe adverse consequences for humans and social-ecological systems resulting from the interaction of climate related hazards with vulnerabilities of societies and systems exposed” (IPCC 2022c, p. 5). For this paper, key risks are to be viewed in this light - as key climate-related risks resulting from such interactions, and in view of climate change.

What is meant by potentially severe? “Key Risks are ‘potentially’ severe because, while some could already be severe now, more typically they may become so over time due to changes in the nature of the climate-related hazards and/or of the exposure and/or vulnerability of societies or ecosystems to those hazards” (Dodman et al. 2022, p. 940).

Key risks are “particularly large for vulnerable subgroups, especially low-income populations, and already at-risk ecosystems” (O’Neill et al. 2022, p. 2416). In addition, key risks are of medium, high or very high confidence level.

Which climate-related key risks for urban areas do we focus on?

We focus on the following **selection** of key risks for urban areas in the ASEAN region from the IPCC’s WG II contribution to AR6:

1. Risks to population from increased heat
2. Heat stress, mortality, and morbidity from exposure to extreme heat and heatwaves

We jointly treat key risks 1 and 2

3. Urban infrastructure at risk of damage from flooding and severe storms
4. Risk to life and property due to sea-level rise (SLR) and coastal flooding
5. Health risks from air pollution exposure in cities

Further key risks for urban areas are identified by the WG II, which we **do not cover in this paper**. These include key risks which are also relevant for the ASEAN region. Main **examples** include:

- a. Risk to water security due to urban droughts
- b. Risk of loss of life, infrastructure, and income due to floods, with cascading risks to food security and health
- c. Risk of increasing chronic poverty due to climate change hazards on climate sensitive livelihoods
- d. Health risks from water pollution exposure and sanitation in cities

How and why did we select the five climate-related key risks for urban areas we focus on?

Key risks matching the following criteria were preselected: They are explicitly or particularly relevant for urban areas in general according to WG II. In addition, the key risks are geographically explicitly and particularly relevant in urban areas in Southeast Asia. Finally, the five key risks are geographically explicitly and particularly relevant in urban areas in Southeast Asia in at least two of these three sources.

Why did we limit the investigation to these five climate-related key risks for urban areas, and what do we suggest as a follow-up?

The investigation of climate-related risks, and this Scoping Paper, are more comprehensive and far-reaching than intended originally in the first stage of the project. Nevertheless, some key risks could not be investigated. This was due to limited time between the publication of the WG II contribution in late February 2022 and the finalization of the analysis, and an emphasis on thorough research and depth rather than breadth. Therefore, it is **important to conduct a gap analysis on the key risks for urban areas, which we have omitted in a follow up study**. The authors can be contacted for further suggestions in this regard.

Box 1: Selected climate-related key risks for urban areas in the ASEAN region which we focus on, the method of selection, and why we focus on this selection.

Risks from heat

Selected Key Risk 1: Risk to population from increased heat, and

Selected Key Risk 2: Heat stress, mortality, and morbidity from exposure to extreme heat, heatwaves

This section illustrates that climate-related key risks 1 (Dodman et al. 2022) and 2 (Shaw et al. 2022), which were identified by WG II to be particularly relevant for urban areas in Southeast Asia, are already pressing. The section then illustrates that, and how, heat-related impacts and risks to urban population and human health are projected to increase in the future in view of climate change.

Already today, heat stress is negatively impacting many parts of Southeast Asia, and is exacerbated in urban environments by the urban heat island effect (Kohler and Chow 2020). Zhao et al. (2021) estimate that currently more than 21,000 people die each year in Southeast Asia due to heat. The Lancet (The Lancet 2022) estimated an average 11,840 heat-related deaths each year in people older than 65 in AMS between 2014 and 2019 – a 117% increase compared to the annual average for 2000 to 2005. Li et al. (2022) find that in most parts of Southeast Asia, heat waves are already becoming more frequent, longer-lasting, and stronger, and affect more land areas. The urban heat island effect has increased in Southeast Asia, for example in Thailand, Indonesia and the Philippines (Shaw et al. 2022). Observed surface air temperature has increased in the 20th century all over Asia (Shaw et al. 2022).

Urban heat, driven by global climate change and urban development, is a major contemporary challenge that critically affects urban livability and sustainability (Nazarian et al. 2022). Heat waves are an important health risk globally (Watts et al. 2020), and this is particularly pressing in cities, inter alia due to the exacerbating urban heat island effect. Tropical and sub-tropical regions are generally exposed to high temperatures and high humidity levels throughout the year, which

makes them especially vulnerable to heat-related risks (Philipp and Chow 2020). O’Neill et al find that “there is nearly universal evidence that non-optimal ambient temperatures increase mortality” (O’Neill et al. 2022, p. 2426). Dodman et al find that “a considerable body of evidence exists on how the multi-scale impacts and consequent risks arise when local elevated temperatures within settlements are enhanced by climate change, with specific elements of this affecting megacities” (Dodman et al. 2022, p. 923).

Climate change will further exacerbate heat-related risks. In the future, more hot days and more intense heat-waves will increase heat-related deaths in Asia (Shaw et al. 2022). The WHO Climate and Health Country Profiles for the AMS⁸ highlight that especially heat-related deaths in the elderly are projected to strongly increase with climate change (WHO 2016). Heat waves, however, do not only negatively impact human health; they can also have detrimental effects on infrastructure (Zuo et al. 2015) and the economy (Xia et al. 2018).

In addition, across Asian cities the urban heat island effect will be amplified by climate change, especially in South and East Asia (Shaw et al. 2022). By 2080, 940-1100 million people in South and Southeast Asian cities could be affected by extreme heat lasting for more than 30 days per year, with poorer populations affected the most (Shaw et al. 2022). According to the ASEAN State of Climate Change Report (ASCCR), projected heat stress impacts by 2050 are “significantly higher in countries such as Myanmar, the Philippines, Thailand and Vietnam, and the impacts are much more pronounced in the RCP8.5 scenario” (ASEAN Secretariat 2021c, p. 39).

Extreme heat risks are expected to affect half of the future urban population when combined with warming induced by urban growth, with a particular impact in the tropical Global South and in coastal cities and settlements (Dodman et al. (2022). Projections indicate that more than 1.6 billion people in cities are expected to be living with extreme heat conditions by the 2050s – an increase of 800% compared to

⁸ Available for Brunei Darussalam, Cambodia, Indonesia, Lao People’s Democratic Republic, Malaysia, Myanmar, Thailand and the Philippines.

today's 200 million (C40 Cities, GCoM, UCCRN, Acclimatise 2018). According to global projections, urban temperatures could increase by up to 7.6°C (with substantial geographic variations) by the end of the century, assuming a high emission scenario (Nazarian et al. 2022).

For risk to population from increase heat, for example, severe consequences (and to whom) include increased mortality, morbidity, and heat stress events from urbanization and climate change, and increased health risks and mortality in elderly population and vulnerability of the young to heat (Dodman et al. 2022). Hazard conditions that would contribute to risks being severe are the substantial increase in frequency and duration of extreme heat events, exacerbated by urban heat island effects, as well as a concentration of a mixture of extreme heat and humidity (Dodman et al. 2022).

Risks from flooding and sea-level rise

Selected Key Risk 3: Urban infrastructure at risk of damage from flooding and severe storms, and Selected Key Risk 4: Risk to life and property due to sea level rise and coastal flooding

This is a selection of findings, mostly from the WG II contribution to AR 6, of why key risks 3 and 4 (Dodman et al. 2022; O'Neill et al. 2022; Pörtner et al. 2022b) are already pressing, and how these risks are projected to increase in the future. Flooding already today belongs to the most prevalent natural hazards in South-East Asia (ASEAN Secretariat 2021c), affecting many urban areas in ASEAN. The number of people, area of urban land, and damages from flood hazard in urban areas will increase due to sea-level rise, increases in tropical cyclone storm surge, and more frequent and intense extreme rainfall (Dodman et al. 2022). An increase in heavy precipitation already occurred in Southeast and East Asia (Shaw et al. 2022). Most of Southeast Asia is projected to experience more intense rainfall events by 2050 or sooner. Flood risk will become more frequent and severe in this particular regard in these regions

(Shaw et al. 2022). In monsoon regions, there will be a large increase in flood frequency, which would lead to the continuation of loss of lives and infrastructure without further mitigation efforts (Shaw et al. 2022).

Urbanization processes are an additional key driver of risks from flooding. Asian cities in particular “are highly exposed to future flood risks arising from urbanization processes” (Dodman et al. 2022, p. 925). In Indonesia, for example, rapid urbanization between 2000 and 2030 will increase flood risks by 76-120% for river and coastal floods. SLR will further increase the exposure to floods by 19-37% (Dodman et al. 2022).

Urban infrastructure at risk of damage from flooding and severe storms: Risk is particularly high within coastal cities, especially those located in low elevation coastal zones, due to risks from SLR. The hazard conditions that would additionally contribute to this risk being severe are substantial increases in intensity and frequency of extreme precipitation from severe weather events and tropical cyclones, contributing to pluvial and fluvial floods, which are exacerbated by long-term SLR and potential land subsidence (Dodman et al. 2022).

Risk to life and property due to SLR and coastal flooding: Severe consequences include “Loss of life and substantial damage to property [...especially in East Asia, ranging up to hundreds of millions of dollars per year in damages in some cities]” (Pörtner et al. 2022, p. 49). The hazard conditions that would contribute to this risk being severe are “property damage estimates based on 0.2 m SLR and associated coastal flooding; 1.9 m SLR projected for some regions with 5°C warming” (Pörtner et al. 2022, p. 49). SLR, land subsidence, poorly regulated coastal development, and the rise of asset values are major drivers of future risk in all coastal types of cities and settlements (Glavovic et al. 2022). East and Southeast Asia have the highest ocean-driven coastal risks to people, land, and infrastructure worldwide, even for low levels of projected SLR (Glavovic et al. 2022). Southeast Asia is a region particularly

⁶ Available for Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Thailand and the Philippines

Table 3: 2030 projections for the impact of sea-level rise and flooding on population and affected areas for Bangkok, Jakarta and Manila (Wang and Kim 2021)

City	Impacted area in km ²	Impacted population in millions
Bangkok	1512.94	10.45
Jakarta	109.38	1.80
Manila	37.29	1.54

vulnerable to SLR due to its extensive lowland and delta areas (Michalak et al. 2021). Indonesia and Vietnam are among the countries with the highest numbers of coastal populations exposed (Shaw et al. 2022). Coastal cities in Southeast Asia in particular “are expected to see a significant increases in average annual economic losses between 2005 and 2050 due to flooding” (Shaw et al. 2022, p. 1460). Storm surges and high waves by tropical cyclones of higher intensity are a high risk for a large number of Asian coastal megacities, exacerbated by SLR. A recent report by Greenpeace East Asia investigates the impacts of SLR on seven major Asian cities, including Jakarta, Manila and Bangkok (Wang and Kim 2021).⁹ The results for Jakarta, Manila and Bangkok are displayed in Table 3, and show the severity of potential SLR-driven flood impacts by 2030.

Risks from air pollution

Selected Key Risk 5: Health risks from air pollution exposure in cities

Population growth and economic development, accompanied by expanding energy consumption

often still relying on fossil fuel combustion, have led to air pollution becoming of increasing concern in Southeast Asia (IQAir 2022). Major anthropogenic sources of harmful air pollutants include the burning of fossil fuels in motor vehicles, power plants, heating systems and cookstoves, as well as industrial activities (including oil and gas extraction), open land burning practices and waste burning (Health Effects Institute 2020a). These activities result in the direct emission or formation of particulate matter (PM10 and PM2.5) and gaseous pollutants (e.g. SO₂, NO₂, CO, CO₂, ground-level ozone, volatile organic compounds), which are among the most important air pollutants with regard to harmful effects on the human respiratory and vascular system (Vallero 2014)¹⁰. Continued exposure to high concentration levels of air pollutants can have severe health effects, causing diseases including lung cancer, heart disease, stroke, chronic obstructive pulmonary diseases and respiratory infections (WHO 2022)¹¹.

Mortality risk for several pollutants, e.g. PM2.5, is considerable (Dodman et al. 2022). In ASEAN, the observable health impacts through air pollution vary across member states (see Table 4). For example,

⁹ The analysis is based on extreme sea level rise estimations for 2030 (estimated by using local sea-level projections plus the added height of a local ‘moderate flood’, caused by storm surges and high tides). It assumes a Business-as-Usual (BAU) greenhouse gas emissions scenario, with annual global greenhouse gas emissions continuing to increase through most of the twenty-first century (RCP8.5 scenario).

¹⁰ PM refers to the sum of all particles suspended in air, varying in composition and size, of which some are hazardous (El Morabet 2019). It is often classified according to particle size: PM10 refers to particles measuring 2.5–10 µm in aerodynamic diameter, while PM2.5 refers to particles with size ranges from 0.1 to 2.5 µm. Considering negative impacts on the respiratory and cardiovascular system, fine PM is generally considered more hazardous to human health than the coarser ones (El Morabet 2019).

¹¹ Generally, air pollution can be divided into ambient (outdoor) and household (indoor) air pollution. Levels of ambient air pollution are especially high in fast-growing urban regions. Denser population and high numbers of motorized vehicles, combined with intensive construction activity, solid waste burning practices and the use of polluting energy sources result in higher air pollution and – at the same time – higher human exposure in urban areas (Asian Development Bank 2022). Household air pollution can result from heating and cooking using solid fuels (e.g. wood, coal, charcoal, agricultural residues) in open fires or cookstoves with limited ventilation. This produces various pollutants harmful to human health, including fine particulate matter (PM2.5) and carbon monoxide (CO) (Health Effects Institute 2020a).

Table 4: Percent of total deaths attributable to air pollution per ASEAN Member State, for both sexes and all ages in 2019. Air pollution here includes particulate matter air pollution and ambient ozone pollution (The Lancet 2022)

ASEAN Member States	Percent of total deaths attributable to air pollution
Brunei Darussalam	2.13
Cambodia	15.90
Indonesia	10.91
Laos	17.47
Malaysia	6.23
Myanmar	17.72
Philippines	11.70
Singapore	5.92
Thailand	8.21
Vietnam	11.34

in Lao PDR and Myanmar, more than 17 % of total deaths were attributable to air pollution, closely followed by Cambodia with almost 16%. In Brunei Darussalam and Singapore, the attributable deaths were lowest with 2.1 % and 5.9 %, respectively (The Lancet 2022).

Considering deaths attributable to PM_{2.5} pollution in Southeast Asia in 2019, slightly more than half were linked to ambient pollution (51.2 %), while household air pollution accounted for the other half (Health Effects Institute 2020b). This is also one important explanatory factor for the high mortality rates observable in Lao PDR, Myanmar and Cambodia, countries in which a large share of the population uses solid fuels (93 %, 80 % and 79 %, respectively) (Health Effects Institute 2020b).

Average annual population-weighted outdoor PM_{2.5} concentration in ASEAN (excluding Brunei Darussalam, which displays lower concentrations) in 2021 ranged from 34.3 µg/m³ (Indonesia) to 13.8 µg/m³ (Singapore) (IQAir 2022). Despite a 16 % reduction

in annual PM_{2.5} concentrations from 2020 to 2021, Indonesia remains the region's most polluted country (ranked 17th globally), displaying concentration levels more than 30 % higher than Myanmar, the second ranked country in the region. Pollution levels in cities, however, reach even higher concentrations. Lampang (Thailand) was ranked first in 2021 in the region, with PM_{2.5} concentrations of 52.2 µg/m³ (IQAir 2022). In 2021, acknowledging the severity of the effects of PM_{2.5} on human health, the WHO changed its recommended PM_{2.5} concentration threshold from previously 10 to 5 µg/m³ (WHO 2021).

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Climate change has the potential to exacerbate air pollution risks, as ambient air quality and climate change are interrelated. Aerosol particles (of which many are also important components of PM_{2.5}) affect the climate through several key mechanisms (UNEP 2019): they directly impact the climate by scattering or absorbing (depending on the aerosol) incoming radiation from the sun and outgoing radiation from the earth. Additionally, they also influence the climate indirectly by affecting cloud properties and changing

surface albedo. Climate change, in turn, will affect air pollution concentrations, as it has the potential to influence the formation and removal processes of pollutants through changes in precipitation, temperature, other meteorological conditions and precursor concentrations (Jacob and Winner 2009). This is also highlighted by findings of the most recent IPCC report. Increasing ambient temperatures will spur pollutant formation reactions and could affect air-pollution related health effects. Higher temperatures are further associated with stronger effects of ozone pollution on mortality. Additionally, more frequent and severe dust and sand storms are expected to exacerbate air pollution problems (Shaw et al. 2022). Climate-induced decreases in air quality and resulting negative effects on human health are therefore to be expected (Cissé et al. 2022).

Global air pollution-related mortality directly attributable to climate change is “likely to increase and partially counteract decreases in air pollution-related mortality achieved through ambitious emission reduction scenarios or stabilization of global temperature change at 2°C” (Cissé et al. 2022, p. 1095). At the same time, projections indicate that ambitious climate action consistent with keeping global temperature change at or below 2°C would result in substantial benefits for air quality and thereby for human health (Dodman et al. 2022).

4 Policy landscape on urban resilience, focusing on aspects within climate change, sustainable cities and disaster risk reduction in ASEAN

4.1 Existing policy documents in ASEAN

With the 2015 Declaration on Institutionalising the Resilience of ASEAN and its Communities and Peoples to Disasters and Climate Change (ASEAN Secretariat 2015d), AMS committed to build and institutionalise resilience, together with DRM and CCA, at all levels of local, national, and regional government. The declaration is both a result of various previous efforts of incorporating resilience aspects in ASEAN policy, and at the same time lays the foundation for subsequent work in this regard.

In fact, the ASEAN region draws on a broad landscape of policies, strategies, and reports on the topics of resilience, CCA, and DRR. While urban resilience, and aspects related to it, have become more visible in some of these documents, a closer review shows that only few of them directly define or

address the concept of urban resilience. Nevertheless, many of them focus on crucial developments and aspects related to climate change, urban planning, and DRR, which lays the foundation for action on urban resilience.

The following section provides an overview of the ASEAN policy landscape on urban resilience, focusing on aspects within CCA, sustainable cities, and DRR (Figure 1). By doing so, it also outlines how the concept of urban resilience is conceptualised and addressed in these documents and initiatives. For a better overview, the documents are grouped into the three core areas climate change, sustainable urbanisation, and DRR, according to the AWGCC, AWGESC, and ACDM WG P&M.

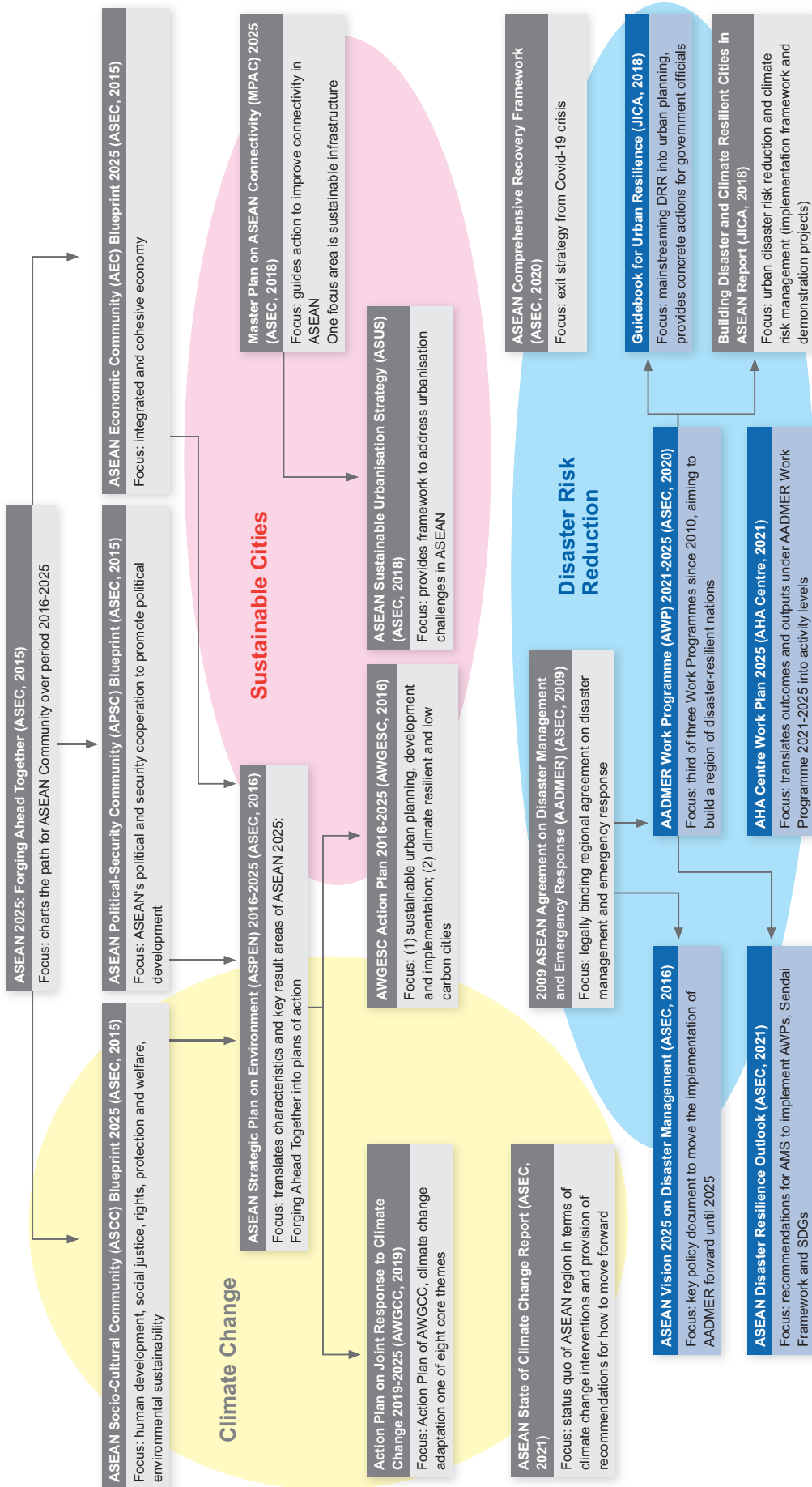


Figure 2: Overview of selected policy responses in ASEAN (ellipses indicating the thematic focus of the documents, i.e. climate change, sustainable cities or DRR)

4.1.1 ASEAN's overarching policy framework

In November 2015, ASEAN entered into an **ASEAN Community**. The ASEAN Community is anchored on three pillars, namely the **ASEAN Political-Security Community (APSC)**, **ASEAN Economic Community (AEC)**, and **ASEAN Socio-Cultural Community (ASCC)**, which are closely intertwined and mutually reinforcing to ensure peace, stability, and shared prosperity in the region. The strategic document **ASEAN 2025: Forging Ahead Together** was endorsed simultaneously and charts the path for the ASEAN Community 2016-2025 (ASEAN Secretariat 2015a). The forward-looking roadmap contains three Blueprints, namely the **APSC, AEC, and ASCC Blueprints 2025** (ASEAN Secretariat 2015c, 2016b, 2016c) which form the current policy framework for ASEAN cooperation until 2025.

Priority areas of cooperation on climate change, environmental questions and climate- and disaster-resilient development are mainly outlined in the **ASCC Blueprint 2025** (ASEAN Secretariat 2016b). The strategy paper integrates a disaster resilient and climate adaptive ASEAN in its vision of resilience, without focusing on urban resilience per se. It envisions “a resilient community with enhanced capacity and capability to adapt and respond to social and economic vulnerabilities, disasters, climate change as well as emerging threats, and challenges” (ASEAN Secretariat 2016b, p. 3). The Blueprint is structured around five characteristics and respective result areas, identified as especially important to achieve the Blueprint's goals. Under the result areas “sustainable climate” and “environmentally sustainable cities”, a strong focus is set on strengthening human and institutional capacity to implement strategies and programmes related to CCA, mitigation and urban planning, especially on vulnerable and marginalized communities. Promoting coordination and synergies among relevant sectors in these regards, including DRR, is a focus as well. To establish a “Disaster Resilient ASEAN”, the strategy suggests to institutionalise resilience as well as “promote policy coherence and interlinkages, and synergise initiatives on disaster risk reduction, climate change adaptation and mitigation, humanitarian actions and sustainable

development” (ASEAN Secretariat 2016b, p. 15). Overall, resilience is understood as a cross-cutting aspect and the importance of integrated (across stakeholders, sectors and policy areas) and inclusive (special focus on vulnerable people and communities) approaches is highlighted.

Another important, overarching ASEAN framework relevant for future resilient development is the **ASEAN Comprehensive Recovery Framework (ACRF)** (ASEAN Secretariat 2020b). It was developed to respond to the COVID-19 pandemic and the continued ending of lives and disruption of livelihoods, and serves as the consolidated exit strategy from the crisis. The framework defines five broad strategies, one of them focusing on “Advancing Towards a More Sustainable and Resilient Future”. To support the attainment of the strategy, seven key priorities are listed, of which one aims at managing disaster risks and strengthening disaster management. The document recognizes the need to “invest greater resources to strengthen the disaster-resilience of the ASEAN community” (ASEAN Secretariat 2020b, p. 41). Without having a specific focus on the urban context, the framework defines a wide range of outputs and deliverables, including capacity building, awareness raising, and strengthening collaboration, which aim at enhancing DRR and management in the region.

4.1.2 Climate Change

AWGCC Action Plan 2019–2025

The **ASEAN Senior Officials on Environment (ASOEN)** are tasked to provide strategic guidance in the implementation and Monitoring and Implementation (M&E) of the ASEAN Strategic Plan on Environment (ASPEN). They also provide supervision of seven subsidiary thematic AWGs, which exercise oversight functions over programmes and activities developed under AWG Action Plans. One of those AWGs is the **AWGCC**.

The AWGCC was established to enhance deeper and closer cooperation on climate change and to support the implementation of strategic measures

and actions. The Updated **AWGCC Action Plan (2019–2025)** guides ASEAN Member States in implementing the ASCC and outlines eight core themes to address climate change (AWGCC 2019). The Action Plan has the objective to enhance cooperation to better address climate change, to contribute actively to global frameworks such as the Paris Agreement, and to coordinate activities within the AMS on climate change to share best practices and lessons learned (ASEAN Secretariat 2016c). The Action Plan outlines eight core themes to achieve that and CCA is one of them. Urban resilience is recognised as a key area of concern under the topic of CCA. Specific activities to address this are to enhance the AMS' urban resilience towards the risks of climate change and conduct knowledge-sharing workshops on climate resilience. However, these activities are not further specified and no AMS has been defined yet to lead the implementation.

4.1.3 Sustainable Cities

AWGESC Action Plan 2016–2025

A key actor working on issues related to urban resilience is the **AWGESC**, which has been established as a subsidiary body of the ASOEN in 2005. One of the key responsibilities of the AWGESC is to oversee the planning and to address technical and implementation issues related to the **AWGESC Action Plan 2016–2025** (AWGESC 2016).

The Action Plan aims at ensuring the environmental sustainability of cities and urban areas in ASEAN, while meeting the social and economic needs of the people. Furthermore, it seeks to “promote sustainable urbanisation and climate resilient cities towards a clean and green ASEAN” (AWGESC 2016, p. 3). By defining these objectives, the plan recognises and highlights the importance of climate resilience of cities and urban areas in ASEAN and makes it a core theme for the strategic direction of the AWG in the upcoming years. The Action Plan includes two programmes to achieve this: (a) Sustainable Urban Planning, Development, and Implementation and (b) Climate Resilient and Low Carbon Cities. Each programme defines a range of outputs and indicators

aimed at capacity development and the establishment of structures and mechanisms to foster urban resilience. A strong focus was set on cross-sectoral and multi-level integration and coordination of the topic of urban resilience – with both CCA and DRM. On one hand, a better integration and demonstration of CCA and mitigation is envisioned, for example through piloting concrete adaptation and mitigation measures and initiatives in selected cities. On the other hand, the plan defines enhanced coordination with the ACDM as a central output, for example through joint initiatives on climate resilient cities.

ASEAN Sustainable Urbanisation Strategy (ASUS)

The **ASEAN Sustainable Urbanisation Strategy (ASUS)** (ASEAN 2018) is one of the crucial strategy papers targeting sustainable cities in ASEAN. It was developed as an initiative under the **Master Plan on ASEAN Connectivity 2025 (MPAC 2025)** (ASEAN Secretariat 2016e) and is aligned with the **ASEAN Smart Cities Framework (ASCF)** (ASCN 2018a). MPAC 2025 is a strategic document with the aim of guiding actions to improve connectivity in the ASEAN region (ASEAN Secretariat 2016e). It encompasses five strategies, each consisting of strategic objectives and affiliated initiatives. As one of the 15 initiatives under MPAC 2025 the **ASUS** was developed in 2018 (ASEAN 2018). The ASUS constitutes a central strategy for urban development in the ASEAN region. The strategy heavily focuses on **sustainable infrastructure** as a means to meet urbanisation demands. It provides a framework for sustainable urbanisation, which is aligned with the **ASCF** (ASCN 2018a, 2018b) by using the same development focus areas. There are six of these priority areas (Figure 3). The ASUS identifies existing barriers for implementing these actions and defines seven corresponding priority sub-actions, one of those being urban resilience. The ASUS does not provide an explicit definition of urban resilience, but the focus, priority action, and objective are stated clearly: Urban resilience in the context of the ASUS is subsumed under the focus area “built infrastructure” and explicitly focuses on (promoting resilience against) disaster risk and potential impacts of climate

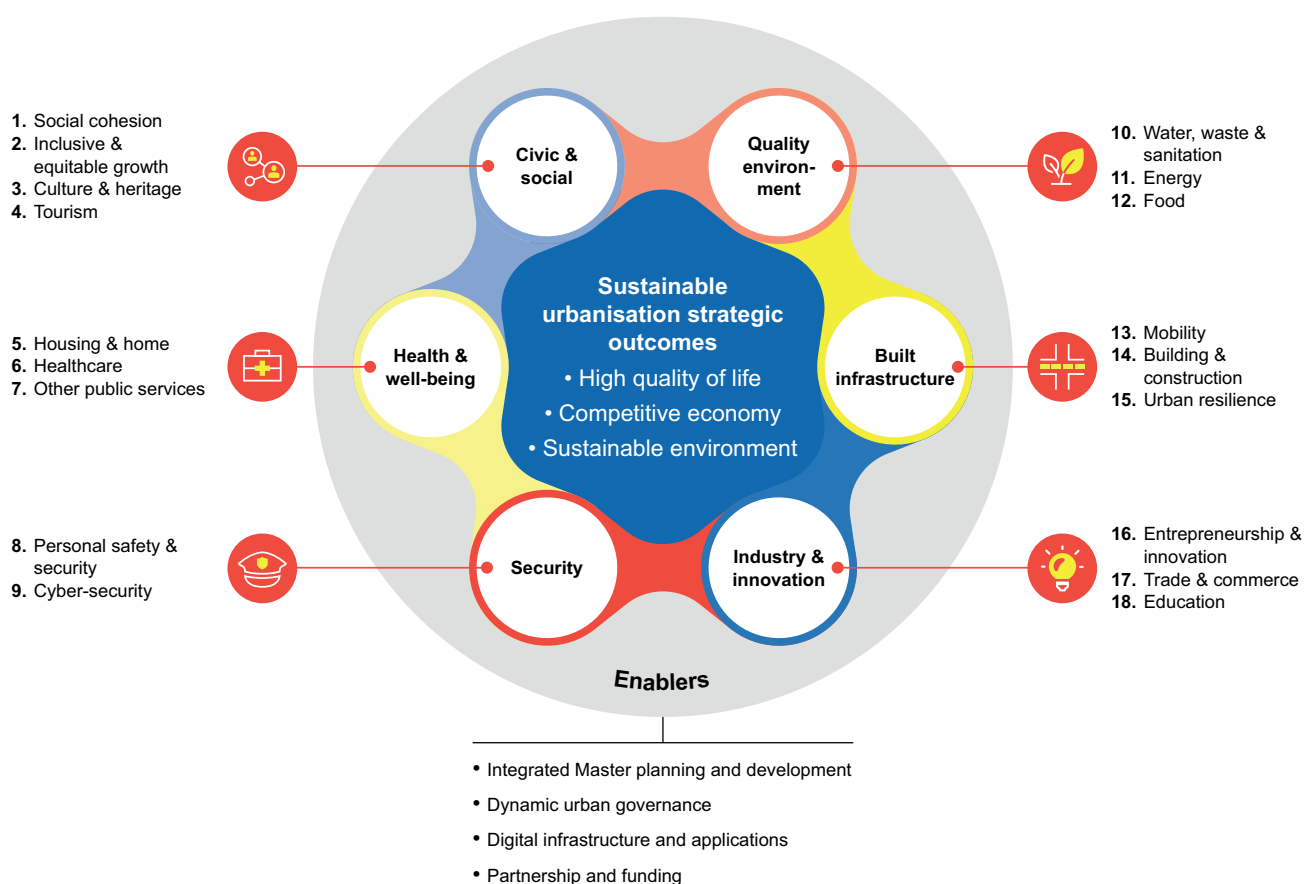


Figure 3: Six priority areas and eighteen sub-areas of the ASUS¹² (adapted from ASEAN 2018)

change (e.g. city flood defences, early warning systems) through integrated planning and development, as well as dynamic and adaptive urban governance. Since the AMS are facing increasing threats from flooding, the strategy highlights the development of flood management systems as the single most important action under the sub-area. A “prioritisation toolkit” and “action plan toolkit” are available for ASEAN cities as part of the ASUS, which help cities carry out their own prioritisation of sub-areas and actions that are relevant to their context. To conclude, in the case of the ASUS, urban resilience focuses on sustainable infrastructure as a means to meet urbanisation demands.

4.1.4 Disaster Risk Reduction (DRR)

Agreement on Disaster Management and Emergency Response (AADMER)

Many of the policy responses on DRR have their origin in or are based on the **AADMER** (ASEAN Secretariat 2009). It is a legally binding regional agreement and serves as the ASEAN policy backbone in all aspects of disaster management and emergency response. AADMER was signed by all 10 AMS to address concerns of vulnerability to natural disasters and to guide the regional cooperation in the field of disaster management and response. In addition, it

¹² While the six areas of the ASUS framework are the same as those of the ASEAN Smart Cities framework, the sub-areas have been adapted from the ASC framework to (a) be consistent with the stocktake of actions in sustainable urbanisation conducted by the ASUS; and (b) reflect the priorities of AMS and Dialogue Partners and other External Partners who were engaged during the development of the ASUS.

supports a number of initiatives that were established by AMS focusing on DRR, disaster management, and disaster response. Based on the AADMER, the **ASEAN Vision 2025 on Disaster Management** (ASEAN Secretariat 2016d) and three **AADMER Work Programmes (AWP)** (ASEAN Secretariat 2010, 2016a, 2020a) were published, which are the focus of this section.

ASEAN Vision 2025 on Disaster Management and AWP

As a key policy document, the **ASEAN Vision 2025 on Disaster Management** was developed to move the implementation of AADMER forward until 2025 by outlining key areas and directions that may be considered by ASEAN (ASEAN Secretariat 2016d). Overall, the strategy paper focuses on disaster management and emergency responses. It highlights the importance of a disaster-resilient ASEAN region, including climate change induced disasters, and building respective capacities of AMS. It does not, however, have a specific focus on urban resilience.

To support the ASEAN Vision 2025 on Disaster Management, three **AADMER Work Programmes (AWP)** (AWP 2010–2015 (ASEAN Secretariat 2010), AWP 2016–2020 (ASEAN Secretariat 2016a), and AWP 2021–2025 (ASEAN Secretariat 2020a)) were developed by ACDM. Resilience as a guiding characteristic has been central in all three AWP, as referring to disaster resilience. This is clear, for example, through the subtitles of the AWP for 2010–2015 of “Building disaster-resilient nations and safer communities” (ASEAN Secretariat 2010). In addition, the first AWP made Urban DRR one of the eight sub-components of the strategic priority Prevention and Mitigation and defined the development of national action plans on urban disaster resilience as one of the expected outputs.

The vision of the current **AWP 2021–2025** is to build “a region of disaster-resilient nations, mutually assisting and complementing one another” (ASEAN Secretariat 2020a, p. 23). The programme was developed based on the foundation laid out by the AADMER itself with the goal to establish key regional initiatives on disaster management that attenuate the consequences of natural disasters and climate change. The mission is “to enhance and support ASEAN’s disaster risk reduction and disaster management capabilities through inter-sectoral cooperation, capacity building, scalable innovation, resource mobilization, new partnership, and stronger coordination among ASEAN Member States” (ASEAN Secretariat 2020a, p. 23). It defines five priority programmes through which the AADMER will be carried out in the coming years. These are implemented through three ACDM WGs, namely the ACDM WG P&M; the ACDM WG on Preparedness, Response and Recovery; and the ACDM WG on Global Leadership. Urban resilience is not explicitly defined. However, it is featuring in sub-priority 2.2. of the priority programme Prevention and Mitigation, which focuses on Resilient Cities and Human Settlements. Two related outcomes are defined, namely (a) strengthening the engagement with regional and national actors on cities and human settlements to enhance urban resilience; and (b) expanding capacity building and knowledge sharing initiatives on cities and human settlements (ASEAN Secretariat 2020a).

The **ASEAN Coordinating Centre for Humanitarian Assistance on disaster management (AHA Centre) Workplan 2025** was published by the AHA Centre as a strategic document (AHA Centre 2021) to support the implementation of the AWP. The AHA Centre is an intergovernmental organization that was established in 2011 to facilitate cooperation and coordination among AMS, and with partners, including international organisations, private sectors, and civil societies.

Flagship projects under the AADMER Work Programmes

For better implementation of the first AWP 2010-2015, a List of Flagship Projects for Phase 1 of the Programme (2010-2012) was developed with flagship projects for each of the AWP's six building blocks. Three years later, complementary flagship projects and priorities for the implementation of AWP's Phase 2 (2013-2015) were identified. These were presented in the form of 21 Concept Notes to further concretise the implementation of the flagship projects and priorities.

Concept Note 18 (CN 18) "**Building Disaster and Climate Resilient Cities in ASEAN**" explicitly targeted urban resilience (ASEAN Secretariat 2013). From 2015–2018, an implementation framework for CN 18 was created through a project performed in close collaboration with the Japan International Cooperation Agency (JICA). All of the three objectives were focusing on urban DRR and climate risk management and as a result, the project generated several important outputs for increasing urban resilience in the ASEAN region. It led to the establishment of the **AURF** and to the development of two demonstration projects on performing risk assessments and formulating city action plans. The final project report was published in 2018 (JICA 2018a) and focuses on DRR and CCA measures in urban development, land use planning processes, and building regulations.

Furthermore, a key output of the implementation framework of Concept Note 18 was the development of the **Guidebook on Urban Resilience** (JICA 2018b). It aims at providing guidance to national and local government officials in the AMS on how to increase urban resilience to disaster and climate risks. The guidebook's key objectives are to foster the understanding of urban disaster risks and possible countermeasures, to provide guidance on how to mainstream DRR into urban planning and management and to share good practice examples. It includes a methodology for Disaster Risk Assessments and an overview of applicable tools to improve a city's resilience. It also contains a checklist for urban resilience to help apply the methods and measures introduced. The guidebook has a clear focus on DRR and does not address other aspects of urban resilience in more detail. It also does not delve into the response side of disaster risk management (i.e. responses when a natural disaster manifests).

As outlined in **The ASEAN Disaster Resilience Outlook** (ASEAN Secretariat 2021d), ASEAN strives to be a global leader in disaster management. The previously presented documents and initiatives have already substantially contributed to achieving that vision. To build on that momentum, the Outlook provides recommendations for AMS to implement AWP 2021–2025, the SFDRR and SDGs. Furthermore, they give inspiration for opening up new ground with regards to communications, resource mobilisation and innovations, thereby paving the way for strengthened disaster resilience in ASEAN.

4.2 Initiatives, programmes and networks on sustainable urbanisation and urban resilience

In support of the presented documents, a wide range of initiatives and programmes exists in the ASEAN region that address urban resilience and sustainable urbanisation. Especially under AWGESC, a number of initiatives were launched to move closer to achieving the goal of ensuring the environmental sustainability of cities and urban areas in ASEAN, while meeting the social and economic needs of the people. The following paragraphs provide an overview of existing and past initiatives, programmes and networks, both under AWGESC and outside.

4.2.1 Initiatives under ASEAN Working Group on Environmentally Sustainable Cities

- **ASEAN Initiative on Environmentally Sustainable Cities (AIESC):** with its endorsement by the ASEAN Environment Ministers in 2005, the initiative was one of the first of this kind (ASEAN Secretariat 2015b). Its main goal is to assist ASEAN cities to pursue environmental sustainability, especially focusing on smaller and rapidly growing cities. At its core is a network of 25 ASEAN cities. Following a process of developing Key Indicators for Clean Air, Clean Land, and Clean Water, which was part of a workshop held in Jakarta in 2005, AWGESC piloted and tested the developed indicators with the cities of the initiative. Later on, the three indicator categories also became part of the ASEAN (ESC) Award Programme.
- **ASEAN Environmentally Sustainable Cities (ESC) Award Programme:** the programme was launched in 2008, rewarding cities' efforts in promoting clean, green, and liveable cities through eco-friendly policies and programmes (ASEAN Secretariat 2015b). Generally, the

award aims at increasing awareness for environmental sustainability and wants to encourage cities to act. The ESC Award takes place every four years. In 2011, Certificates of Recognition were additionally introduced. These recognise cities' achievements in three specific target areas: clean air, clean land, and clean water. The latest ESC Awards were held in 2021, back-to-back with the 16th ASEAN Ministerial Meeting on Environment in Indonesia.

- **High-level Seminars on Sustainable Cities (HLS-SC):** since 2010, these seminars have been organised on a yearly basis by ASEAN and Japan (IGES 2020). Every year, policymakers, experts, and practitioners from East and Southeast Asian countries gather to advance knowledge exchange and foster collaboration between cities in the region. The seminars provide opportunities to share innovative urban development strategies and best practices as well as to discuss and decide on further collaborative actions. In addition, specific recommendations for the East Asia Summit Environment Ministers Meeting, which includes ASEAN Environment Ministers, are developed during the seminars, including suggestions for practical cooperation activities. For example, the **ASEAN ESC Model Cities Programme** was proposed during the first seminar in 2010, before running from 2011 until 2017 (Teoh et al. 2018). It had identified and supported 40 cities in implementing innovative policies and practices and bottom-up environmental management. In light of the increasing importance of enhancing urban resilience, the HLS-SC emphasises that both climate and developmental issues need to be addressed.

- **SDGs Frontrunner Cities Programme (SDGs-FC):** building on the ASEAN ESC Model Cities programme, the SDGs-FC is an initiative under the AWGESC. Funded by the Japan-ASEAN Integration Fund (JAIF), the initiative aims at supporting ASEAN cities in achieving inclusive, sustainable, resilient, and dynamic development in line with the ASEAN Vision 2020 through aligning city action with the SDGs (ASEAN SDGs Cities 2021). Key objectives of the SDGs-FC are to support practices and policies enhancing green and sustainable development, to foster capacity building and to promote the exchange of knowledge and experiences. The programme also supports cities in producing tangible outputs to achieve those objectives. Under the initiative, cities produce a “Priority SDGs Report” and “Project Action Plan”, and apply the “Inventory Method” to identify key policies and good practices that have the potential to impact sustainable development in the respective city.
- **Smart Green ASEAN Cities Programme (SGAC):** as the most recently launched initiative under AWGESC, it supports the AMS in advancing low-carbon and sustainable urban development, focusing on smart solutions and technologies (ASEAN Secretariat 2021e). It was launched in November 2021 with a duration of four years. The programme is funded by the European Union and implemented by the United Nations Capital Development Fund (UNCDF). It aims at reducing cities’ environmental and carbon footprints, reducing urban pollution as well as promoting energy efficiency and the development of a circular economy. Climate change mitigation and smart solutions are the focus of this initiative, urban resilience to disaster and climate change risks is not explicitly targeted. However, the programme acknowledges threats from climate change as a key challenge for the AMS that also has to be addressed as part of sustainable urban development.

4.2.2 Additional initiatives, programmes and networks

Outside of AWGESC, a number of programmes, networks and initiatives aim at promoting sustainable urbanisation.

- **ASEAN Smart Cities Network (ASCN):** This city network was established in 2018 at the 32nd ASEAN Summit (ASCN 2018b) as a collaborative platform through which cities from the AMS work towards promoting smart and sustainable urban development. It is an initiative under the ASEAN Connectivity Division. Currently, 29 pilot cities are part of the network. As a main output, ASCN has developed the **ASCF** as a guide for smart city development in the region, on which the ASUS framework is based. It strives for three strategic outcomes: High Quality of Life; Competitive Economy; and Sustainable Environment (ASCN 2018a, 2018b). Initiatives can be implemented in one or more of six development focus areas. Urban resilience is mainly part of the focus area “quality environment” and is understood as resilience to disaster risks and potential climate change impacts. The ASCF highlights the importance of integrated planning and development, as well as dynamic and adaptive urban governance. All cities of the network have developed a Smart City Action Plan, of which two chose urban resilience as one of their focus areas or strategic targets.
- **ASEAN Urban Resilience Forum (AURF):** The forum was established as a regional cooperation mechanism, enhancing partnerships in the ASEAN region to increase urban resilience (JICA 2017). The Forum was created as part of the CN 18 project implemented by JICA from 2015 to 2018. The first AURF took place in 2016. Key objectives of the forum are to enhance knowledge exchange and networking by establishing a multi-sectoral collaborative platform, as well as to support policy develop-

ment on DRR and CCA. Its activities comprise an annual seminar and the provision of information and knowledge exchange opportunities through the forum's website.

- **ASEAN Sustainable Urbanisation Forum (ASUF):** The ASUF was conducted for the first time in 2021 (ASUF 2021). It is an ASEAN initiative, aiming at the establishment of a multi-stakeholder ecosystem for knowledge sharing and policy development on the topic of sustainable urbanisation. ASUF is one deliverable of the project on Accelerating the Implementation of ASUS (the "ASUS Project") and builds on the findings and guidelines of the ASUS. The forum aspires to increase connectivity and engagement between AMS, cities and other relevant stakeholders, to provide a knowledge platform for sustainable urban development as well as to provide learning opportunities and guidance to interested practitioners. Urban Resilience: Develop Flood Management System was one of the thematic dialogues in the forum which discussed, among others: city learning opportunities for technical and strategic areas of flood risk management; integration of vulnerable communities into flood risk planning processes; risk reduction and the scaling up of collaboration and cooperation among stakeholder groups; best practices on accessing sustainable funding mechanisms for flood risk management (ASUF 2021).

4.2.3 National level policy responses

As outlined in Section 3, the ASEAN region faces multiple climate risks and vulnerabilities, as well as rising levels of urbanisation throughout. Each AMS is affected differently and therefore needs to respond individually to those risks and vulnerabilities. Appendix B provides an overview of the key bodies and institutions, as well as unique policy responses on urban resilience, DRR and CCA policy responses by each of the ten AMS.

5 Gap analysis: Addressing risks and vulnerabilities for urban areas in ASEAN

This section aims at providing a basis for identifying policy gaps relating to urban resilience – risks and vulnerabilities lacking coverage in the current ASEAN regional policy landscape. It analyses whether selected risks from Section 3.2 Selected risks related to climate change, natural disasters and rapid urbanisation in ASEAN are addressed in key ASEAN documents presented in the first half of Section 4 Policy landscape on urban resilience, climate, and disaster risks in ASEAN. Where relevant, the analysis also draws on additional ASEAN policy documents targeting specific topics.

Addressing a risk is understood as: 1. The risk is acknowledged as a common risk throughout the AMS; 2. It is considered important to act in order to mitigate this risk; 3. It is either acknowledged that measures have to be taken to reduce the risk or

measures are suggested. It does not entail, however, that the assessed policy document contains suggestions for adaptation action or proof that adaptation measures have been implemented. Additionally, it has to be highlighted that the focus of this analysis is on regional policy responses. National policies were considered outside the scope of this analysis.

The analysis first assesses whether risks for urban areas relating to climate change and natural disasters are generally addressed. It then assesses whether selected “key risks” for urban areas in the ASEAN region (discussed in Section 3.2.2 Findings on selected climate-related “key risks” for urban areas in the ASEAN region) are addressed. The term “key risk” is comprehensively defined in Box 1 in Section 3.2.2 Findings on selected climate-related “key risks” for urban areas in the ASEAN region. Finally, it

Table 5: Select topics and whether they are addressed in ASEAN documents that are most relevant for

Topics addressed	ASEAN Documents			
	ASEAN Declaration on One ASEAN One Response (2016)	ASEAN Socio-Cultural Community Blueprint 2025 (2016)	Master Plan on ASEAN Connectivity 2025 (2017)	ASUS (2018)
Climate risks in general		x		
Disaster risks in general	x	x		
Climate resilient development		x		
Risks from floods				x
Risks from sea-level rise				
Risks from urban heat				
Air pollution				x

investigates whether key aspects of CRD are considered in the reviewed documents, focussing on using synergies of adaptive action with climate change mit-

igation and biodiversity conservation. The findings of the analysis for the most important regional policy documents are summarized in Table 5.

5.1 Addressing climate-related risks and risks from natural disasters

Most documents and initiatives address observed climate-related and disaster risks, often from a regional perspective, sometimes also from a national perspective. However, importantly, less attention is paid to projected changes in climate-related risks as well as analyses at smaller scales. Most widely mentioned are risks from floods, droughts, and risks from climate change-related extreme weather events such as storms (specifically tropical cyclones). The ASCCR (ASEAN Secretariat 2021c) is the most comprehensive document that identifies climate-related risks and outlines possibilities to address them throughout various governance levels. The report looks at climate change impacts and vulnerabilities in the ASEAN region, which are expected to increase in the medium to long-term. It highlights the importance of underlying factors, such as the high dependency of the region's economies on sectors that are strongly affected by climate change, high poverty levels and disaster loss and damage.

The AWP (ASEAN Secretariat 2020a) and the affiliated AHA Centre Work Plan (AHA Centre 2021)

are key policy documents addressing disaster risks in ASEAN, aiming to contribute to the reduction of disaster losses and enhancing regional cooperation in disaster preparedness and response through five extensive priority programmes. These documents also acknowledge the importance of climate change impacts, touch upon various climate-related risks. Overall, climate-related and disaster risks and vulnerabilities are addressed in a number of ASEAN strategies and initiatives, yet missing in a number of others (see Table 3). It is important to mention that the connection to urban areas and urban resilience is often not explicitly drawn. Risks are often addressed in a generalised manner, and a more differentiated approach to risks is frequently lacking. Aspects which would benefit from further differentiation include, but are not restricted to: a) considering not only current climatic conditions, but also taking into account future projections of climate and related changes in risks, b) assessing risks specifically in urban contexts, c) further specifying and differentiating the risks which are assessed (risks from what, i.e. flooding types, to whom, what, and where).

urban resilience (general topics in light blue, specific risks in dark blue)

	ASEAN Documents					
	Guidebook for Urban Resilience: Building Disaster and Climate Resilient Cities (2018)	ASEAN Vision 2025 on Disaster Management	ASEAN Comprehensive Recovery Framework (2020)	AWP 2025 (2020)	AHA Centre Workplan 2025 (2021)	ASEAN State of Climate Change Report (2021)
	x		x	x	x	x
	x	x	x	x	x	
	x			x		x
	x			x	x	x
	x					x
						x
						x

5.2 Addressing selected “key risks” for urban areas in the ASEAN region

Risks from heat

Selected Key Risk 1: Risk to population from increased heat, and

Selected Key Risk 2: Heat stress, mortality, and morbidity from exposure to extreme heat, heatwaves

The ASCCR states that heat stress is among existing climate change risks that are projected to increase in ASEAN. The report highlights the need to introduce adaptation practices to deal with heat stress in the near future due to significant impacts (ASEAN Secretariat 2021c). Furthermore, heatwaves are a category of natural disasters the activities of ACDM intend to focus on (ASEAN Secretariat 2020a, Annex 5). In the Climate and Health Country Profiles from the WHO for almost all AMS, heat-related mortality for vulnerable groups (especially elderly) and its projected increases in the future, for example, is always featured as an important climate-induced health risk for these countries (WHO 2016). The ASEAN literature review concluded, however, that there is still little awareness of the increasing risk to population from increased heat, and mortality and morbidity from exposure to extreme heat and heatwaves. Urban heat is mentioned in one out of ten documents.

There are also gaps in assessing, as well as reducing, existing and future risks from increased heat and heatwaves. For example, heat and the health risks outlined above are not mentioned in screened ASEAN Health Cluster Work Programmes (Senior Officials Meeting on Health Development 2022a, 2022b, 2022c, 2022d) and the ASEAN Post-2015 Health Development Agenda (2021-2025) (ASEAN Senior Officials Meeting on Health Development 2021). Additionally, the information on linkages between human health and extreme heat and potential solutions are currently missing in ASEAN documents. There is also a gap of assessing risks from heat in urban areas specifically. Altogether, this

indicates a danger of systematically underestimating these risks and the importance of mainstreaming heat risk prevention in ASEAN, especially in urban areas.

Risks from flooding and sea-level rise

Selected Key Risk 3: Urban infrastructure at risk of damage from flooding and severe storms, and

Selected Key Risk 4: Risk to life and property due to sea level rise and coastal flooding

Overall, the literature review revealed a high awareness for observed risks in ASEAN. Flooding is mentioned in half of the reviewed ASEAN documents (see Table 3). Risks related to inland and coastal flooding are among the most frequently addressed risks throughout ASEAN documents. Other key addressed topics include risks for infrastructure and appropriate flood management systems. SLR appears in two documents: in the Guidebook for Urban Resilience: Building Disaster and Climate Resilient Cities (2018) and in the ASCCR (2021). The latter includes future risk projections for AMS that will be affected by SLR, its impacts by sector and country and loss and damage estimates.

While flood risks are acknowledged as important to act on, the differentiation between risks for urban and rural areas is made explicit in three out of eleven reviewed documents: a) Guidebook for Urban Resilience: Building Disaster and Climate Resilient Cities (2018), b) ASUS (2018), and c) AWP 2025 (2020). In the ASCCR the distinction between rural and urban areas is not made with regards to risks from flooding (ASEAN Secretariat 2021c). The AHA Centre Workplan 2025 (2021) acknowledges flooding risks and encourages to address them considering future projections. However, it lacks urban focus and only focuses on outlining the direction for actions. The most prominent connection to urban resilience is

drawn in the Guidebook for Urban Resilience: Building Disaster and Climate Resilient Cities in ASEAN (JICA 2018a). In the Guidebook the risks for infrastructure, life, and property are analysed both for (coastal) flooding and SLR (JICA 2018b). Floods are addressed as a natural hazard and approached from a DRR perspective. It also includes future flood dynamics by applying a Disaster Risk Assessment. Finally, it acknowledges the importance of considering future flood risk.

Future flood projections with urban focus are included in the three documents mentioned above with an urban focus. The ASCCR also addresses future flood risks – it mentions risks from SLR, but does not go in depth with addressing life and property risks associated with it (ASEAN Secretariat 2021c). The AHA Workplan 2025 (2021) includes improving risk modelling capacities as one of the outputs of the workplan and outlines five activities that should be implemented to achieve that. Therefore, to a varying extent, future risks are considered in all five documents that address flooding. However, it is crucial to highlight two shortcomings: In all ten reviewed documents the identification and assessment of the future risks from flooding to what in urban areas, such as disruption of food systems, economic losses from damage of infrastructure, resettlement and others, are lacking. This is critical, given the ample indications of expected increases of risks from flooding in Southeast Asia in select IPCC AR6 WG II chapters alone. Second, differentiation between various types of settlements in urban areas for both current and future flood risks is not explicitly addressed. Therefore, regional responses across ASEAN are not sufficiently tailored to different types of settlements and current and future flood risks.

Risks from air pollution

Selected Key Risk 5: Health risks from air pollution exposure in cities

Ambient air pollution is addressed in the ASUS (ASEAN Secretariat 2018) and ASCCR (ASEAN Secretariat 2021c). However, only the former one addresses air pollution as a health-related risk: “[...]

cities are the primary driver of GHG emissions. Emissions from industrial activity and transportation also have a profound impact on the health of the people living in cities. Urban air pollution is projected to become the top environmental cause of premature mortality by 2050” (ASEAN Secretariat 2018, p. 25). Measures required to be implemented in order to mitigate pollution risks are not included in the document. Additionally, key indicators for clean air were introduced and piloted through the AIESC (as part of the Key Indicators for Clean Air, Clean Land, and Clean Water). The current AWGESC Action Plan includes a measure to revise and adopt the Key Indicators (AWGESC 2016). The ASEAN ESC Award also includes (besides the main award) Certificates of Recognition. These recognize cities’ achievements in the three areas clean air, clean land, and clean water.

Haze pollution, mainly caused by large forest fires, peatland fires, and land burning practices, is an important factor contributing to overall ambient air pollution in ASEAN and has been addressed by ASEAN over the last years, such as in the Roadmap on ASEAN Cooperation towards Transboundary Haze Pollution Control (ASEAN Secretariat 2021d). Although touched upon in several strategies and initiatives, ambient air pollution from other sources (mainly related to fossil fuel usage) and household air pollution have not been addressed to the same extent. No targeted, regional action towards reducing air pollution has been proposed. ASEAN strategies and programmes relating to health, such as the ASEAN Post-2015 Health Development Agenda (2021-2025) (ASEAN Senior Officials Meeting on Health Development 2021) and the Health Cluster Work Programmes (Senior Officials Meeting on Health Development 2022a, 2022b, 2022c, 2022d), consider environmental health risks generally but do not target air pollution explicitly. Coordinated and far-reaching measures to lower air pollution concentrations in cities throughout the region are therefore still lacking.

5.3 Climate resilient development (CRD): considering climate change mitigation and biodiversity conservation

CRD aims at considering more than targeted risk reduction for specific climate-related risks; incorporating climate change mitigation and biodiversity conservation where possible is key for a **holistic resilience approach**. A number of ASEAN documents address both mitigation and adaptation. These include the ASCC Blueprint 2025 (ASEAN Secretariat 2016b), ASCCR (ASEAN Secretariat 2021c), Building Disaster and Climate Resilient Cities in ASEAN (JICA 2018a), and the AWP (ASEAN Secretariat 2020a). Some of these documents also acknowledge the need to combine measures from both mitigation and adaptation. However, integration of biodiversity is often overlooked, and concrete possibilities to combine CCA and DRR with mitigation and biodiversity conservation are not consistently addressed. One informative document in this regard is the report Building Disaster and Climate Resilient Cities in ASEAN (JICA 2018a). It primarily focuses on mitigation and prevention of natural disasters, but also suggests ways to integrate

adaptation to climate change. One other document that includes a set of measures on adaptation, mitigation, and biodiversity is the Action Plan of the AWGCC (AWGCC 2019). However, the Action Plan addresses adaptation and mitigation in separate sections. It is therefore unclear if the measures are intended to be combined to ensure effectiveness and co-benefits.

A holistic resilience approach is taken up in the latest ASEAN Work Programme on Urban Biodiversity and Greenery (ASEAN 2022). The programme recognizes the need to implement a mix of measures that tackle all three areas - mitigation, adaptation and biodiversity – to develop in a climate-resilient way. In this regard, special attention is given to Nature-based Solutions (NbS) due to their potential to provide (co-)benefits for various aspects of sustainable development. In addition, the ASCCR also mentions NbS and their potential for sustainable development (ASEAN Secretariat 2021c).

6 Implementation challenges and opportunities for policy responses

Given the risks and vulnerability landscape drawn in the previous section, the successful implementation of concrete activities and measures to strengthen urban resilience in the ASEAN region will become increasingly important in the upcoming years. A strong ASEAN community, ongoing technological development, and the great number of potential synergies between different ASEAN goals related to urban resilience create multiple opportunities for activities and measures to enhance urban resilience in the region. However, translating ASEAN strategies into action has been met by challenges in the past. The ASUS highlights five key implementation barriers for urban resilience: information failures, fiscal capacity, strategic planning, implementation capacity, and coordination (ASEAN Secretariat 2018). This section builds on the ASUS findings and provides a detailed analysis of implementation chal-

lenges, with a stronger focus on challenges within the range of influence of ASEAN. The analysis is extended to also cover important implementation opportunities. By drawing on the ASUS implementation barriers for classification, comparability with previous analyses is ensured.¹³ Key implementation challenges and opportunities were synthesised based on an extensive review of ASEAN policy documents and strategies touching on urban resilience (directly or indirectly). Furthermore, the synthesis is informed by the results of expert interviews conducted with ASEAN representatives of relevant AWGs and development partners, as well as by the results of workshops on vertical and horizontal ASEAN cooperation. The workshops were held with representatives from the three AWGs (AWGESC, AWGCC, and ACDM WG P&M), city-level actors, and development partners.

¹³ The ASUS implementation barrier “information failures” was replaced by “data quality and dissemination of information”.

6.1 Coordination

Despite significant efforts of ongoing initiatives with regards to the alignment of actors and actions, there is still room for improvement. One important challenge to the successful implementation of ASEAN policies and measures is the current demarcation of **roles and responsibilities**. Lacking ownership for some activities, the challenge of identifying suitable Lead Implementation Bodies and insufficient clarity on the distribution of roles and responsibilities, especially when implementing ASEAN strategies on the national level, are key problems in this area (ASEAN Secretariat 2016e). These are exacerbated by limited incentives to drive implementation among National Coordinators (NCs) and National Focal Points (NFPs) (ASEAN Secretariat 2016e) and the complex structure of ASEAN decision-making and reporting (JICA 2018a).

The **alignment of policy initiatives and strategies** is another important factor that needs to be improved to avoid impeding successful implementation. Without a structured approach to ensure alignment across fields and policy levels, the growing number of activities at regional, national, and sub-national level further increases the risks of duplication and missed opportunities for collaboration (ASEAN Secretariat 2016e, 2016b). Policy alignment has been described as insufficient on the ASEAN level (e.g., between the ASCC, the AEC and the APSC, especially for disaster management and emergency response (ASEAN Secretariat 2017), with regard to ASEAN and AMS policy priorities (ASEAN Secretariat 2016e) as well as across national government departments (ASEAN Secretariat 2018). Increasing transparency and promoting collaboration opportunities for activities directly targeting urban resilience can be an important first step. Successful policy alignment further entails ensuring coherence and exploiting synergies across various fields related to urban resilience, such as DRR, CCA, humanitarian action, and sustainable development, as suggested in a strategic measure of the ASCC (ASEAN Secretariat 2016b). Finally, policy alignment could further be extended to mainstreaming considerations of urban resilience into other policy fields (UN ESCAP

2020): strategies and measures (e.g. focusing on economic development, digitalization or nature conservation) should also be assessed for their potential impact on urban resilience. Synergies can also be sought in light of **the momentum of COVID-19 recovery strategies**, which can be used as opportunity to strengthen urban resilience (UN ESCAP 2020). Reform programs and national fiscal stimulus packages can be used not only to promote economic recovery, but can be designed to simultaneously target urban resilience.

A **common understanding of urban resilience**, ideally backed by a commonly endorsed definition, could further support this process. A shared understanding would make the discourse across different actor groups and levels of government easier, and would reduce misinterpretation and misunderstandings, clarifying what is included, and what is excluded when referring to urban resilience. It would further greatly facilitate effective engagement between levels of government, and would make it easier to define and implement concrete actions for building and strengthening urban resilience, and to assign responsibilities for their implementation. Finally, it would help build further momentum towards common goals.

Limited **collaboration and communication** were further identified as a reoccurring implementation challenge. Annual AWG meetings are held to monitor the implementation of Sectoral Body workplans and programmes. However, the interview and workshop findings stressed the lack of coordination and communication on the ASEAN level, i.e. between AWGs. Representatives explained that this can be attributed to a prevalent cross-sectoral fragmentation and decentralization within ASEAN. This refers to a spread of priorities and actions related to urban resilience across both regional and national level. The frequent change of NFPs in some Member States exacerbates coordination difficulties. This can have a particularly detrimental effect on coordination and cooperation at the vertical level, i.e. between ASEAN bodies and municipalities and city level actors. While

collaboration with specific 2nd and 3rd tier cities is supposed to go through the NFPs, these processes can be slow and limit possibilities for communication. Insufficient cooperation at the vertical level was also highlighted for national and sub-national agencies with similar focus.

Strengthening stakeholder engagement and participatory approaches in the work of ASEAN bodies and agencies bear various opportunities, as high-

lighted by strategic measures of the ASCC (ASEAN Secretariat 2016b). New partnerships with local agencies and civil society organizations could help ASEAN raise awareness for urban resilience and at the same time enable ASEAN to better include local knowledge in the design of measures and activities (ASEAN Secretariat 2017). Strong stakeholder engagement is also key for successful DRM, especially to ensure efficient disaster management mechanisms and swift emergency responses on the ground.

6.2 Implementing capacity

Sufficient **human resource capacities** are key for the successful implementation of measures and activities. However, shortcomings in human resources have been stressed, especially on the ASEAN and sub-national level. ASEAN desks often do not have sufficient capacities to deal with all regional and bilateral cooperation issues and are frequently overloaded (ASEAN Secretariat 2016b). On the sub-national level, agencies often lack capacity for the development and implementation of long-term strategies and tend to address only immediate issues, neglecting long-term solutions (ASEAN Secretariat 2018). Representatives in interviews and workshops confirmed the constraints in time, staff, and other resources as a pressing challenge for successful policy implementation. Furthermore, **language barriers**, especially at local levels, were mentioned as an important barrier for successful implementation of regional agreements during interviews and workshops.

Skill gaps and lacking technical expertise are further factors adversely affecting progress in urban resilience. Lacking expertise working with climate change projections, performing climate change vulnerability and risk assessments, and developing and implementing climate change and adaptation solutions are prominent examples of problems encountered in the field of urban resilience. Insufficient skills in GIS software and other software needed for quantitative analyses are also often mentioned (JICA 2018a). Shortcomings in necessary skills and

expertise are especially prevalent in sub-national agencies (JICA 2018a) and can have important negative impacts on urban resilience projects, since local governments are often in charge of developing and implementing local disaster and climate change management plans. Strengthening technical expertise and closing skill gaps in the field of urban resilience, especially in local government and relevant agencies, can be a major opportunity for ASEAN (ASEAN Secretariat 2020c, 2015c). It could increase the capacity of local actors to perform their own risk assessments, develop long-term plans and integrate resilience in all relevant fields of urban planning and management (JICA 2018a). At the same time, it would drive the skill and educational level and create new employment opportunities, also in smaller cities. Drawing from local and traditional knowledge could provide additional opportunities, as highlighted by a strategic measure of the ASCC Blueprint 2025 (ASEAN Secretariat 2016b).

Making use of the existing expertise within ASEAN would additionally strengthen the region. Stronger involvement of the ASEAN research and think-tank community and of important operational agencies in the design and implementation of capacity building measures could help establish ASEAN as region with high urban resilience expertise (ASEAN Secretariat 2017). This could be achieved by a stronger involvement of ASEAN centres, including the AHA Centre and ACB, as well as research insti-

tutes, such as the Geoinformatics Center (GIC) of the Asian Institute of Technology or other university-

based research centres working on urban resilience related topics.¹⁴

6.3 Strategic planning

Strategic planning should aim at ensuring the **longevity of measures and initiatives in DRR and CCA**. However, within the ASEAN context, adequate planning to ensure project ownership as well as necessary resources and skills beyond initial financing timelines have sometimes been lacking, especially for projects with major external financing (ASEAN Secretariat 2016e). Additionally, consultation findings have highlighted the need to further strengthen the integration of urban resilience considerations throughout planning and decision-making processes.

Attention should also be paid to **monitoring and evaluation (M&E)** as an important aspect of the project implementation cycle. The ASCC Blueprint 2025 (ASEAN Secretariat 2016b) highlights that thorough M&E is often lacking, partly requiring improved indicators and methods.

Furthermore, interviews and workshops revealed that the **variety of existing frameworks, guidelines and strategies** often causes confusion. A harmonisation of the policy responses and recommended methods, together with the development of indicators for urban resilience was expressed as a need to overcome this challenge and establish a unified approach to strategic planning.

Most challenges, however, appear at **sub-national level strategic planning**. As already discussed, capacity is often lacking for long-term planning. Especially on sub-national and city level, reactions tend to be reactive, addressing primarily immediate issues and neglecting long-term solutions (ASEAN Secretariat 2018). This was also confirmed by interviews and workshop findings. Strategic planning should

also consider and integrate collaborations across sectors, including government bodies, non-governmental organizations, the private sector, and community representatives. Securing commitment from political leaders is another crucial aspect, ensuring that strategies are not only well-crafted but also effectively executed on the ground. Supporting sub-national strategic planning bears various opportunities. Promoting the development of long-term strategies on city (or other sub-national) level, explicitly focusing on sustainable development and increasing urban resilience, can have major impacts on cities' developments. Developing Sustainable Urbanisation Strategies in ASEAN Cities is already one initiative included in the Sustainable Infrastructure Strategy of the MPAC 2025 (ASEAN Secretariat 2016e).

Another important finding is the **insufficient integration of DRR and CCA into urban planning**. This can result in land use and urban development plans not aligned with results of climate change and disaster risks assessments (JICA 2018b). In the ASEAN region, deficiencies in the integration of climate and natural disaster related risks into urban planning are especially prevailing for areas prone to flooding, earthquakes and tsunamis. For example, development permits are often still issued for low-altitude areas prone to flooding in the rainy season. Urban development and building codes also often do not consider earthquake risks sufficiently, and although disaster records and risk information for tsunamis are available for many regions, these are often not reflected in urban plans for coastal regions (JICA 2018b). Additionally, interview results have shown that participatory approaches and engagement opportunities are still limited and have not yet been

¹⁴ For example, an overview of university-based research centres in Southeast Asia working on climate change hazards and natural disasters can be found here: <https://hazards.colorado.edu/resources/research-centers/asia> (accessed on 3/14/2022).

established as integral part of planning processes, both in AMS and on the sub-national level. Input from local actors and civil society (including input from people in vulnerable situations, who often have less participation opportunities and decision-making power) is thereby insufficiently integrated in long-term planning. Mainstreaming DRR and other resilience aspects into urban planning could institutionalise urban resilience in local administrative processes

and drive positive urban development. Examples of successful integration of DRR and CCA in urban planning include controlling development in areas with high disaster risk, or including resilience considerations in infrastructure planning (JICA 2018b, 2018a). Another good example is the construction of highly resilient buildings according to the concept “build back better”, including buildings to accommodate disaster victims.

6.4 Data quality and dissemination of information

The availability of **high-quality data** is of crucial importance to perform quantitative analyses and to design appropriate risk management strategies. The lack of relevant, high-quality data, however, is still a recurring problem (JICA 2018a; ASEAN Secretariat 2018) and was reported by members of all AWGs. Insufficient data standardisation further promotes discrepancies among data issued by different organizations. For example, in the case of the demonstration project in Denpasar, discrepancies among different versions of tsunami risk maps issued by different organizations complicated the operations (JICA 2018a).

Supporting data acquisition, improving data quality and strengthening open-data use will be of increasing importance to enable resilient urban development. This has already been highlighted by initiatives in the Sustainable Infrastructure Strategy and Digital Innovation Strategy of MPAC 2025 (ASEAN Secretariat 2016e) and was included as strategic measure in the ASCC Blueprint 2025 (ASEAN Secretariat 2016b). Synergies between ASEAN bodies could be strengthened in this field, for example by utilizing the competencies and digital infrastructure provided by the AHA centre, which already aim at improving data and information dissemination and have included various measures to strengthen data and information services in their Action Plan 2021-2025 (AHA Centre 2021). ASEAN can seize this opportunity to take on a leading role in coordinating and implementing common data and

information solutions for the region, extending the focus from disaster risks to also include other key risks to urban resilience. Strengthening systematic climate and disaster risk data can also support the establishment or improvement of Early Warning System (EWS) in the region.

The lack of relevant **information**, e.g. about the availability of actions, their costs and benefits, and technologies involved, was further reported by members of all AWGs. Consultations and workshops also identified several topics ASEAN bodies would wish to learn more about. These include NbS, urban planning, sustainable financing, and climate risk management.

Additionally, a need for improved **knowledge and methods dissemination** persists. The need to further raise awareness for potential natural disasters was highlighted (JICA 2018b), as well as the importance of improving the dissemination of methods for disaster risk and vulnerability assessments for urban areas (JICA 2018a). Toolkits provided as part of ASUS (ASEAN Secretariat 2018) and the Guidebook for Urban Resilience (JICA 2018b) are good examples of methods created by ASEAN to support urban resilience in the AMS. Further promoting the dissemination of already existing methods and the development of additional, easy-to-use methodologies where necessary provide opportunities to strengthen implementation capacity, raise awareness for urban resilience problems and pave the way for regionally comparable assessment results.

6.5 Fiscal capacity

Financial contributions and support between ASEAN entities and across policy levels are important determinants of overall fiscal capacity for urban resilience activities. AMS often prioritise domestic issues, which can leave ASEAN strategies and initiatives underfunded (ASEAN Secretariat 2016b). A discussion on increasing AMS' contributions available for ASEAN bodies and entities might therefore be needed (ASEAN Secretariat 2017).

Another challenge is the **lack of financial resources per se, as well as the lack of financial control by local governments and cities**, which are often responsible for the implementation of disaster management and climate adaptation strategies (UN ESCAP 2020).. This problem is the result of the combination of three factors: first, engaging with multilateral climate funds requires a certain level of human capacity and expertise needed to prepare national mechanisms and write proposals, which many countries and local governments simply do not have. Second, domestic finance for adaptation remains relatively unknown. Finally, the private sector is still underrepresented in providing funding to implement urgent adaptation measures, due to barriers such as lacking support from policy and regulations and restricted availability of technologies (Anbumozhi et al. 2020). Especially investments from small and medium size enterprises are subject to high transaction costs for banks, which makes their investment less attractive despite their relevance for the ASEAN economy.

The **diversification of financing sources** has the potential to help alleviate the general problem of scarce financial resources for the implementation of ASEAN strategies and initiatives. Numerous actors play a role in providing finance for adaptation, ranging from national and international to public and private institutions. ASEAN-level financial resources, however, are characterised by heavy reliance on funding from partners (ASEAN Secretariat 2017) and limited private sector engagement (ASEAN Secretariat 2016e). Promoting alternative sources of funding could help alleviate funding shortcomings. This could entail encouraging more private sector investments (ASEAN Secretariat 2016e) and increasing accessibility of innovative financing mechanisms (also addressed by strategic measures of the ASCC Blueprint 2025 (ASEAN Secretariat 2016b), especially for national and sub-national actors. Positive effects could thereby also be achieved with regard to the longevity of activities, as they would become less dependent on funding from international partners.

7 Recommendations

In the vast topic of urban resilience, the ASEAN region and its Member States have already established important elements to strengthen urban resilience in the selected segments which this study focuses on: contributing to more effectively combining CCA, DRM and sustainable urban development through increasing cooperation, integration and action in ASEAN. Thereby the study focus is on selected aspects – not all – in three AWGs: AWGESC, AWGCC, and ACDM WG P&M. The study also highlights opportunities for cooperation across policy levels, sectors, and the region.

However, this scoping study also demonstrates that there is still a need for action to further strengthen the resilience of urban areas in ASEAN. Based on the gaps in regional policy responses identified in Section 5 Gap analysis: Addressing risks and vulnerabilities for urban areas in ASEAN and on opportunities and challenges for implementation discussed in Section 6 Implementation challenges and opportunities for policy responses, this section provides a range of inexhaustive recommendations to contribute to further strengthening urban resilience in ASEAN in the segments of urban resilience targeted in this paper. The recommendations are structured in three thematic clusters (Figure 4):

1. Supporting integration across sectors and governance levels
2. Promoting and mainstreaming responses to selected key risks
3. Capacity building and implementation

All recommendations contain ideas for implementation and highlight possible entry points for implementation based on the study's analysis. These ideas for implementation and possible entry points are suggestions and should be adapted to fit ASEAN's needs and internal processes.

Each recommendation aims to contribute to closing identified gaps and tackling identified challenges. Thereby it is key to coherently integrate and coordinate actions based on the recommendations – with existing and upcoming programmes, initiatives and strategies, and between the recommendations themselves.

Thereby special attention should be given to achieving synergies and co-benefits, such as with climate change mitigation and air pollution reduction, due to the great importance of these topics. For example, expanding nature-based solutions and green infrastructure for reducing risks to population from increased heat through cooling of public spaces and buildings can also lead to 'co-benefits' in the form of reduced GHG emissions.

Yet special attention should be also be given to avoiding trade-offs. While the aim should be on generating co-benefits, trade-offs, however, can often occur in real world circumstances. As much as possible, care should be taken to avoiding trade-offs at the outset, e.g. not exacerbating GHG emissions and air pollution, especially if trade-offs involve 'lock-in' effects which are very difficult to reverse or transition away from. Wisdom and discretion are required in dealing with trade-offs, e.g. when trade-offs are clearly unavoidable.¹⁵

¹⁵ To, for example, minimize the degree of negative outcomes, or balance the distribution of positive/negative outcomes among affected stakeholders. However, continuous efforts should be made to shift from such cases of potentially less optimal approaches to synergistic approaches as soon as possible.



Figure 4: Thematic clusters and overview of the recommendations

7.1 Supporting integration across sectors and governance levels

Recommendation 1: Improve cross-sectoral collaboration and coordination on urban resilience

Conclusion:

Cross-sectoral collaboration and coordination are crucial prerequisites for attaining goals and successful implementation of actions. This also applies to actions on urban resilience. While the

importance and need for collaboration and coordination is acknowledged in many of the reviewed documents, the current lack of it was identified as a prominent challenge for the implementation of those policies, strategies, and initiatives. Furthermore, AWGs highlight that there is still a need to enhance collaboration and communication, which is lacking due to cross-sectoral fragmentation and decentralization.

Recommendation:

Improve cross-sectoral collaboration, coordination, and communication on urban resilience.

This includes the clear definition of roles and responsibilities; the establishment of structured processes for collaboration a) on a horizontal (between AWGs), b) on a vertical level (between AWGs, national governments and cities), and c) with national and sub-national agencies; and ultimately the advancement of existing or establishment of new collaboration platforms for key actors to work jointly on strengthening urban resilience.

Policy level: all levels, with a focus on regional

Ideas for implementation:

- The topic of collaboration, coordination and communication is already highlighted in existing Action Plans of AWGs and synergies between those efforts should be created. For example, the AWGESC Action Plan 2016-2025 foresees to enhance cross-sectoral coordination on sustainable urban planning and development – one of the key strategic outputs – through a multi-sectoral platform to mainstreaming environmental issues to other relevant sectors. In addition, the strategic measures of the ASCC suggest to promote the coordination among relevant sectors and facilitate the development of coherent responses (ASEAN Secretariat 2016b).
- To establish clear processes at and between all levels (AWGs, cities and local agencies), the ASCN could, together with AWGESC, take on the role of a leader to a) structure and regroup existing activities targeting resilient and sustainable urbanisation; b) assign clear roles and responsibilities to implement these activities; and c) establish a comprehensive M&E online platform for all relevant stakeholders to track progress. This should be further supported through regular meetings of relevant bodies to exchange knowledge on the activities and their progress.

Recommendation 2: Better link and integrate health, DRR and climate action for strengthening urban resilience

Conclusion:

Urban resilience and health are inextricably linked. Good environmental conditions with sustainable and well-managed natural resources are greatly important to individual health and well-being, and to the sustainability and liveability of any city (ASCN 2018b). It is clear that climate change and disasters pose a multitude of risks to human health. In urban areas, climate change, for example, is further increasing health risks. However, health is not sufficiently linked and integrated with DRR, CCA, and climate change mitigation in the urban context in the ASEAN documents screened for this study. This is an important finding substantiated by three further health-related recommendations in this section – even more so given the large body of evidence for future increases of related health risks.

Recommendations:

Better link and integrate health, DRR and climate action (climate change adaptation and mitigation) for strengthening urban resilience. This becomes all the more important in view of increasing health risks to urban populations, e.g. through climate change, air pollution, and urbanization.

To this end, strengthen research and collaboration between DRR, CCA, climate change mitigation and sustainable urbanization (including urban planning) communities with the health community. To account for and strengthen these community interrelations, it is crucial to accordingly shape upcoming strategies, programmes, and work and action plans in these fields.

It is important to use the many available opportunities for **synergies and co-benefits, to reduce fragmentation**, and to **avoid trade-offs**. This should be done between and within the pertaining communities, as well as in existing and upcoming strategies, programmes, and action plans. There are already

many entry points to do so in existing documents, and examples are listed below. Seek synergies, e.g. with climate change mitigation – especially for reducing GHG emissions – and with biodiversity conservation. Implementation should not result in trade-offs, e.g. with mitigation.

Policy level: all levels, with a focus on the regional level

Ideas for implementation:

- Integrate interrelations between DRR, climate action and human health in upcoming strategies, Work and Action Plans, and work programmes. This could include, for example, potential successors of the current AWGESC Action Plan, AWGCC Action Plan (2019-2025), AADMER Work Programme (2021-2025), but also potential successors of the ASEAN Post-2015 Health Development Agenda (2021-2025) (ASEAN Senior Officials Meeting on Health Development 2021), and of the Health Cluster Work Programmes (2021-2025).
- Implement the steps recommended by UNDRR to achieve the integration of DRR and CCA (UNDRR 2020a) – two of the five steps directly link DRR, CCA, and health: Developing capacities for national policy development and implementation that promote coherence and synergy between CCA, DRR, and Health; and Prioritise support to co-efficient disaster and health risk management and adaptation measures.
- In view of this recommendation, link and create synergies between the Development Focus Areas “Health and well-being”, “Built environment” (especially “Urban resilience”) and “Quality Environment” in the ASUS and ASCF Frameworks.
- Better link and exploit synergies between “Key Result Areas” D.1 – D.3 in the key characteristic “Resilient” of the ASCC Blueprint 2025 (ASEAN Secretariat 2016b): Disaster-resilient ASEAN, Responses to all health-related hazards, and climate adaptive ASEAN.

- Strengthen collaboration and knowledge exchange between AWGESC, AWGCC, ACDM, Health Sector and Health Clusters. Only as an example, perpetuate health as a topic in the output “enhanced coordination with ASEAN Committee on Disaster Management” of the of the AWGESC Action Plan in the ASPEN Strategic Priority “environmentally sustainable cities” (ASEAN Secretariat 2016c). In this Plan include AWGCC and the Health Sector and Health Clusters in the corresponding activity “developing joint initiatives on climate resilient cities with focus on (inter alia) early warning systems, and urban health (climate induced)”.
- In addition to this, strengthen collaboration between AWGESC, AWGCC, ACDM, Health Sector and Health Clusters and other relevant institutions, initiatives, in science, and between national actor and city-level actors.
- If a climate change cooperation plan for the region is developed (as suggested by the ASCCR), it is recommended to integrate health into this plan.

Recommendation 3: Promote the integration of urban resilience into national and sub-national level strategic planning and vice versa

Conclusion:

Cities and local governments are well positioned to implement action on urban resilience. The analysis has shown that it is important to a) integrate them into strategic planning at regional level, and b) institutionalize the urban resilience discourse in national and sub-national planning processes.

Recommendations:

Promote the integration of national and sub-national level actors into regional strategic planning. Establish collaboration between actors at regional, national and sub-national levels.

Strengthen the understanding, and capacities, of sub-national level actors on urban resilience and institutionalise urban resilience in their processes.

Policy level: national and sub-national

Ideas for implementation:

- This recommendation has two sides of the same coin. On the one hand, national and sub-national level actors should be better integrated into regional strategic planning on urban resilience; and on the other hand, the topic should be better integrated into city and local government level planning.
- The integration of national and sub-national governments into strategic planning is already on the agenda of various ASEAN strategies and pledges. The ASCC Blueprint 2025 highlights to also “promote participation of local governments and authorities, provinces, townships, municipalities and cities through the central government in the development of ASEAN capacity building programmes” (ASEAN Secretariat 2016b, p. 10). Being equipped with the right skills and knowledge is a prerequisite for being integrated at higher level planning and at the same time advancing their own agenda on the topic.
- Existing networks and initiatives can be appropriate entry points to achieve this. The SDGs-FC Programme and the ASCN can serve as platforms to a) train and build capacities of local governments and b) establish the connection of these actors with regional level actors to ensure their integration in strategic planning. For further suggestions on the enhancement of trainings and capacity building, also see Recommendation 11.

Recommendation 4: Enable and accelerate the joint integration of DRR and CCA, and their mainstreaming, into urban planning

Conclusion:

It has become increasingly evident that CCA and DRR are inextricably linked (ASEAN Secretariat 2020a). Jointly integrating DRR and CCA into urban planning is very important for strengthening urban resilience, whereas their insufficient integration into urban planning can be severely consequential.

ASEAN has committed itself to enhancing participatory and integrated approaches in urban planning and management and promoting coordination among relevant sectors (ASEAN Secretariat 2016b).

There is a clear need to jointly integrate DRR and CCA into urban planning in AMS, and the state of integration is currently improvable. Reasons include gaps in collaboration and communication, challenges in long-term planning, insufficient input opportunities into long-term planning for civil society, knowledge gaps on urban planning, and limited vertical coordination. However, multiple opportunities exist to improve enabling conditions for joint integration of DRR and CCA, and their mainstreaming, into urban planning.

Recommendations:

Improve the enabling conditions for the joint integration of DRR and CCA, and their mainstreaming, into urban planning. This should be done with, among other measures, a) addressing this more prominently in upcoming strategies, work programmes and work and action plans relating to DRR, CCA, and sustainable cities, and b) using opportunities in and links to existing strategies, work programmes and action plans; c) supporting strategic planning, and d) rolling out trainings.

Promote this as a **concrete in-demand example for integrated approaches in urban planning and management, and promoting coordination across relevant sectors and AWGs** on sustainable urban planning and development. This is what the AWGESC Action Plan foresees in a key output in Programme 1 (ASEAN Secretariat 2016c). Seek synergies, e.g. with climate change mitigation – especially for reducing GHG emissions – and with biodiversity conservation. Implementation should not result trade-offs with mitigation.

Levels: Local (city-level) and sub-national, regional

Ideas for implementation:

- Enable and accelerate the integration of DRR and CCA in urban planning in upcoming Work and action plans, strategies and programmes,

such as successors of the current AWGESC Action Plan and AADMER Work Programme (2021-2025).

- There are multiple entry points in existing ASEAN strategies, programmes, and action plans to improve enabling conditions for joint integration of DRR and CCA into urban planning: Create synergies and links with existing documents, e.g. to activities in areas of the ASUS framework of sustainable urbanization (ASEAN Secretariat 2018). The most evident area is the sub-area “Urban resilience” in the area “Built infrastructure”. Link to the Priority Programme “Prevention and Mitigation” through which the AADMER Work Programme 2021-2025 is carried out. In view of programme area 1 targeting sustainable urban planning in the current AWGESC Action Plan: It is recommended that AWGESC enhances cross-AWG coordination with AWGCC and ACDM on jointly integrating DRR and CCA into urban planning and development. Using these entry point examples also gives AWGESC an opportunity to strengthen the connection between the two programme areas (1) “Sustainable Urban Planning, Development, and Implementation”, and (2) “Climate Resilient and Low Carbon Cities” of the AWGESC Action plan in the ASPEN Strategic Priority “environmentally sustainable cities” (ASEAN Secretariat 2016c).
- Support strategic planning at municipal levels. Mainstreaming DRR and other resilience aspects into urban planning can help institutionalise urban resilience in local administrative processes and drive positive urban development (e.g., by controlling development in areas with high disaster risk, or including resilience considerations in infrastructure planning).
- Make full use of relevant recommendations in the ASEAN-specific literature, e.g. the Guidebook for Urban Resilience (JICA 2018b), and the Building Disaster and Climate Resilient Cities in ASEAN: Final Report (JICA 2018a). They

provide practical measures for local governments and relevant national institutions in reducing local risks and mainstreaming DRR in urban planning. The “Guidance Note on Using Climate and Disaster Risk Management to Help Build Resilient Societies” from UNDRR, for example, shows step by step how DRR and CCA can be integrated (UNDRR 2020a) – yet without a focus on urban planning.

- Roll out demonstrably demand-driven trainings on the integration of DRR and CCA into urban planning – see Recommendation 11 “Invest in capacity building” for details on this capacity building-related idea for implementation.

Recommendation 5: Measure, monitor and evaluate progress in urban resilience

Conclusion:

ASEAN has addressed urban resilience, and pledged to increase it, with respect to multiple risks and processes. Baselines and progress need to be measured, monitored, and managed. However, a standardised process to track the progress as a whole, as well as for specific strategies and plans (M&E system), is currently missing.

Recommendation:

Develop quantitative indicators for measuring baselines and changes in urban resilience in the ASEAN region (measuring improvements of urban resilience generally, across sectors and AWGs). These indicators need to capture with respect to what urban resilience is measured, e.g. towards what climate and non-climate related disaster risks. The process of developing indicators should be coordinated at the ASEAN level; the indicators themselves, however, may include city-level metrics. M&E evaluation should be conducted regularly as fit for purpose (e.g. annually or bi-annually). The conclusions drawn from such evaluations need to be taken up and integrated in policy strategies and programmes.

Level of implementation: regional

Ideas for implementation:

- ASEAN has already developed key indicators for clean air, clean water, and clean land. These are to be revised and adopted as part of the current AWGESC Action Plan. The process of developing and implementing cross-cutting indicators for urban resilience could build on that process by introducing a new indicator category and/or adding indicators to existing categories to more strongly account for urban resilience. Additional indicators could, for example, target urban heat,

as well as social, economic, and regulatory aspects of urban resilience. These, however, are only suggestions, and a thorough decision-making process of which key indicators for urban resilience should be included would be needed at the ASEAN level first.

- Additional indicators for urban resilience should, in a second step, be used to determine baselines and track progress in urban resilience across ASEAN, ideally being applied to a wide range of cities within the region.

7.2 Promoting and mainstreaming responses to selected key risks

Recommendation 6: Mainstream action reducing health risks from heat – in accordance with the size of the current and increasing risks in urban areas

Conclusion:

In cities and settlements in ASEAN, risk to population from increased heat, and mortality and morbidity from exposure to extreme heat and heatwaves, are two of the climate-related key risks¹⁶ (Dodman et al. 2022). In ASEAN, people's health is already adversely impacted by these key risks, impacts and risks are increasing, and risks are projected to further increase significantly. In reviewed ASEAN documents, however, there is still little awareness shown for these two key risks from heat. This suggests that the risks are currently systematically underestimated, which is problematic in view of current and projected risk increases, and required risk reduction. There are also important gaps in assessing these risks. Additionally, risks from heat are yet to be further assessed for urban areas in the documents reviewed.

For some perspective, Zhao et al. (2021) for example estimate that currently more than 21,000 people die each year in Southeast Asia due to heat. The Lancet (The Lancet 2022) estimated an average 11,840 heat-related deaths each year in people older than 65 in AMS between 2014 and 2019 – a 117% increase compared to the annual average for 2000 to 2005. Country Profiles for AMS¹⁷ highlight that especially heat-related deaths in the elderly are projected to strongly increase with climate change (WHO 2016).

Recommendations:

In view of current and projected increases in risks, integrate and strengthen action reducing risks to population from increasing heat and heat waves by **shaping upcoming strategies, programmes, and work and action plans**. At the same time, **strengthen action using opportunities in existing initiatives**. Both particularly apply for strategies, programmes, and action plans in sustainable urbanization (including urban planning), DRR, CCA and health. Joint collaboration and close coordination

¹⁶ The term “key risk“ is comprehensively defined in Box 1 in Section 3.3.2 (an incomplete, broad definition is having severe outcomes common to a majority of cities (Dodman et al. 2022)).

¹⁷ Available for Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Thailand and the Philippines.

with ASEAN Health Cluster Work Programmes and related programmes and strategies are important.

Promote and support the development and implementation of city heat action plans throughout the region.

Based on a needs assessment, identify and develop the most appropriate regional-level action to raise awareness and significantly reduce health risks from increasing heat in urban areas – **complementary and synergistic with national and municipal level efforts**, and in collaboration with AMS.

Integrate and mainstream heat risk reduction into urban planning, especially in view of rapid urbanization in AMS.

Use the many possible synergies with climate change mitigation, and reducing GHG emissions, in particular. This should receive special attention for implementation. For example, expanding nature-based solutions and green infrastructure for reducing risks to population from increased heat through cooling of public spaces and buildings can also lead to 'co-benefits' in the form of reduced GHG emissions. **While the aim should be achieving co-benefits, care should also be taken to avoiding trade-offs with mitigation as much as possible**, especially if trade-offs involve 'lock-in' effects which are difficult to reverse or transition away from. Examples of trade-offs are exacerbating GHG emissions and waste heat in urban areas, e.g. by continuing over-reliance on use of air conditioning methods using typically fossil-fuel based grid electricity in ASEAN Member States. Wisdom and discretion are required in dealing with trade-offs. They are required, for example, when trade-offs are clearly unavoidable.

Risks assessments to urban population from increased heat, extreme heat and heatwaves, as well

as **plans with appropriate risk reducing action in urban areas**, need to be further thoroughly conducted at appropriate levels of higher spatial resolution.¹⁸ Related IPCC WG II contribution chapters of the AR 6 (2022) provide part of literature basis in these regards.

Policy level: All levels (regional, national, sub-national, local)

Ideas for implementation:

- Integrate heat risk reduction in urban areas, and in urban planning, in upcoming strategies, programmes, and work and action plans. This could include, for example, potential successors of the current AWGESC Action Plan, AWGCC Action Plan (2019-2025), but also potential successors of the ASEAN Post-2015 Health Development Agenda (2021-2025) (ASEAN Senior Officials Meeting on Health Development 2021), and of the Health Cluster Work Programmes (2021-2025).
- Raise awareness for the necessity of city heat action plans, and provide guidance and consultations to cities to develop and implement heat action plans. Explicitly reducing risk to most vulnerable groups, for example the elderly, must also be included.
- Conduct the above-mentioned needs assessment for most appropriate complementary and synergistic regional action to raise awareness and significantly reduce risks from increasing heat in urban areas. For the needs assessment and resulting regional-level action,¹⁹ cooperation, inter- and transdisciplinary development and implementation are important, e.g. among AWGESC, AWGCC, ACDM, and Health Clusters, their communities, science, urban planning, health institutions, vulnerable groups, other citizens groups.

¹⁸ Climate model ensemble projections, among other elements, are key. The assessments need to take into consideration urban and rural differentiation and specifics, as well different vulnerability of different groups of people, and how to reach these groups, among other elements.

¹⁹ A joint approach could take various forms, e.g. reaching from loose coordination formats, developing an overarching regional strategy up to implementing a more comprehensive regional framework.

- Strengthen collaboration of AWGESC, AWGCC, ACDM, and Health Cluster Work Programmes between each other and further relevant bodies and sectors – especially regarding health. Develop joint initiatives, as exemplified in the AWGESC Work Plan 2016-2025 (AWGESC 2016) with ACDM on (among others named) early warning systems, and urban health (climate induced).
- Take full advantage of existing adaptation measures for reducing negative impacts and risk. Where feasible, integrate or enable those through urban planning which are best fit and effective in the respective local contexts. A few of the measures with the highest potential for reducing risk according to the IPCC AR6 WGII (Technical Summary, Supplementary Material) are NbS such as urban greenery at multiple spatial scales; shading; green roofs; improved building and urban design; passive cooling; tree planting; increased public understanding of heat impacts and protection measures; broader access to public health systems, especially for the most vulnerable; and enhanced space conditioning in buildings (Pörtner et al. 2022).²⁰ Regarding an enhanced space conditioning example such as significantly more energy-efficient space cooling, great care must be taken to implement it co-beneficially and synergistically with climate change mitigation, particularly reducing GHG emissions (see also IEA 2022). According to the ASEAN-focused IEA report, this means mainly combining decarbonizing electricity, efficient building, efficient equipment, incentives, regulations, standards, and information programmes. At the same time, from the outset, great care must be taken for such conditioning not to result in trade-offs with mitigation, i.e. exacerbating GHG emissions. An example is through possible undesired rebound effects, leading to the increased use of a saved resource. This example therefore demands a wise policy mix, among other things. Therefore, a well-informed decision basis for achieving synergies and co-benefits, not trade-offs, is also key.
- If a climate change cooperation plan for the region is developed (as suggested by the ASCCR) it is recommended to integrate and mainstream heat risk prevention into this plan.
- Use the multiple suitable opportunities for strengthening action to reduce heat risks within existing strategies, programmes, and action plans to support the implementation of the recommendations. Examples include integrating heat risk prevention into specific areas of the ASUS framework of sustainable urbanization;²¹ the ASCC Blueprint 2025 (ASEAN Secretariat 2016b);²² multiple “areas of concern” of the AWGCC Action Plan (the most obvious area being health), and with two core themes;²³ three Priority Programmes through which the AADMER Work Programme 2021-2025 is carried out;²⁴ existing priorities and activities in the AWGCC Action plan, and the AWGESC’s Action Plan 2016-2025.
- At the same time, strengthen anticipatory action for heat risk reduction by supporting making the ASEAN Framework on Anticipatory Action

²⁰ Enhanced space conditioning refers to improved or advanced technologies and strategies to control indoor environments with reduced environmental impacts, including reduced GHG emissions. (e.g. through significant energy efficiency increase) and improved well-being. Examples are significantly more energy-efficient HVAC (heating, ventilation, and air conditioning) systems, passive cooling e.g. through building design, and heat pumps.

²¹ For example, “Health and well being” and the sub-area “Urban resilience” in the area “Built infrastructure” – also, use this recommendation to create synergy between these areas.

²² Key result areas and corresponding strategic measures D.1 – D.4 in the key characteristic “Resilient”

²³ Primarily “climate change adaptation”, with strong connections to the specific activities “advancing ASEAN Initiatives on Clean Air, Health and Climate Change” and “Assessment of climate change risk and vulnerability in ASEAN region”. It is also aligned with the core theme “climate modelling and assessment”.

²⁴ With “Risk Assessment and Monitoring” and all its three subpriorities; with “Prevention and Mitigation”, in particular with subpriorities “DRR and CCA” and “Resilient Cities and Human Settlements”; and with “Preparedness and Response” ASEAN Secretariat 2020a.

in Disaster Management (ASEAN Secretariat 2022) and its plan for Action 2021-2025 extensible and actionable with respect to heat risks in urban areas, specifically.

- Identify synergies between these recommendations and the ASEAN Regional Plan of Action on Adaptation to Drought 2021-2025 (ASEAN Secretariat 2021b).
- Integrate heat risk reduction in trainings on the integration of DRR and CCA into urban planning – see Recommendation 11 “Invest in capacity building” for details.
- Establish knowledge exchange about existing best-practice assessments and plans on heat risks and adaptation within ASEAN, but also from similar contexts elsewhere, and how to conduct them. Assessments from different spatial scales are conceivable in this regard. Include climate model ensemble projections.

Recommendation 7: Address health risks from high air pollution concentrations in urban areas

Conclusion:

Air pollution, particularly PM 2.5, is a major hazard for human health in ASEAN, especially in urban environments. Efforts to address haze pollution have been made by the ASEAN community in the past, as in the Roadmap on ASEAN Cooperation towards Transboundary Haze Pollution Control (ASEAN Secretariat 2021d). However, coordinated and far-reaching measures to lower air pollution concentrations in cities are still lacking, especially those related to ambient air pollution from other sources (mainly related to fossil fuel usage) and household air pollution.

Recommendations:

Given the severity of effects of air pollution on human health, ASEAN should **address hazards from air pollution more prominently**. This should be done by **fully utilizing synergies between actions targeting GHG emissions reductions and maximizing air quality benefits**. These synergies should be identified and used in existing

strategies, work programmes and initiatives, as well as through upcoming strategies work programmes and strategies relating to human health and sustainable cities.

Additionally, **ASEAN should aim at developing an overarching, coordinated approach to reduce air pollution concentrations in ASEAN cities**, reflecting the importance of the topic. Managing urban air quality effectively requires regional, national, urban and rural authorities with responsibility for emission reducing activities to collaborate more closely (UNEP 2019). Collaboration between various levels of decision-making should therefore be addressed in the process, especially accounting for already existing national efforts. Such a coordinated approach can take various forms, potential entry points for implementation are provided below.

Policy level: regional, cross-cutting

Ideas for implementation:

- As a first step, integrate combating air pollution more prominently in upcoming regional strategies, work plans, and initiatives. This could apply to health-related policy frameworks and programmes, such as potential successors of the ASEAN Comprehensive Framework on Care Economy (ASEAN Secretariat 2021a), the ASEAN Post-2015 Health Development Agenda (2021-2025) (ASEAN Senior Officials Meeting on Health Development 2021), the Health Cluster Work Programmes, as well as to the successor of the current AWGESC Action Plan.
- Additionally, increasing air quality could also be targeted more prominently in initiatives and projects promoting greenhouse gas emissions reductions, making use of synergies between greenhouse gas emissions abatement strategies and reducing air pollution concentrations. This could apply, for example, to the Smart Green ASEAN Cities Programme (SGAC) and the SDGs Frontrunner Cities Programme (SDGs-FC). The ASEAN Environmentally Sustainable Cities (ESC) Awards is a good example of already existing efforts to promote awareness for the importance of air quality measures.

- Given the severity of air pollution impacts on health, a thorough assessment of needs for action and cooperation opportunities, followed by a common approach to increase air quality in urban areas throughout the region, should be considered. Measures to address air pollution in the region are highly dependent on the findings of such assessment, and the individual situation within each member state might require a flexible approach to tackling air pollution. However, certain measures have proven to be effective in increasing air quality and can be used as a starting point. The extensive report by the United Nations Environment Programme (UNEP) proposes 25 clean air measures for Asia and the Pacific, addressing various sectors (UNEP 2019). A common approach could take various forms. A regional agreement on post-combustion controls, industrial process emissions standards, emissions standards for road vehicles, mandatory vehicle inspection and maintenance and road dust control could be envisaged. This would target the five clean air measures identified as key starting point for air quality improvements in the region by the aforementioned UNEP report.
- Use synergies with the comprehensive ASEAN regional strategy for haze pollution management (Roadmap on ASEAN Cooperation towards Transboundary Haze Pollution Control with Means of Implementation) (ASEAN Secretariat 2021d), e.g. regarding means of implementation.

Recommendation 8: For flood risks to urban areas, integrate differentiated future projections and risk reduction more prominently into corresponding ASEAN approaches

Conclusion:

Overall, the literature review revealed a high awareness for observed hazards and risks from flooding in ASEAN. Much has been done to reduce risks from

flooding from a DRR perspective. Turning to projected future increases in flooding risks, however, awareness and concreteness in addressing these risks is clearly lower in the literature reviewed and requires action.

Thereby three gaps were identified. First, only a limited number of reviewed documents acknowledge future risk increases, although the documents that do consider these risk increases are important. Second, specifically who and what (e.g. population in informal settlements, infrastructure) is projected to be at increasing risk in urban areas, from which flooding type, and which impacts (e.g. loss of life, economic losses), is missing in the reviewed documents. Third, risk assessments and responses were seldomly tailored to urban areas and their characteristics. More urban differentiation and contextualization in this regard would further contribute to reducing current and future risks from different flooding types.

Recommendations:

As contributions to reducing risks to flooding in urban areas: First, **factor climate-related related “key risks” from flooding in urban areas in ASEAN and corresponding risk reduction into relevant upcoming strategies, programmes, and work and action plans.** Take projected future risk increases, among others due to climate change (including SLR), and to urbanization, into full account. “Key risks” from flooding from the IPCC WG II contribution to AR 6 (see Section 3.2.2 Findings on selected climate-related “key risks” for urban areas in the ASEAN region) to factor in should include (but are not limited to):

1. Urban infrastructure at risk of damage from flooding and severe storms
2. Risk to life and property due to SLR and coastal flooding
3. Risk of loss of life, infrastructure, and income due to floods, with cascading risks to food security and health²⁵

²⁵ Due to the systematic selection process (see Section 3.2 Selected risks related to climate change, natural disasters and rapid urbanisation in ASEAN), this study does not further investigate this flood-related key risk, yet Southeast Asia is a stand-out region for it (Pörtner et al. 2022, p. 40).

Second, **factor these three key risks and risk reduction into upcoming relevant ASEAN programmes, strategies and initiatives in a more differentiated, contextualized way.**²⁶ This includes differentiating between flooding types (e.g. coastal flooding by severe storms), risk to what (e.g. loss of life), whom (e.g. informal settlements), and where (e.g. in low-lying areas). This would provide a better basis for equivalent and tailored adaptation to these key risks in urban areas. Also, consider this recommendation for other, non-urban, areas.

Third, **mainstream appropriate-level municipal assessment of the aforementioned key risks and of adaptation options, where geographically applicable.** This would strengthen the basis for the first and second recommendation and for informed local decision making. Take projected future risk increases, among others due to climate change (including SLR), and to urbanization, into full account. Hence it is also important to strengthen access to and transfer of the scientific and practical knowledge base, including the data, for these key risks.

Level of implementation: Regional level, sub-national to city level

Ideas for implementation:

- Factor in and promote targeted risk assessments (also at the local scale) and risk reduction of flood-related “key risks” in upcoming work plans and programmes, action plans, and strategies. This could include, for example, in potential successors of the current AWGESC Action Plan, AWGCC Action Plan (2019-2025), and AAD-MER Work Programme (2021-2025). Highlight the importance of taking projected future risk increases into account, as well as a context-specific approach (differentiating between risks from flooding types, risks to what, to whom, and where).

- If a climate change cooperation plan for the region is developed (as suggested by the ASCCR) it is recommended to integrate and mainstream risk reduction to the above mentioned “key risks” into this plan.
- Create links and synergies to existing work plans and programmes, action plans, and strategies, for example to the areas “Built infrastructure” (sub area “Urban resilience”) and “Health and well-being” in the ASUS (ASEAN Secretariat 2018); to the “Key Result Area” “climate adaptive ASEAN” in the key characteristic “Resilient” of the ASCC Blueprint 2025 (ASEAN Secretariat 2016b), as well as to “Disaster-resilient ASEAN” therein.
- Implementing the recommendations can help to strengthen collaboration between AWGESC, AWGCC, and ACDM and between and further relevant bodies and sectors. The recommendations are partly implementable in the AWGESC Work Plan 2016-2025.²⁷
- Use and exchange knowledge on existing assessments of adaptation options with the highest potential for reducing risk to select key risks (see, e.g. (Dodman et al. 2022), yet taking the local contexts into full account.
- Appropriate level municipal assessments of these key risks and corresponding adaptation options would benefit from measures that are already part of the AHA Centre workplan 2021-2025, such as strengthening the forecasting and monitoring capacity for climate-related hazards as well as improved risk modelling capacity for sudden onset climate hazards (AHA Centre 2021).

²⁶ Again, taking projected future risk increases due to CC, including sea-level rise, and to urbanization, inter alia, into full account.

²⁷ e.g. in the activity “developing joint initiatives on climate resilient cities with focus on (inter alia) resilient vital infrastructure, coastal management, urban run-off”

Recommendation 9: Promote NbS measures to increase resilience and simultaneously provide mitigation and adaptation benefits

Conclusion:

AMS expressed the need to learn more about NbS and assessing their potential in various sectors to fully exploit their benefits. It has been recognised that NbS and investing in natural capital provide important entry points to resilient livelihoods, sustainable adaptation and climate resilient development. It is well established that NbS in urban areas are one example set of measures that can have mitigation, adaptation and other SDG synergies, while providing several ecosystem services including livelihood, biodiversity and health benefits. Although NbS are addressed in the recently published ASEAN Work Programme on Urban Biodiversity and Greenery (2022-2032), further promotion and mainstreaming of NbS as multi-benefit adaptation options is needed at all levels.

Further still, NbS are recognized as some of the adaptation options with the highest potential for reducing select climate-related “key risks” from the IPCC AR6 (WG II) to cities, settlements, and key infrastructure (Dodman et al. 2022). Two examples of such key risks for which NbS adaptation options have some of the highest reduction potential are “risks to population from increased heat” and “urban infrastructure at risk of damage from flooding and severe storms” (see Section 3.2.2 Findings on selected climate-related “key risks” for urban areas in the ASEAN region) (Dodman et al. 2022). And these are two of the key risks which are particularly relevant for urban areas in Southeast Asia.

Recommendation:

Promote NbS as low-regret options to increase urban resilience to various risks. Increase cooperation and knowledge sharing for successful

implementation of NbS as examples of integrating adaptation and mitigation measures. Use NbS as a tangible field to strengthen cooperation between AWGESC, AWGCC, ADCM, and the Working Group on Nature Conservation and Biodiversity (AWGNCB). Strengthen awareness and build capacities of ASEAN urban authorities, city leaders and local actors for planning, implementing and maintaining NbS.

Policy level: all levels, with a focus on regional

Ideas for implementation:

- As a first step to implement this recommendation, enhance cooperation between ongoing initiatives on urban NbS and on urban ecosystem-based adaptation: The Work Programme on Urban Biodiversity and Greenery (2022-2032) identifies NbS as one of three key action areas and defines indicative activities such as promoting the understanding of standards and indicators for NbS. In addition, the recently published status report Investing in Sustainable Natural Capital in ASEAN (The European Union Mission to ASEAN and ASEAN Secretariat 2021) presents recommendations for an ASEAN Natural Capital Roadmap. Ultimately, the programme area “Climate Resilient and Low Carbon Cities” in the AWGESC Action Plan provides multiple outputs and activities as further examples to promote and implement NbS to help achieve existing targets and objectives.²⁸ Concrete ideas and measures for planning, implementing and mainstreaming NbS could be added and made a priority in future AWG’s strategies and initiatives, such as the AWGESC and AWGCC Action Plans.
- Exchange and close collaboration of AWGs with the ASEAN Centre for Biodiversity (ACB) should be established to further support the implementation of the initiatives and thus the upscaling of NbS in ASEAN.

²⁸ One is the output on “increasing the number of ASEAN cities with low carbon and improved resilience capacities to climate change through better integration of climate change adaptation and mitigation in sustainable development agenda”. Another is the output “Demonstration of climate change mitigation and adaptation at selected ASEAN cities”. Both output host multiple activities in which NBS can be implemented.

- Building on that, strengthen the transfer of, and access to, the scientific and practical knowledge base of NbS by disseminating proven good practices of NbS, e.g. sponge city concepts and green infrastructure, between cities with similar contexts. Promote knowledge exchange between these cities and their implementing actors.
- Learning from these good practice examples, increase the number of ASEAN cities with demonstration projects of NbS, e.g. in resilient city planning, mangrove restoration, sponge city concepts, and green infrastructure for reducing risks to population from increased heat (e.g. regarding heat stress, mortality, and morbidity), floods and other hazards. Ensure the involvement of stakeholders at various levels, including local people and communities to manage natural capital, private sector businesses to provide incentives and support, and the finance industry to promote investments.
- As one targeted implementation example for NbS for which there is a clear need in urban areas in ASEAN, deploy NbS for explicitly reducing the key risk “urban infrastructure at risk of damage from flooding and severe storms” from IPCC’s AR 6 (see Section 3.2.2 Findings on selected climate-related “key risks” for urban areas in the ASEAN region) – extending and complementing predominant physical infrastructure approaches, and social interventions.

7.3 Capacity building and implementation

Recommendation 10: Improve access to finance and develop financing strategies

Conclusion:

The lack of access to and availability of sufficient and appropriate financing options are huge barriers for successful implementation of policy responses in ASEAN. Especially sub-national actors often lack the necessary financial resources for capacity building, project preparation and project implementation. The challenges for accessing adaptation finance from various actors (national and international, public and private) need to be overcome. This can be achieved through the diversification of financing sources as well as development of well-designed long-term financing strategies.

Recommendation:

Exploit existing and promote alternative options to scale up green finance. The private sector plays a critical role in this regard and needs to be further integrated in financing approaches, as currently only 25% of funds come from private finance (DBS and UN Environment 2017). Increase the awareness and accessibility of existing financing instruments and explore further innovative financing mechanisms both internationally and domestically.

Policy level: all levels, with a focus on sub-national and regional

Ideas for implementation:

- To mobilize private sector climate finance, new incentives and more bankable projects need to be established. In addition, own capital markets need to be developed as they play an important role in mobilizing private capital. For example, local institutional investors such as local pension funds and insurance companies usually have a better understanding of the local investment environment than international investors and can thus take operating risks as well as avoid currency mismatches for borrowers, thereby playing a catalytic role in market development. For domestic markets to function and to attract these investors, it is crucial to overcome existing challenges such as inadequate market structures or weak regulations. Also, own (government-owned) development finance institutions as targeted financial intermediates to fund green projects are an opportunity for showcasing projects with good returns.

- Innovative financing mechanisms, tools and products need to be developed and further scaled up by building on already existing approaches and instruments, especially to implement and maintain NbS. For example, the People's Survival Fund in the Philippines was created as an annual fund for local government units (LGU) and local community organizations to implement CCA projects and provide financial support for resilience building on a local level (GIZ 2018).
- Multilateral public climate funds that have a resilience focus exist for developing and least developed countries, such as the Pilot Programme for Climate Resilience (PPCR), which assists governments in integrating climate resilience into strategic development planning, or the International Climate Initiative (IKI), which funds projects on climate action and biodiversity.

Recommendation 11: Invest in capacity building

Conclusion:

The analysis has shown that national and sub-national level actors are often in charge of implementing concrete actions to improve urban resilience (e.g., related to urban planning or local DRR) or would be well positioned to do so. However, insufficient skills and expertise levels in the field of urban resilience, especially in sub-national governments and agencies, are impeding the resilience action. Examples of topics that capacity building measures should target are technical skills and expertise, access to funds and financing strategies, as well as the integration of CCA and DRR into urban planning.

Recommendation:

Set up educational programmes, trainings and/or bursary schemes to strengthen technical expertise and to close skill gaps in the field of urban resilience. Specifically target sub-national governments and agencies planning and implementing measures with the potential to impact urban resilience.

Policy level: regional, sub-national

Ideas for implementation:

- The current AWGCC Action Plan 2019-2025 aims at developing a platform providing a comprehensive list of available trainings and capacity building programmes in adaptation. To assess the coverage of current capacity programmes and identify gaps therein, this could be extended into providing an online platform featuring all training and capacity building programmes relating to urban resilience.
- The AHA Centre Executive (ACE) Programme has been set up to develop and mentor regional leaders in disaster management. By integrating training content on climate change risks, particularly to urban centres, the programme could educate participants to become leaders with a more holistic view and understanding of the intersection of disaster, climate change risks and resilience.
- Synergy opportunities with the MPAC 2025 initiative on establishing new vocational training programmes and common qualifications across the AMS (ASEAN Secretariat 2016e) could be explored. Including local authorities, municipalities, and cities in this process would further contribute to enhanced vertical collaboration.
- New capacity building programmes to strengthen technical expertise could target GIS and other software skills, data use, processing and management, as well as encompass trainings in climate change risk and vulnerability analyses, CCA, and resilient urban planning.
- Targeted capacity building in access to finance and financing strategies should be further promoted. A range of programmes and tools is already available within and outside ASEAN that help countries and sub-national governments navigate through the complex climate finance architecture and create the conditions for use of international funds. For example, the action plan toolkit of the ASUS can support cities in developing project proposals relevant for their unique context and engage partners for financing assistance. In addition, the Quick Guide to CCA Funds, developed by weADAPT, or GIZ's Climate Finance

Readiness Programme are valuable knowledge sources. Furthermore, targeted capacity development projects and programmes that help local institutions and SMEs to apply green finance are useful to scale up sustainable practices.

- Actors in workshops and consultation interviews repeatedly identified the need for knowledge input on urban planning and climate risk management for ASEAN bodies. In connection with Recommendation 4 (accelerating the integration of DRR and CCA into urban planning), trainings on the integration of DRR and CCA into urban planning should be rolled out. These trainings should and would be concrete examples for integrated approaches in urban planning and management, and promoting coordination among relevant sectors and would target sub-national level actors. Strengthening technical expertise and closing skill gaps in this field of resilient urban planning, especially in local government and relevant agencies, can be a major opportunity for ASEAN (ASEAN Secretariat 2020c, 2015c) and would increase the capacity of local actors to better integrate resilience into all relevant fields of urban planning and management (JICA 2018a).

Recommendation 12: Strengthen the dissemination of relevant knowledge and methods

Conclusion:

Providing easy access to relevant knowledge is crucial to further strengthen the implementation capacity across the ASEAN community, e.g. for actors completing assessments and designing management strategies in the field of urban resilience. The lack of relevant information, e.g. about the feasibility of measures, their costs and benefits, and technologies involved, is a repeatedly reported issue. Clarity and assistance are also needed regarding methods relevant for urban resilience analyses, especially for risk and vulnerability assessments for urban environments and respective data analyses.

Recommendation:

Further promote the dissemination of key knowledge and already existing methods, as well as the development of additional, easy-to-use methodologies for important use cases based on a needs assessment. Increase transparency with regard to the applicability of methods (when [not] to use what). Use synergies with existing programmes and planned activities from different AWGs and other relevant bodies.

Policy level: regional

Ideas for implementation:

- Existing methods that could further be promoted include the toolkits provided as part of ASUS (ASEAN Secretariat 2018) and the Guidebook for Urban Resilience (JICA 2018b).
- Further methodologies can be developed after a needs assessment has been performed.
- Ideally, the dissemination would be supported by a methods repository structured by thematic fields and a clear communication of the use case of each method. A similar approach could be employed to select and disseminate key information from the field of urban resilience.
- For both the dissemination of information and methods a close cooperation with the AHA Centre could be highly beneficial. A stronger focus on climate change related risks for the upcoming years is already part of the AHA Centre's work plan 2021-2025 (AHA Centre 2021). By broadening the AHA Centre's scope to not only integrate climate change risks but also other risks to urban areas – which are among many other aspects of urban resilience – it could begin establishing itself as a central body and knowledge hub for urban resilience. Additionally, several measures that are already part of the AHA Centre workplan could be extended to also support the dissemination of information and methods in the field of urban resilience. This could include adding urban resilience as topic to be considered by ADILab (ASEAN Disaster Information Laboratory), a research and innovation network that is to be established.

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Appendix

Natural hazards and resulting current risks in ASEAN Member States from a selected literature review

Brunei Darussalam

As a country with a **tropical climate**, Brunei experiences high levels of humidity, rainfall, and temperatures (Brunei 2015, p. 2). A rapid BIMP-EAGA²⁹ climate vulnerability assessment for Brunei has yielded a medium to high exposure to the impacts of climate change (Abracosa et al. 2015). This exposure results from **higher rainfall intensities** in the wet season, which increases **flooding** as well as **landslide** risks. Especially **more densely populated areas** in Brunei will be adversely affected by these risks (ibid). Brunei's INDC mentions that heavy rainfall in combination with high tides has disrupted and damaged residential assets, as well as transport links in the past (Brunei 2015). According to the BIMP-EAGA assessment, Brunei is furthermore exposed to higher temperatures during the dry season, which may result in **heat stress** and an increasing incidence of **wildfires** and **smoke haze** with health risks for concentrated urban populations (Abracosa et al. 2015). Natural hazards, such as typhoons or earthquakes, are rare. However, Brunei's capital city Bandar Seri Begawan has experienced smaller earthquakes with a magnitude in the range of 4–5 in the past. In addition, the El Niño phenomenon has increasingly affected Brunei in the past two decades (Abracosa et al. 2015).

JICA's country report on Brunei seconds the findings of the BIMP-EAGA assessment, reporting **floods** and flash floods among the most frequent disasters and stating that **heavy rainfalls** have led to **inundations of urban areas** in the past (JICA 2015a). As opposed to the BIMP-EAGA assessment, JICA assesses the risks for natural disasters in the country as low. (Ndah and Odihi 2017) findings contradict JICA in this regard, arguing that the (mis-) perception of low disaster risk is driven by limited reporting of disasters to international databases. The authors furthermore argue that Brunei's population is prone to disasters risks due to a lack of knowledge and awareness of low magnitude but reoccurring hazardous events.

In 2018, **77.6%** of Brunei's population have lived in **urban areas**; the country is urbanising at an annual rate of 1.66% from 2015–2020 (Center for Excellence in Disaster Management and Humanitarian Assistance 2019).

Cambodia

Dyoulgerov et al. (2011) report a mean annual **temperature increase** by 0.8°C between 1960 and 2003 as well as an increase in the frequency of **hot days** for Cambodia. Furthermore, the country is

²⁹ BIMP-EAGA: Brunei Darussalam-Indonesia-Malaysia-Philippines East Asian Growth Area

prone to **floods** and **droughts** (Dyoulgerov et al. 2011; Malteser International 2015; Leng Heng An 2014). According to Malteser International (2015), flooding negatively impacts sanitation, food security, drinking water, and transport. Leng Heng An (2014) also reports heavy storms and typhoons, fire incidents and epidemics as natural hazards likely to affect the country. Especially the country's low-lying areas are affected by **sea-level rise**.

Around **80 %** of Cambodia's primarily agrarian population lives in **rural areas** (Dyoulgerov et al. 2011; World Bank 2021b; Malteser International 2015). However, the country is **urbanising rather rapidly** at an estimated rate of 2.65 % from 2010–2015 (Malteser International 2015).

Indonesia

Indonesia is affected by various natural hazards and climate impacts, including: **floods, earthquakes, tsunamis, volcanic eruptions, cyclones, landslides, and droughts** (Ministry of Foreign Affairs Netherlands 2018; JICA 2015b). Especially Indonesia's **urban centres** – inter alia Jakarta, Medan and Bandung – frequently suffer from **floods and associated land- and mudslides** (USAID 2012). **Informal settlements and slum dwellers**, for example in Jakarta, are especially affected (UNRISD 2019). In spite of the above, Indonesia's urban population has been growing continuously over the past decades (UNDP and BCPR 2013).

Temperatures, previously constant over the year with a wet and a dry season, have increased in the last decades. Data vary between an increase of 0.3 °C between 1990 and 2012 (USAID 2012) and an increase of 0.04 °C per decade over the last thirty years (Ministry of Foreign Affairs Netherlands 2018). When it comes to **changes of precipitation**, the report from the Dutch Government (2018) finds that the total annual rainfall has increased by 12 % since 1990. USAID, on the other hand, determine that the annual rainfall has decreased 2–3 % since that year (USAID 2012). The temperature increases and changing rainfall patterns will threaten **water availability** and **food security** (Ministry of Foreign Affairs Netherlands 2018).

Another threat for Indonesia is the **SLR** caused by climate change. According to USAID, the sea levels could rise 27.5–40 cm by 2050 and 60–80 cm by the end of the century, with the baseline year 2000 (USAID 2012). 42 million Indonesian citizens are living in low-lying land, and will be heavily affected by the impacts of SLR (USAID 2012).

Lao PDR

Among the most important risks are **floods** and **droughts** (Lao PDR 2010; Dyoulgerov et al. 2011; ADB 2016; GIZ and MONRE 2014). The reviewed literature also consistently remarks that these risks are becoming more frequent and severe (ADB 2016; Lao PDR 2010; GIZ and MONRE 2014; Dyoulgerov et al. 2011). Both of these climate hazards may destroy infrastructure by interrupting power supply, leading to a shortage in drinking and irrigation water, infectious and water-borne diseases and food insecurity through crop failures (GIZ and MONRE 2014; Dyoulgerov et al. 2011). In addition, the Asian Development Bank (ADB 2012) reports that the country will be highly affected by **storm surges** and torrential rains.

While around 75 % of Lao PDR's population lives in rural villages or very small rural towns, **urban growth** is progressing rather rapidly (Centre for Development and Environment University of Bern 2018). Around 35 % of Lao PDR's population live in urban areas. The urbanisation process brings about several challenges, including the need for a national systematic approach to dealing with **flooding and drainage issues in cities** (ADB 2012), as well as a coordinated urbanisation approach that inter alia addresses the informal job sector, urban poverty, inequality and marginalisation (Centre for Development and Environment University of Bern 2018).

Malaysia

Floods, storms, and earthquakes are the **major three disasters**. According to the JICA Country Report for Malaysia, **floods** caused 71 % of the total number of disasters. This was followed by **storm** (14 %) which affected 90 % and 8 % of people, respectively. Flooding (65 %) and earthquake (32 %) are the two major causes of estimated damage cost.

However, mud- and landslides are also significantly affecting human lives in the country (JICA 2015c). In addition, the Center for Excellence in Disaster Management & Humanitarian Assistance (2019) reports **floods, landslides, drought, forest fire, earthquakes and tsunamis as important disaster risks**. The Malaysia Disaster Management Reference Handbook states that according to the INFORM Risk Index Malaysia faces a lower risk of earthquakes in comparison to other Pacific Rim areas (Center for Excellence in Disaster Management and Humanitarian Assistance 2019, 2022). Nevertheless, the authors also point out that the risk is higher for Eastern Malaysia.

Myanmar

According to the Global Climate Risk Index, Myanmar ranks third among those countries most affected by extreme weather events between 1998 and 2017 (Eckstein et al. 2019). About 50 % of the disasters that Myanmar had to face were related to **floods** according to the JICA country report findings (JICA 2015d). In terms of frequency, flooding is followed by **storms** (23 %), which constitute the highest estimated damage costs (86 %) (JICA 2015d). USAID names **floods, heavy monsoon rains, storm surges, tsunamis, drought and cyclones**, as events that Myanmar is inherently prone to (USAID 2017a). Further natural hazards that have been recorded in Myanmar are **earthquakes and landslides** (JICA 2015d).

Urbanisation processes in Myanmar are still in their early phase (World Bank 2019). Around one third of Myanmar's population lives in **urban areas** (Republic of the Union of Myanmar 2012). The latter are characterized by a high density in buildings, infrastructure and population (Horton et al. 2017). Water, transport, and energy components of infrastructure in these areas are interrelated and hence at risk of negatively influencing each other in case of extreme weather events (Horton et al. 2017). As Myanmar states in its National Adaptation Program of Action, floods and storm surges coupled with (inter alia) poor infrastructure lead to **localized floods in urban areas** (Republic of the Union of Myanmar 2012, p. 23). Urban areas are especially at risk from climate change: infrastructure and land use planning need to include environmental-sensitive measures,

but also grapple with increasing numbers of people migrating to towns and cities. **Informal settlements with poor infrastructure** and services may be a result of these developments (Republic of the Union of Myanmar 2016).

Philippines

Climate hazard literature for the Philippines consistently reports a heavy vulnerability to climate change (Eckstein et al. 2019; Scherer, N., Tänzler, D. 2018; USAID 2017b; World Bank 2013). According to the Global Climate Risk Index 2019, the Philippines ranks fourth among the countries most affected by weather-related losses in their Long-Term Climate Risk Index covering 1999–2018 and second among the countries most affected in 2018 (Eckstein et al. 2019). (Scherer, N., Tänzler, D. 2018) mention **extreme weather events and disasters (specifically flood, tropical typhoons and storm surges)**, and **sea-level rise and coastal degradation** as the key climate risks of the Philippines. The authors furthermore name **tropical typhoons and floods** as major climate-related events to which the country is highly exposed, also considering that globally the Philippines has one of longest coastlines (Scherer, N., Tänzler, D. 2018).

Next to a high vulnerability to climate change impacts, the Philippines has also experienced **one of the fastest urbanisation rates in the East Asia and Pacific region**. The urban population has grown by over 50 million people over the past five decades (Dyoulgerov et al. 2011; World Bank 2017). **Over 60 %** of the country's population lives in **urban areas** (USAID, 2017). The impacts of climate change (in particular **flooding**) and **seismic risks** adversely affect the country's effective management of these areas (World Bank 2017).

Singapore

As a low-lying city state, Singapore is particularly vulnerable to **flooding** and **rising-sea levels** (Palma 2019; National Climate Change Secretariat Singapore 2012, 2016). These climate hazards have led to coastal erosion and inundation in the past (National Climate Change Secretariat Singapore 2012). Additional climatic changes include an increase in the frequency and intensity of **rainfall** as well as prolonged

drought periods as a result of the El Niño Phenomenon (Chow 2018). This weather variability could seriously challenge the sustainable management of **water resources** in the country

Temperatures in Singapore have been rising twice as quickly as the global average over the past six decades (Mokhtar 2020). The rise in temperatures is inter alia a result of the **heat island effect**, which can be attributed to the **country's urbanisation**: The replacement of Singapore's natural environment (including mangroves and forests) with built infrastructure has resulted in surfaces that retain and produce high amounts of heat (Chow 2018). The resulting higher temperatures have adverse effects on human health including **heat stress** (Chow 2018) and vector-borne diseases (National Climate Change Secretariat Singapore 2022).

Thailand

Temperature rise and increased frequency and intensity of **rainfall** count among the most pronounced impacts of climate change on Thailand (ICEM 2013). Furthermore, tropical storms, **floods, coastal erosion**, and cyclones have increased in severity and frequency over the past years and decades (UNDP 2012), putting especially coastal areas at risk. Heavy rainfall turning into floods has occurred in the South of Thailand in 2017, impairing transport infrastructure and adversely affecting around 1.6 million people (Eckstein et al. 2019). Additionally, **drought** is recognized as a significant climate hazard in Thailand, and is projected to be exacerbated under future climate scenarios (World Bank and Asian Development Bank 2021). This pressing issue has already engendered adverse repercussions on the agricultural sector, adversely affecting its productivity and economic stability (Arunrat et al. 2022).


Thailand has experienced an **urbanisation rise** over the past 40 years (Friend et al. 2016). Much of this rise has occurred in river basin, deltaic and coastal areas, which are disproportionally exposed to climate-related hazards (Friend et al. 2016).

Viet Nam

Being one of the world's most vulnerable countries to climate change, Viet Nam faces multiple disaster risks and climate change impacts. Mean **temperatures have increased** by 0.26°C per decade for the years 1971–2010 – almost twice the rate of global warming. The number of **hot days** has increased significantly since 1960 (World Bank 2021a). Viet Nam is impacted by the El Niño Southern Oscillation (ENSO), influencing precipitation and temperature patterns as well as monsoon circulation (World Bank 2021a). According to JICA's Country Report on Viet Nam, **floods, typhoons, and inundations** count among high natural disaster risks in Viet Nam (JICA 2015e; GIZ 2018). On the Global Climate Risk Index 2020, Viet Nam ranks 6th among the countries most affected by weather-related losses in the period 1999–2018 (Eckstein et al. 2019).

Approximately one third of the population – estimated at 93 million in 2016 – lives in the metropolitan areas of Viet Nam's mega cities Ho Chi Minh City and Hanoi (World Bank 2021a). A large part of the population lives in **coastal lowlands and deltas**. The population in this area has become accustomed to the annual flood season. However, as a result of climate change the timing and intensity of the floods fluctuates and increases. In addition, the **degradation of mangroves** increases the coastline's vulnerability to saline intrusion and sea-level rise (GIZ 2018). In the **highland areas** of Central and Northern Viet Nam, the population suffers from often **rapid-onset and intense flash floods and landslides**, which are often caused by major storms (GIZ 2018). Another urbanisation challenge that Viet Nam has to grapple with are rapid **land change use** (from agricultural to urban) as well as the high level of **informal or indecent settlements** (Quang n.d.).

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