

Chapter 1

Introduction: Distributional Effects of Disasters and Climate Change- Economic and Food Security Implications

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Introduction: Distributional Effects of Disasters and Climate Change – Economic and Food Security Implications

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Natural disasters and climate change have global impacts in terms of both causes and effects. These impacts are not distributed evenly across countries and sectors in the region, however, but can create dissimilar effects across different latitudes and altitudes – affecting food security. For example, some parts of Southeast Asia may be impacted by a large number of cyclones, while others suffer from frequent drought episodes. Depending on the location of populated areas, this makes many people vulnerable to food security risks with respect to access to water, disease, and hunger.

The Association of Southeast Asian Nations (ASEAN) Socio-Cultural Community (ASCC) Blueprint 2025 (ASEAN, 2016) and East Asia Summit (EAS) statement (ASEAN, 2015) clearly recognise the need for concerted efforts to address the issue of disasters and climate change and their impacts on socio-economic development, health, and food security. ASEAN Member States (AMS) have agreed on the implementation of eleven related actions, based on the principles of equity, flexibility, effectiveness, common but differentiated responsibilities, and enhanced institutional capabilities. Ensuring adequate access to food at all times for all ASEAN people is also identified as a priority agenda for the implementation of the ASCC blueprint. However, climate change and the increasing number of natural disasters are affecting regional and local food security. The Asian Development Bank (ADB, 2011) showed a yield reduction of 14%–20% for paddy rice, 32%–44% for wheat, 2%–5% for corn, and 9%–10% for soybean in Asia. Within ASEAN, differences may occur locally, and it is very difficult to make exact predictions since the available data are scarce at the subnational level and for major cash crops such as cashew nuts. However, given the biophysical impacts

of disasters and climate change, when integrated with future food demand, food prices are projected to increase by 29%–37% for rice, 81%–103% for wheat, 58%–97% for corn, and 14%–49% for soybean in 2050, compared with no-climate change policy scenarios (ADB, 2009).

One aspect of disasters that has been studied in less detail in ASEAN is related to the agricultural production system and its socio-economic impacts. This may be due to the intrinsic complexity that characterises long-term economic predications as well as assumptions on food security or the wide variety of structural and non-structural measures for adapting to climate change induced disasters such as flooding and drought. The most likely scenario is that some AMS will suffer severe shocks because of the new risk conditions, whereas other countries will face moderate challenges. In any case, greater resilience to extreme weather events and disasters is achievable with better information on social and economic impacts, more economic resources, strengthened institutions, and government support.

1.1 Economic and Distributional Impacts of Disasters

Southeast and South Asian countries continue to be the world's most disaster-prone areas. Asia incurred more than \$45 billion in economic damages and even higher indirect losses from 2000 to 2014 (United Nations Economic and Social Commission for Asia and the Pacific, 2016). These numbers are gross underestimations, however, as no systematic assessment has been made of the cost of all disasters – either climate-induced or manmade – that affect the region, especially slow-onset disasters such as droughts, heatwaves, and flash floods, which have direct impacts on the region's food security.

Why are AMS not investing more in disaster resilience, despite the prevalence and rising costs of disaster events? This may be because decision makers in governments, businesses, and households tend to focus on avoiding losses from disasters and perceive the return on investment as uncertain – only realised if a somewhat unlikely disaster event actually happens (Aldrich, Oum, and Sawada, 2015).

Effective policy actions require sector-specific damage and loss data for the agriculture and trade ministries of the AMS. Their national strategies on disaster risk reduction and climate change adaptation, which support resilience, must address the types of disasters with the greatest impact on the agricultural sector. Governments must design measures specific to

the crop, livestock, and fisheries sub-sectors; and be enabled to adopt more systematic strategies that counteract the impacts of disasters on the sector's growth, and national as well as regional food security.

Nevertheless, business rationale should inform climate change adaptation and disaster risk management based on the multiple dividends of resilience. Actions should look beyond avoiding losses (the first dividend) to the wider benefits to be gained independently of whether or not a disaster event occurs. These include unleashing entrepreneurial activities and productive investments by lowering the threat of losses from climate change, and enabling farmers and supply chain actors to take positive risks (the second dividend); and co-benefits of resilience measures beyond disaster risk (the third dividend), such as flood embankments that double as roads or drought-tolerant crop varieties that maximise crop yields. The no-regret adaptation strategies¹ should also reflect on recent efforts to build a stronger business case for resilience in the private sector, including the insurance sector.

Hence, the main objectives of this book are to (i) understand the distributional effects of disasters and climate change, and the related food security challenges in ASEAN; (ii) analyse the required actions taken by policymakers to address these risks; (iii) share experiences on the adjustment of key planning instruments relating to the crop, livestock, and fisheries sectors; (iv) exchange experiences on successful adaptation measures across key vulnerable areas; and (v) undertake cost-benefit analysis and identify necessary structural and non-structural measures that could contribute to a resilient ASEAN.

To meet these objectives, this book is organised into five interrelated parts and 13 chapters quantifying the distributional impacts of climate-induced natural disasters and – managing resilience and proposing a roadmap considering the key trends in the region and reviewing the local, national, and international levels of action. The book also seeks to highlight opportunities to build a resilient future through the implementation of both the 2030 Agenda for Sustainable Development and the Sendai Framework for Disaster Risk Reduction, 2015–2030.

¹ No-regret adaptation strategies aim at maximising positive and minimising negative outcomes of disasters for communities and societies in climate-sensitive areas such as agriculture, food security, water resources, and health.

1.2 Measuring the Vulnerability and Distributional Impacts of Disasters

In this section, we address many aspects of measuring the distributional issues resulting from disasters and climate change. The damage and losses calculated for sectors need to be analysed in relation to food security under free trade, moderate trade, and very restricted trade scenarios in the crop, livestock, fisheries, and forestry sub-sectors. Following this introduction, in Chapter 2, Yumi Shiomi et al. describe a vulnerability measurement model that uses several proxy indicators, grouped into eight elements, to assess the quantitative basis of the comparative potential vulnerability and resilience of countries, provinces, and counties vulnerable to disasters.

In Chapter 3, Srivatsan et al. employ climate modelling to assess the future of climate impacts in ASEAN countries. They argue that there is still considerable dependence on climate models produced outside the region which are not necessarily tailored to the needs of the region, and advocate for an increase in regional capacity to cope better with scenarios of climate change, food availability, and disaster forecasts from inside the region. For this, the scarce measurement network in ASEAN should become much denser. Current studies in Southeast Asia on the +2°C and +4°C warming available on the regional scale need to be interpreted on the local scale. This would lead to targeted assessments of climate impacts on local food production and disaster vulnerability, considering particular disaster events and agricultural commodities. In consequence, discussions on the policy perspectives of ASEAN could be widely altered if missing information becomes available and the full range of adaptation options becomes apparent.

John Kuwornu's Chapter 4 studies the effects of disasters on intra-ASEAN agricultural trade. The author employs numerous public databases and modelling exercises to generate his results. First, he observes the increase in international trade of agricultural products during 1980–2013 between Thailand, Indonesia, and Viet Nam after investigating the trade policies of these countries. While Thailand and Viet Nam are export nations of agricultural products, particularly rice, Indonesia has followed a different pattern, importing rice and other agricultural products to feed its fast-growing population. In a second step, Kuwornu investigates the role of disasters in international trade and food security. On a national scale, disasters rank in the middle of trade barriers. He argues that disasters can be both a hindrance and a means of acceleration of international agricultural trade. Disasters become a hindrance to international trade if remote areas are affected, transportation becomes limited

and expensive, and products cannot reach markets. Disasters can become an accelerator to international trade if central areas, key markets, and traffic nodes are affected; and otherwise existing trade barriers are lowered to recover quickly from adverse effects.

1.3 Technology Adaptation

Natural disasters and climate change tend to corrode or destroy physical and social infrastructure, change the environment, and cause economic stress. In Chapter 5, Budi Indra Setiawan and Eiji Yamaji identify types of disasters which have threatened food security and describe how each country has carried out technology-based adaptive measures. Special attention is given to Indonesia, as the largest food producer and consumer market, which has ambitious visions to achieve self-sovereignty; and the System of Rice Intensification, a promising rice cultivation method that can mitigate the effects of climate change. More frequent droughts and flooding as well as seasonal uncertainty are the main concerns, and adaptive measures for these issues range from improvements in infrastructure (structural) to management systems (non-structural). As food problems generate adverse relationships with other countries, mutual precaution and cooperation are very important while each country needs to develop individual agricultural policies that are compatible with those of their neighbours.

The effects of disasters and climate change on the livestock sector and the implications for ASEAN food security are analysed by Hyeon T. Kim in Chapter 6. This chapter reviews the current situation of the Korean climate, livestock production status, and adaptation measures to mitigate the effects of climate change. It covers (i) precision livestock smart farming, (ii) the application of information and communication technology, (iii) policies and strategies, and (iv) the role of institutions. AMS countries are facing long-term food security problems because of the increasing frequency of high impact natural disasters. Local short-term food insecurity in low-income households is often a result of extreme climate events in several ASEAN countries immediately after a disaster or extreme climate event occurs. With appropriate adaptation measures, ASEAN countries can reduce the losses that result from disasters and overcome food security problems.

The effects of disasters and climate change on the fisheries sector and implications on ASEAN food security are analysed in Chapter 7 by Thayalan Gopal and Venkatachalam Anbumozhi. The shortage of food security and fish production will become increasingly

severe to the communities of ASEAN in 2030, which are in climate and disaster hotspots. This chapter identifies cost-effective adaptation options to reduce the impacts of climate change and disasters on marine and inland aquaculture. Based on the rule of risk management, the adaptation strategies are differentiated and analysed into autonomous adaptation and planned adaptation – with critical cost–benefit analysis. Public-supported proactive planned adaptation is emphasised to counter the risks posed by increasing climate variability and disasters in ASEAN. To improve food security and minimise the projected decrease in profitability, it is concluded that fisheries need to build overall adaptive capacity along the value chain and diversify income opportunities, ideally without small-scale fishers incurring additional social costs.

1.4 Institutional Adaptation

Unabated, increased vulnerability and malnutrition caused by disasters are likely to impact poor people more severely. But other important though less direct connections between climate change and institutional adaptation also remain. In Chapter 8, Meinhard Breiling addresses the question of how cost-effective adaptation regimes become feasible through institutional design. The focus of his analysis lies in policy and institutional design, the choice of policy instruments, and the timing of interventions. Strategies to avoid damage and losses caused by disasters differ according to the scale and size of the food value chain. The AMS are very diverse in their economic development and food supply. Today, all ASEAN countries depend on a mix of local, regional, and global food value chains. Different disaster risk institutional strategies apply according to the level of individuals and entities involved in the value chain formulation.

In Chapter 9, Tomonori Sudo argues that financial institutions and the insurance industry are decisive actors which influence disaster risk management and adaptation actions. Financial institutions can play a significant role in providing finance, managing risks, and producing information. A variety of financial instruments is available to cope with disasters. However, each financial instrument has unique characteristics and this chapter identifies their pros and cons. For efficient management of disaster risks, the author proposes a funding pool mechanism with three functions to support the government and financial institutions in fulfilling their roles; and six policy recommendations for financial institutions, governments, and the region.

Despite the increased interest in strengthening financial institutional capacity, it remains a challenge for many developing countries to bring resilience along the entire value chain. In Chapter 10, Suresh Babu et al. argues that institutional capacity for disaster management and risk reduction can be built through various mechanisms. One key approach is via the agriculture sector, where climate-resilient agriculture has become an effective tool for adapting to climate change and developing resilience in the long run – resulting in increased capacity for disaster management and risk reduction at the system, institutional, and individual levels. This chapter presents the experiences of four countries, which have been evaluated to develop an institutional strengthening framework.

Chapter 11, authored by Vangimalla Reddy et al., argues that understanding the effects of natural disasters and the changing climate on food security is crucial to ensure that the most appropriate policies and practices are implemented. Adaptation strategies and frameworks are required to manage food and nutritional security in the context of natural disasters and climate change. This chapter analyses the effects of natural disasters and climate change on food security and vulnerability. It also discusses the adaptation strategies and sustainable measures to strengthen the resilience of agriculture to curb economic losses and achieve food and nutritional security. This knowledge will assist policymakers in choosing appropriate actions for implementing policies to address natural disaster and climate change risks with the goal of ensuring food and nutritional security.

1.5 Policy Adaptation

People's livelihoods are impacted by the various types of disasters, which can lead to the damage or destruction of human lives, crops, animals, fishing boats and gear, infrastructure, etc. The extent of the impact depends on the intensity of the hazard, the level of people's vulnerability, and their capacity to cope with these shocks and stresses. In Chapter 12, Kumaresan and Rajapakse give an overview of the health-related aspects of disasters and food security, and bring together relevant information from recently published studies. They introduce the topic value chain resilience from health-related policy, pointing out that infants, small children, pregnant and lactating women, and elderly people are particularly vulnerable groups that are disproportionately affected by disasters and food scarcity. The authors describe the role of food security and the relevance of its three aspects – food availability, food access, and food utilisation – in meeting daily calorific intake and a balanced nutrient supply. Disasters alter general levels of malnutrition during food emergencies and increase

mortality rates. The authors describe strategies to reduce the health impacts of disasters and underline the role of social safety nets, including consumer food price subsidies, food-for-work programmes, feeding programmes, and cash transfers. Finally, the authors recommend ASEAN to implement food security interventions, ensure access to appropriate healthcare, and prepare risk management systems and tools for disadvantaged groups.

In the final chapter, Venkatachalam Anbumozhi argues that effective mainstreaming of resilience considerations requires incorporating the Sustainable Development Goals (SDGs) in the planning process and arriving at a consensus on open agriculture trade pacts. Disaster and climate change risks, objectives, and policies should be based on a good understanding of SDG targets and free trade agreements that focus on agriculture. The shared roles and responsibilities of all players, including economic and planning ministries, are currently challenged in ASEAN countries. A general perception exists among the public, project proponents, and development authorities that climate change is the sole responsibility of environmental agencies, that disaster response is a humanitarian assistance issue, and that food security is better handled by the agriculture ministries – failing to implement the necessary measures effectively. As ASEAN economies continue to accelerate growth rates, the response to disaster will come under increased scrutiny and pressure. It is important to move quickly towards reaching broad agreement with all major stakeholders on SDG targets and agriculture trade, starting with the identified list, and to develop a medium- to long-term programme for implementing the agreed actions, supported by the necessary resources, monitorable targets, and clear accountability mechanisms.

1.6 Knowledge Gaps, Policy Equities, and Vulnerability Reduction

This book begins to fill a gap in the existing literature by covering the differentiated impacts of disasters and climate change on food security. It raises important issues that become relevant at the global, regional, national, and subnational levels in terms of the expected effects of disasters and climate change, and how adaptation roadmaps may help reduce vulnerability to food security in the ASEAN region. We conclude by synthesising the insights encapsulated in the chapters and discussing possible solutions to cope with the distributional effects of disasters and climate change and the implications for food security.

Authors discuss different ways for people and nations to deal with extreme weather events and climate variability. Many elements need to be combined to move towards a significant

and sustainable reduction in the vulnerability of the poor to the impacts of disasters and climate change on their food security. Sustainable national food systems can be created through an effective interplay of governance, knowledge, and action from the household and community level to the national and international level. Such systems would adapt to and endure the current and projected risks associated with natural disasters and climate change, and would not exacerbate the drivers of climate change discussed in this book. Different chapters deliberate on the effort to be endorsed and actions to be taken, such as seasonal forecasts to anticipate extreme weather events and management practices to allow farmers to achieve the best yields under prevailing conditions, to avert the possibility of food insecurity as a result of natural disasters and climate change at every level. The authors also focus on identifying threats to agricultural production, and countermeasures and solutions in inland and coastal areas of the ASEAN region, by discussing at the local level and suggesting strengthening ASEAN cooperation with other stakeholders at the international level.

The chapters analyse the responses of agriculture to natural disasters and climate change, and introduce concepts and provide a framework for building adaptation roadmaps and policies for decision makers. Developing policies to support decision makers and relevant stakeholders in selecting farming practices and agricultural technologies that build resilience to meet future challenges requires data on the impact of disasters and climate change on agriculture as well as foresight to predict the situations that need to be met. The chapters highlight the impact assessment of agriculture and climate-resilient policies based on the regional and national scenarios in the ASEAN region. They deal with the issues relevant at the international, national, subnational, and regional levels in predicting the expected effects and identifying adaptation roadmaps to reduce vulnerability and achieve food security. The authors propose development plans including long-term national programmes integrating climate change adaptation strategies, and disaster risk reduction and trade pacts involving all relevant stakeholders, to create a shared understanding of the adaptation agenda for appropriate decision making. The book highlights the importance of re-evaluating research needs to provide decision makers with actionable data and/or information, and considering investment in climate and environmental monitoring.

Enhancing adaptive capacity depends on financial factors, including access to credit, financial assistance, and the insurance system. National governments and international organisations provide financial assistance to disaster risk reduction in the agriculture sector to prevent and mitigate the significant impact of disasters. Different types of disasters have significantly different effects on the agriculture sector and its sub-sectors, and across

countries and regions, which requires tailored risk reduction interventions in terms of policy, and financial investments in prevention and sustainable post-disaster recovery responses. The adaptation roadmaps summarised in the chapters discuss potential solutions to cope with the distributional effects of disasters and climate change and the economic and food security implications. The strategies discussed would create plans to improve cooperation between sectoral, environmental, and financial authorities, as well as academia and private sector stakeholders. The policy coherence discussed in the chapters ensures that actors at all levels are included in the mainstreaming process for better information flow to fill the gaps in capacity building and financing. The discussions also support capacity building at the local level to help communities understand the climate risks and links to sector activities. The strategies discussed in the book would educate farmers on applying for financial assistance programmes to help with damage to farms, including disaster assistance programmes and schemes to help restore and rehabilitate farmlands. Table 1.1 synthesises the insights encapsulated in each chapter and discusses possible solutions to cope with the distributional effects of disasters and climate change and the economic and food security implications.

Table 1.1: Group and Sector-Specific Adaptation Strategies

Theme	Key messages	Policy Implications	Knowledge gaps
Economic losses and damage	<ul style="list-style-type: none"> Loss of production resources affects final supply and demand in regions through the Cobb–Douglas function Input–output tables allow calculation of 1st and 2nd ripple effects, respectively, through loss of production and consumption Location of production and consumption compared to the disaster area determines the applicability of ripple effects 	<ul style="list-style-type: none"> Individual countries’ Input–Output tables need to be available for this application The Cobb–Douglas function is unique to the region and industry, and loss ratios depend on the type of disaster, therefore data collection is needed 	<ul style="list-style-type: none"> Application of this methodology to ASEAN countries Communication with satellite companies for monitoring with sensor infrastructure, which is crucial for food security
Food security under 2°C global warming scenario	<ul style="list-style-type: none"> Modelling climate change in the ASEAN area shows predicted variations in temperatures, rainfall, and crop yield Case studies in Viet Nam and Indonesia predict crop losses 	<ul style="list-style-type: none"> We need to prepare for the worst-case scenario, in this case a 4°C increase Major and minor factors that influence production need to be monitored in real time for policymakers to react appropriately Vulnerable regions become more vulnerable, and payment schemes based on Standardised Precipitation Index (SPI) can help transfer risk away from farmers in these areas. 	<ul style="list-style-type: none"> This study can be extended to crops beyond rice and vegetables New kinds of crops that can be brought in and the nutritional and health implications of such change Uses of modelling to plan where to grow each type of crop (New crops and cultures that can withstand temperature change, as well as rediscovering ‘forgotten foods’ for culture diversification)

Theme	Key messages	Policy Implications	Knowledge gaps
Effects of disasters on agricultural product trade	<ul style="list-style-type: none"> An augmented gravity model shows the impact of disasters on trade in commodities of ASEAN countries Trade restrictions are included to observe the effect of economic integration (or lack thereof) 	<ul style="list-style-type: none"> Countries need to strategically address disasters that have an impact on trade Trade restrictions make the impact of floods more pronounced, showing the value of economic integration in disaster settings 	<ul style="list-style-type: none"> Applying this method to more countries and commodities. Addressing the issue of access to reliable trade data
Effects on fisheries sector	<ul style="list-style-type: none"> Natural disasters have positive, adverse, and indirect impacts on food security through both the agriculture sector and natural resources and the environment Climate change has an impact on fisheries through natural disasters, amongst other factors Malaysia is implementing a climate action plan to help fisheries mitigate and adapt 	<ul style="list-style-type: none"> ASEAN countries need more research and collaboration ASEAN countries can use action plans to encourage data collection, research, capacity building, awareness programmes, and more 	<ul style="list-style-type: none"> The impact of climate change on fisheries is not yet fully understood. The problem of coral bleaching merits further investigation. Better ways of access to climate sensitive information by general public Assessing the effect of disasters on water quality Topic of the fishing industry in rivers
Effects on livestock sector	<ul style="list-style-type: none"> Livestock production system is evolving to deal effectively with natural disasters and climate vulnerability as it grows to absorb new smart technologies Livestock is one of the main providers of food security The Republic of Korea has used different types of adaptation measures: Information and Communication Technology (ICT), policies, livestock smart farms, and public institutional involvement 	<ul style="list-style-type: none"> ASEAN needs to invest in research and development for innovative solutions to climate change Smallholder and family farming can improve productivity Governments should provide incentives to invest in the agriculture sector A food security information system is needed in the region Policy coordination and cooperation are required at the regional and global levels ICT smart farm research centre system 	<ul style="list-style-type: none"> Variance of factors on each individual farm can make a difference, so local level data are needed Reciprocally, livestock has an effect on climate change Trend of de-correlation of livestock and its area of production
Successful adaptation measures	<ul style="list-style-type: none"> Indonesia shows rising rice planting intensity and productivity in response to direct and indirect rice consumption Extreme climate poses a challenge to this growth and requires mitigation and adaptation strategies Experiments with SRI show possibilities to increase yield and decrease greenhouse gas emissions 	<ul style="list-style-type: none"> Countries need to develop water resources and secure irrigation systems Extension efforts for agricultural methods such as System of Rice Intensification (SRI) can be improved 	<ul style="list-style-type: none"> The economic implications of climate change for Rice System Intensification are not yet clear Need to look into which adaptation strategies (intensity, productivity, diversity, and dissemination improvements) should be maintained Question of investment needs for spreading and implementing agricultural methods Problem of needed labour intensity for SRI Cost-benefit analysis and comparison of SRI in different contexts

Theme	Key messages	Policy Implications	Knowledge gaps
Health and food security	<ul style="list-style-type: none"> Disasters hit vulnerable groups with malnutrition, communicable and non-communicable diseases, and psychosocial stress Food security is about the availability, utilisation, and accessibility of food for adequate nutrition Lack of food impedes investment in education, health, and more, creating a vicious cycle The double burden of malnutrition concerns stunting and overweight issues 	<ul style="list-style-type: none"> Climate change needs to be adapted to in a location-specific way Nutritional and dietary assistance, combined with nutritional education, are important tools to tackle malnutrition Research, human capital investment, coordinated responses, and emergency food reserves are some medium- and long-term solutions ASEAN needs to cooperate and coordinate policies between countries and with stakeholders Health systems need safe infrastructure and trained personnel to cope with hazards 	<ul style="list-style-type: none"> Missing information reduces certainty and collaboration between global actors Mechanism for data sharing with the public Value of the local ecosystem and empowering local communities to make use of it Relationship between acute and chronic food insecurity
Cost-effective regimes	<ul style="list-style-type: none"> Food has been the centre of models and theories for a long time Losses from disasters can happen at the agriculture, transport, storage, post-harvest processing, retail, or consumption stages EU system relies on negative population growth, local food specialty prices, financial incentives for rural populations, and agriculture as a hobby 	<ul style="list-style-type: none"> ASEAN countries are more diverse and need to adapt to individual conditions Looking at the EU experience, countries in ASEAN can expect deeper integration to cause important migration flows EU system for disaster management relies on state intervention (e.g. in insurance premiums) and ASEAN needs to devise its own adapted system 	<ul style="list-style-type: none"> Change of behaviour in producers and consumers Dramatic price fluctuations created by harvest schedules
Food and nutritional security	<ul style="list-style-type: none"> Climate change is a global phenomenon with regional impacts, such as natural disasters, which are amongst factors influencing agricultural production A threshold analysis on the Rice Bowl Index shows challenges to food security in many ASEAN countries 	<ul style="list-style-type: none"> Proactive solutions: early warning system, reliable data, hunger reduction, food storage, resistant infrastructure, preparedness at all levels Reactive solutions: immediate impact mitigation, quick rebuilding, working with communities, resilience building, chronic hunger reduction, focus on food-insecure people Adaptation strategies: monitoring and education, production optimisation, ecological restoration, food storage, capacity building, financial instruments, governance 	<ul style="list-style-type: none"> Empirical study on this topic through primary data Considerations of short- versus long-term preparation

Theme	Key messages	Policy Implications	Knowledge gaps
Role of financial institutions	<ul style="list-style-type: none"> Climate change affects the ‘financial intermediation’ and the role of financial institution by changes in costs for appraisal/ due diligence Different financial products are appropriate at the precautionary, emergency, and post-disaster stages Catastrophe bonds and Catastrophe Deferred Drawdown Options allow different stakeholders to participate in risk sharing Collaborative financial mechanisms are also possible (e.g. Disaster Risk Management funding pool) 	<ul style="list-style-type: none"> Financial policies and markets need to be as transparent as possible to reduce credit and market risks Financial institutions need to develop their capacity for including disaster risk analysis in appraisal/ due diligence and monitoring 	<ul style="list-style-type: none"> Stakeholders need to share disaster risk information amongst themselves Role of domestic market and financial institutions Problems of reappraisal in the face of climate change, e.g. of weather index insurance schemes Role of regional cooperation versus actors external to the region Effective ways and means of financial inclusion by nongovernment organisations or community based approaches.
Mainstreaming resilience into SDGs	<ul style="list-style-type: none"> ASEAN food supply chains are vulnerable to disaster risk and therefore to climate change, but can gain resilience through participation in Free Trade Agreements (FTA) SDGs need to be handled as a set because of interlinkages between different goals Mainstreaming runs into obstacles – knowledge, capacity, and finance gaps ASEAN’s functioning and community blueprint show opportunities for synergies in reaching SDG goals 	<ul style="list-style-type: none"> Mainstreaming requires six steps: alignment with the national planning and policy framework; evidence-based actions; accelerating frameworks; benchmarking; mainstreaming of Climate Change Adaptation (CCA), Disasters Risk Reduction (DRR), and trade pacts; and horizontal and vertical policy coherence Mainstreaming requires improving information, decision making, and finance Cross-sectoral coordination is an important tool for mainstreaming 	<ul style="list-style-type: none"> Cost-benefit analysis of trade-offs between the SDGs and compensation of the ‘losers’

ASEAN = Association of Southeast Asian Nations, EU = European Union, ICT = Information and Communication Technology, SDG = Sustainable Development Goal, SRI = System of Rice Intensification.

Source: Authors.

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