



Food and Agriculture  
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ENVIRONMENT  
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PAPER

78

NDC

ISSN 2226-6062

# REGIONAL ANALYSIS OF THE NATIONALLY DETERMINED CONTRIBUTIONS IN ASIA

Gaps and opportunities in the agriculture  
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Krystal Crumpler, Srijita Dasgupta, Sandro Federici, Alexandre Meybeck, Mario Bloise, Valentyna Slivinska, Mirella Salvatore, Beau Damen, Sophie Von Loeben, Julia Wolf and Martial Bernoux

Required citation:

Crumpler, K., Dasgupta, S., Federici, S., Meybeck, M., Bloise, M., Slivinska, V., Salvatore, M., Damen, B., Von Loebe, S., Wolf, J. and Bernoux, M. 2020. *Regional analysis of the nationally determined contributions in Asia – Gaps and opportunities in the agriculture and land use sectors*. Environment and Natural Resources Management Working Paper No. 78. Rome, FAO. <https://doi.org/10.4060/ca7264en>

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ISSN 2226-6062 [Print]  
ISSN 2664-6137 [Online]

ISBN 978-92-5-132032-7  
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# FOREWORD

The Paris Agreement is a landmark achievement signaling a truly international response to the drivers and risks of climate change. The (Intended) Nationally Determined Contributions (NDCs) put forward by developed and developing countries alike in support of the Agreement provide the beginnings of a pathway toward a low-emission and climate-resilient future. They represent a commitment to act at the national level to mitigate emissions and adapt to changes in climate, report on progress made, and identify support where it is needed. The cumulative effect of these contributions is still far short of what is required to achieve the ultimate goal of keeping the increase in average global temperatures to within 2°C. However, through the Agreement's unique ambition mechanism, the NDCs will be enhanced overtime to put the goal within reach. In this context, efforts to take stock of the NDCs and analyze their nature and magnitude are important and necessary.

It is with this in mind that FAO is developing a series of regional-level analyses of the NDCs to assess the current commitments and identify gaps and opportunities in the agriculture sectors<sup>1</sup> for enhancing mitigation and adaptation ambitions ahead of the next round of revisions of the NDCs in 2020. The regional analysis provided in this report reflects the dynamism and diversity existing within Asia. Asia is experiencing dramatic demographic changes, high population growth, urbanization and growing economic inequities. The food system in the region varies significantly between and within its many sub-regions in terms of climate, landscapes, ecosystems and farming systems. All of these factors provide the context for climate action at the national level and have shaped to some extent how agriculture is reflected in countries respective NDCs.

Agriculture is a defining component of Asian livelihood and culture. This is reflected in the prominence of place given to the sector in NDCs from the region. The NDCs highlight the risks that climate change and inaction will pose for agriculture. Already-observed changes in climate over the past three decades have impacted productivity in the sector and forced farmers, fishers, foresters and herders across Asia to adapt. Recent increases in extreme climate events associated with climate change have been identified as one factor that is slowing regional progress toward zero hunger. Projections of future climate change indicate that this situation will worsen unless action is taken now to adopt measures to strengthen farmers resilience. Many countries have also noted in their NDCs the role that agriculture plays, through activities such as enteric fermentation, rice cultivation and application of organic and synthetic fertilizers as well as deforestation and forest degradation, as a key source of emissions.

The NDCs from the region point to numerous technologies and approaches that could be employed to reduce the risks associated with the changing climate and reduce emissions sustainably. Gaps in knowledge and varied capacities of sector stakeholders at various levels is hindering their dissemination and adoption at a wide scale.

This report provides a unique, sector-specific synthesis of the NDCs from Asia. It summarizes the substantial contributions already put forward by countries, opportunities for further action and the gaps, barriers and needs that will need to be addressed if the agriculture sector in Asia is to raise mitigation and adaptation ambitions. The findings of this report will help member countries to reflect on their progress in advancing toward NDC priorities for agriculture and associated national climate goals including related targets under the Sustainable Development Goals (SDGs). The analysis also helps to make clear the links between the NDCs from the region and the ongoing work of the United Nations Framework Convention on Climate Change in support of the Koronivia Joint Work on Agriculture (KJWA).

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<sup>1</sup> The agriculture sectors refer to crops, livestock, forestry, and fisheries and aquaculture as defined by FAO.

Finally, the report serves as a guide to FAO, as well as other international actors, of the support that will be required to help countries in the region move forward to implement agriculture sector priorities in their NDCs and ensure that future commitments from the agriculture sector are quantifiable, verifiable and sufficiently ambitious.

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# ACKNOWLEDGEMENTS

This report is the result of a collaborative effort by the Climate and Environment Division (CBC) of FAO. Under the overall leadership of Martial Bernoux (CBC) and Julia Wolf (CBC), the methodology and report were prepared by Krystal Crumpler (CBC), Srijita Dasgupta (RAP), Sandro Federici (CBC), Mario Bloise (CBC), Valentyna Slivinska (CBC), Mirella Salvatore (CBC) and Beau Damen (RAP), with contributing author Alexandre Meybeck (CIFOR/FTA). The authors are especially grateful for the valuable inputs from Sophie VonLoeben (SP5), Olga Buto (CBC) and Selva Ramasamy (CBC). The authors are appreciative of the close collaboration with the Regional Office for Asia and the Pacific. Gratitude is especially owed to the individuals who participated in the internal and external review process.

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Stephan Baas (SP5), Alessandro Ferrara (CBC), Giulia Gagliardi (CBC), Rebeca Koloffon (TCE), Elizabeth Laval (CBC) Esther Mertens (FOA), Zitouni Ould-Dada (CBC) and Paolo Prospero (CBC).

## **Panel of external reviewers**

Fahmuddin Agus (Indonesia), Buddhi Marambe (Sri Lanka), Therese Guiao (Philippines), Mohammed Asaduzzaman (Bangladesh) and Dirk Nemitz (UNFCCC).

The graphic designer Claudia Tonini is acknowledged for her excellent work.



# ACRONYMS AND ABBREVIATIONS

<b>AFOLU</b>	Agriculture, Forestry and Other Land Use
<b>BAU</b>	Business-as-usual
<b>BUR</b>	Biennial Update Report
<b>COP</b>	Conference of the Parties
<b>CSA</b>	Climate-Smart Agriculture
<b>DRR/M</b>	Disaster Risk Reduction and Management
<b>FAO</b>	Food and Agriculture Organization of the United Nations
<b>GDP</b>	Gross Domestic Product
<b>GHG</b>	Greenhouse Gas
<b>INDC</b>	Intended Nationally Determined Contributions
<b>IPCC</b>	Intergovernmental Panel on Climate Change
<b>LLDC</b>	Land-Locked developing country
<b>LULUCF</b>	Land Use, Land Use Change and Forestry
<b>M&amp;E</b>	Monitoring and Evaluation
<b>MRV</b>	Measurement, reporting and verification
<b>NAMA</b>	Nationally Appropriate Mitigation Action
<b>NAP</b>	National Adaptation Plan
<b>NC</b>	National Communication
<b>NDC</b>	Nationally Determined Contributions
<b>NGHGI</b>	National Greenhouse Gas Inventory
<b>NIR</b>	National Inventory Report
<b>NWFP</b>	Non-Wood Forest Product
<b>OECD</b>	Organisation for Economic Co-operation and Development
<b>SDG</b>	Sustainable Development Goal
<b>UN</b>	United Nations

<b>UNFCCC</b>	United Nations Framework Convention on Climate Change
<b>USD</b>	United States Dollar
<b>2030 Agenda</b>	2030 Agenda for Sustainable Development

# CHEMICAL FORMULAE

<b>CH<sub>4</sub></b>	Methane
<b>CO<sub>2</sub></b>	Carbon Dioxide
<b>Mt CO<sub>2</sub> eq</b>	Million tons of Carbon dioxide equivalent
<b>N<sub>2</sub>O</b>	Nitrous Oxide

# INTRODUCTION

## BACKGROUND

**The Paris Agreement constitutes a landmark achievement in the international response to climate change, as developed and developing countries alike committed to do their part in the transition to a low-emission and climate-resilient future.** The Agreement seeks to limit global warming to below a 2°C rise above pre-industrial levels and pursue efforts to stay within 1.5°C, as well as sets a global goal on adaptation within the context of sustainable development. Underpinning the Agreement are the (Intended) Nationally Determined Contributions, (I)NDCs,<sup>2</sup> representing the main national policy framework, under the United Nations Framework Convention on Climate Change (UNFCCC), by which Parties communicate their commitment to reducing national greenhouse gas emissions (GHG) and adapting to the impacts of climate change, based on national priorities, circumstances and capabilities, and support needs.

**The success of the Paris Agreement rests upon the enhanced ambition of Parties to progressively revise and strengthen their respective mitigation and adaptation plans over time.**<sup>3</sup> At the twenty-second Conference of Parties (COP) of UNFCCC, a facilitative dialogue<sup>4</sup> was convened to assess collective efforts made towards achieving the long-term goal of the Agreement, with the view of enhancing pre-2020 ambitions and the provision of means of implementation. In 2023, and every five years thereafter, Parties shall periodically take stock of the implementation of the Agreement to assess the collective progress towards achieving its purpose and long-term goals.<sup>5</sup> The outcome of the global stocktake shall inform Parties in updating and enhancing, in a nationally determined manner, their actions and support in accordance with the relevant provisions of this Agreement, as well as in enhancing international cooperation for climate action.

**The tracking of NDC implementation will take place under the Enhanced Transparency Framework,<sup>6</sup> which provides a foundation for building mutual trust and confidence.** The “Paris Rulebook” requires Parties to report reliable, transparent and comprehensive information on GHG emissions, climate actions and support, with built-in flexibility for developing countries under the principle of common but differentiated responsibilities and respective capabilities.<sup>7</sup>

**Linked to the Paris Agreement and NDCs are the 17 Sustainable Development Goals (SDGs) of the 2030 Agenda,** which sets out a vision for a hunger-free, more equitable, sustainable, peaceful and resilient world in 2030. Closing the emissions gap while safeguarding food security and pulling millions out of extreme poverty can only be achieved in a context of sustainable development, and sustainable development can only be achieved if coupled with a low-emissions and climate-resilient future.

**The agriculture and land use sectors<sup>8</sup> feature prominently in the NDCs,** with up to 86 and 97 percent of developing countries prioritizing mitigation and adaptation, respectively, in the sectors (FAO, forthcoming a). As such, FAO has a critical role to play in supporting Member Countries to leverage the mitigation and adaptation potential in the agriculture and land use sectors and harness their synergies, while “leaving no one behind.”

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<sup>2</sup> For the purpose of this document, the (I)NDCs and NDCs are collectively referred to as NDCs.

<sup>3</sup> Article 4.2 of the Paris Agreement.

<sup>4</sup> Talanoa dialogue decision 1/CP.22, paragraph 16 (COP22, Fiji).

<sup>5</sup> Article 14 of the Paris Agreement.

<sup>6</sup> Article 13 of the Paris Agreement.

<sup>7</sup> Modalities, procedures and guidelines for the transparency framework for action and support referred to in Article 13 of the Paris Agreement (FCCC/CP/2018/L.23).

<sup>8</sup> For the purpose of this document, the ‘agriculture and land use sectors’ comprise crops, livestock, fisheries and aquaculture, and forestry.

# OBJECTIVE

FAO recognizes that its goals to eliminate hunger, food insecurity and malnutrition, reduce rural poverty, and make agriculture, forestry and fisheries more productive and sustainable cannot be fulfilled without decisive action on climate change (FAO, 2013). Building on its longstanding leadership as a provider of technical knowledge and expertise on sustainable food and agriculture, FAO is committed to supporting member countries prepare for and respond to the adverse impacts of climate change. FAO's Climate Change Strategy outlines its commitment to enhancing countries' institutional and technical capacity to plan and implement NDCs; to improving the integration of food security, agriculture, forestry and fisheries within the international climate agenda; and to strengthening the coordination and delivery of FAO's work (FAO, 2017a).

**The NDCs present a natural framework for FAO's work on climate change**, as they already define, at the highest political level, targets and strategies for responding to the consequences and addressing the causes of climate change. At COP 22, FAO launched an extensive global analysis of the NDCs, evidencing the significant role of the agriculture and Land Use, Land Use Change and Forestry (LULUCF) sectors<sup>9</sup> in the NDCs (FAO, 2016a). In 2016, FAO assessed the main challenges countries face when moving from NDC planning to implementation and identified five priority areas for international support in the agriculture and land use sectors (FAO, 2016b). From 2017, FAO has launched a series of regional-level analyses aiming to provide a more in-depth review of national climate priorities, capacities and constraints in the agriculture and land use sectors, including Eastern Africa (FAO, 2017b); Central Asia and Eastern and Southern Europe (FAO, 2018a); Latin America (FAO, 2020a); Caribbean (FAO, 2020b); and the Pacific (FAO, forthcoming b).

**The main objective of this report is to provide a synthesis of the climate change mitigation and adaptation priorities in the agriculture and land use sectors set forth in the NDCs of countries in Asia and to identify opportunities** for governments to strengthen their sectoral mitigation and adaptation ambitions, capture synergies and accelerate progress on the sustainable development agenda. Furthermore, a better understanding of national climate priorities, challenges and needs in the agriculture and land use sectors can facilitate access to climate finance and inform country programming and support options in the region. This analysis is directed at national policy makers and practitioners in the region with a stake in ensuring that future mitigation and adaptation policies are clear, quantifiable, comparable, transparent and ambitious. It also aims to guide FAO, and other international development organizations, committed to providing the country support required for scaling up climate action in the agriculture and land use sectors and co-delivering on the 2030 Agenda for Sustainable Development and Sendai Framework for Disaster Risk Reduction.

**The NDCs are the product of diverse national approaches and processes.** They vary greatly in terms of format, scale and detail, resulting from differing perspectives, degrees of technical and institutional capacity, biophysical and economic opportunity and political will. For instance, not all countries integrate an adaptation component into their NDC. As a result, any comparison amongst these documents has to be taken with caution. To facilitate the synthesis and analysis of the NDCs in the agriculture and land use sectors, in light of these methodological challenges, FAO developed a common framework and methodology.

<sup>9</sup> For the purposes of this document, the Agriculture and LULUCF sectors, as defined by Intergovernmental Panel on Climate Change (IPCC), are also collectively referred to as the "agriculture and land use sectors."

**The report is organized in six chapters:**

**Chapter 1** describes the geographical scope, data sources and methodological approach underlying the analysis.

**Chapter 2** provides an overview of the regional and sub-regional trends driving emission trajectories, climate vulnerabilities, adaptive capacities and food security and nutrition outcomes in the region.

**Chapter 3** presents a common framework for the synthesis and analysis of the NDCs in the agriculture and land use sectors. It reflects the heterogeneous nature of country commitments and illustrates regional trends. It analyzes the scope, specificity, measurability and timeline of the mitigation and adaptation contributions in the agriculture and land use sectors. The data informs the gap and opportunity analysis in **Chapter 4**.

**Chapter 4** describes the results of the gap and opportunity analysis of the mitigation and adaptation contributions in the agriculture and land use sectors to support the NDC revision process and ambition-building mechanism of the Paris Agreement.

**Chapter 5** assesses the opportunities for capturing adaptation and mitigation co-benefits, as well as leveraging synergies between climate actions in the agriculture and land use sectors and the 2030 Agenda for Sustainable Development and Sendai Framework for Disaster Risk Reduction. It also highlights the links between the NDCs and the Koronivia Joint Work on Agriculture.<sup>10</sup>

**Chapter 6** presents the key messages and policy recommendations.

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<sup>10</sup> Decision 4/CP.23 requests the Subsidiary Body for Scientific and Technological Advice and Subsidiary Body for Implementation to jointly address issues related to agriculture.



# CHAPTER 1





# METHODOLOGY

## 1.1 GEOGRAPHIC SCOPE

For this analysis, Asia comprises 25 countries spanning three geographic areas: Eastern Asia (mainland China, Democratic People's Republic of Korea, Japan, Mongolia and Republic of Korea), South-eastern Asia (Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic (PDR), Malaysia, Myanmar, Philippines, Singapore, Thailand, Timor-Leste and Viet Nam); and Southern Asia (Afghanistan, Bangladesh, Bhutan, India, Iran (Islamic Republic of), Maldives, Nepal, Pakistan and Sri Lanka) (UNSD, n.d.). In order to account for similarities and differences across landscapes, climates and political economies, the analysis is disaggregated by sub-region. Of the 25 countries, three (Singapore, Timor-Leste and Maldives) are Small Island Developing State (SIDS) and five (Mongolia, Lao PDR, Afghanistan, Bhutan and Nepal) are Land-Locked Developing Countries (LLDC). The assignment of countries or areas to specific groupings is for statistical convenience and does not imply any assumption regarding political or other affiliation of countries or territories by the UN.

For the purpose of the analysis all member countries to the Convention on the Organisation for Economic Co-operation and Development (OECD) considered developed economies (Japan and Republic of Korea) for this analysis, while all others are considered developing economies.

## 1.2 DATA

This analysis is based on the information reported in the latest NDCs, National Communications (NCs), Biennial Update Reports (BURs) and Technical Needs Assessments (TNAs) of 25 Parties to the UNFCCC as of 1 July 2019, of which 24 are non-Annex I and one is Annex I (Japan). **Annex 1** contains a list of the document assessed.

## 1.3 COMMON FRAMEWORK

A common framework was developed to facilitate the synthesis and analysis of the NDCs in the agriculture and land use sectors. The framework provides a structure for assessing the clarity, measurability, transparency and ambition of NDCs over time. Each NDC is analyzed within the bounds of this common framework. The common framework was based on a stocktaking of the NDCs to quantify and qualify the types of climate change mitigation and adaptation contributions in the agriculture and land use sectors by means of a common set of categories and sub-categories. The full methodological notes are contained in FAO, 2019c.

# CHAPTER 2



# REGIONAL CIRCUMSTANCES

Understanding the environmental, economic and socio-economic variables driving GHG emissions and climate-related vulnerabilities in the region is critical for identifying context-specific adaptation and mitigation options that simultaneously support – rather than limit – food security and nutrition and sustainable development objectives. Indeed, most countries refer to their specific national circumstances when outlining why their NDCs are fair and ambitious. This section provides an overview of the regional trends driving and conditioning emission trajectories, climate vulnerabilities, adaptive capacities and food security and nutrition outcomes in the region.

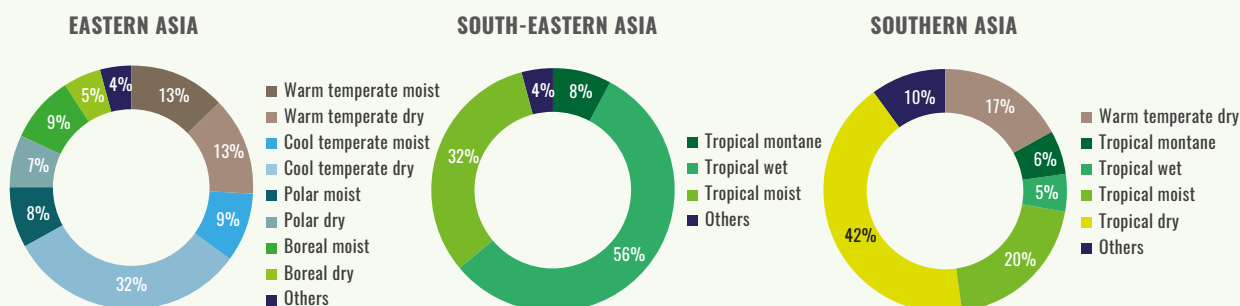
## 2.1 CLIMATE AND NATURAL RESOURCES

Owing to the diversity across the region in terms of not only socioeconomic and demographic conditions, but also climate, topography and natural resource endowments, the analysis differentiates between three sub-regions, namely Eastern Asia, South-eastern Asia and Southern Asia.

**Climate zones in Asia are an almost equal mix of tropical and temperate areas together with the small area share among polar and boreal climate zones.** Tropical zones are differentiated by moist (15 percent of total land area), wet (13 percent) and dry areas (12 percent), while temperate zones are primarily cool and dry (17 percent), warm moist and warm dry (12 percent respectively). In Eastern Asia, the major climate zone is cool temperate dry climate (32 percent), with small shares of warm temperate moist and dry areas. In South-eastern Asia, the major climate zones are tropical wet and moist (56 and 32 percent, respectively). In Southern Asia, climate zones are more varied, including tropical dry (42 percent), tropical moist (20 percent) and warm temperate dry (17 percent) (JRC, 2010). **Figure 1** illustrates the major climate zones, per sub-region, by share of total area.

FIGURE 1.

## MAJOR CLIMATE ZONES IN ASIA (SHARE OF TOTAL AREA IN SUB-REGION BY TYPE)



Source: JRC, 2010.

**Average annual temperatures have remained relatively stable across all sub-regions over the past two decades although there are significant variations across sub-regions and countries.** Between 1991 and 2015, the average annual mean temperature ranged between 6.5°C to 8°C in Eastern Asia, 19.5°C to 20.9°C in Southern Asia and 25.4°C to 26.0°C in South-eastern Asia (WB, n.d.).

**Annual precipitation varies substantially across sub-regions**, with Eastern Asia receiving just under a long-term average of 1 000 mm in depth each year and South-eastern Asia receiving more than double that. In Eastern Asia, the lowest amount of annual precipitation recorded is in Mongolia (241 mm) and the highest in Japan (1 668 mm). In South-eastern Asia, Malaysia receives the highest amount of precipitation annually (2 875 mm) and Timor-Leste the lowest (1 500 mm). In Southern Asia, the highest annual precipitation recorded is in Bangladesh (2 666 mm) and the lowest in Afghanistan (327 mm) (FAOa, n.d.).<sup>11</sup>

**Total land area amounts to approximately 2 225 million ha, or 18 percent of global land area.** Land cover is almost equally distributed across grassland (27 percent of total land area), forest land (25 percent), cropland (22 percent) and other land uses<sup>12</sup> (26 percent). Variations exist across land cover in each sub-region. For instance, in Eastern Asia, grasslands are more prominent (44 percent), while in South-eastern Asia forest land is most prominent (49 percent), as is cropland in Southern Asia (37 percent) (FAOb, n.d.).<sup>13</sup> In Eastern Asia, per capita share of arable land averages 0.09 ha, in South-eastern Asia 0.12 ha, and in Southern Asia from 0.11 ha (WB, n.d.).<sup>14</sup> **Figure 2** illustrates the distribution of land cover, per sub-region, by share of total land area.

**Around 45 percent of total land area in the region is considered suitable for agriculture**, or associated with no or slight soil constraints, as measured by soil depth and quality. On the other hand, around 50 percent of land is either moderately or severely constrained (27 and 21 percent of total land area, respectively), marked by poor natural fertility. Among the three sub-regions, Southern Asia is endowed with the largest share of soils with no or slight constraints (61 percent), as one of the richest areas for crop production in the world. Almost half of the soils in Eastern Asia can be categorized as having high natural fertility with no or slight constraints (48 percent). In contrast, a considerable portion of soils in South-eastern Asia can be characterized as under severe constraints (42 percent), or lacking nutrients (FAOc, n.d.).<sup>15</sup> **Figure 3** demonstrates the types of soil constraints, per sub-region, by share.

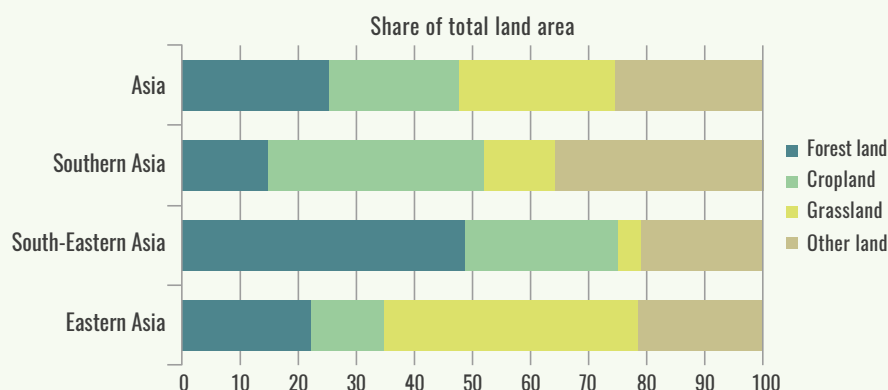
<sup>11</sup> Data refers to year 2014 (FAOa, n.d.).

<sup>12</sup> Other land use refers to wetlands, settlements and remaining land types.

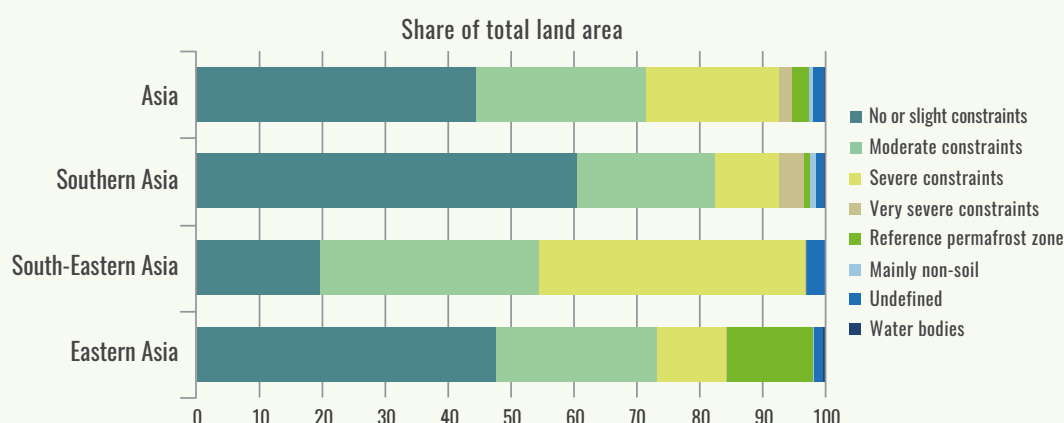
<sup>13</sup> Data refers to year 2015 (FAOb, n.d.).

<sup>14</sup> Data refers to year 2016 (WB, n.d.).

<sup>15</sup> Metadata sourced from FAO/IIASA/ISRIC/ISS-CAS/JRC, 2009. *Harmonized World Soil Database*.

**FIGURE 2.****LAND COVER IN ASIA (SHARE OF TOTAL AREA IN REGION/SUB-REGION BY TYPE)**

Source: FAOb, n.d.

**FIGURE 3.****SOIL CONSTRAINTS IN ASIA (SHARE OF TOTAL AREA IN REGION/SUB-REGION BY TYPE OF CONSTRAINT)**

Source: FAOb, n.d.

**Freshwater resources are abundant at the national and annual scale, as the region receives over 20 percent of global precipitation each year.** However, the figures hide considerable variability across countries in the region and acute water stress in different locations at different times of the year. It is expected that an acute water scarcity scenario is very likely in the near future, driven by economic growth and fast population growth combined with a changing climate (Satoh, 2017). Average total renewable water resources per capita in South-eastern Asia (16 000 m<sup>3</sup> per year) and in Southern Asia (14 000 m<sup>3</sup>) is almost four times that of Eastern Asia (4 000 m<sup>3</sup>).<sup>16</sup> Bhutan, Lao PDR and Cambodia are endowed with the largest share of renewable water resources per capita in the region, while India, Maldives, Pakistan, Republic of Korea and Singapore are exposed to water stress, with total annual resources just below the 1,700 m<sup>3</sup> per capita threshold (FAOa, n.d.).<sup>17</sup>

**Average water withdrawal for agriculture represents less than a 10 percent share of total annual renewable resources in Eastern and South-eastern Asia,** but one-fourth of total withdrawals in Southern Asia, reaching 70 percent of total withdrawals in Pakistan and 63 percent in Iran (FAOa, n.d.).<sup>18</sup> Agriculture is the most vulnerable to any water scarcity but it also remains the sector that holds the most potential to adapt to changes in water availability and use (FAO, 2012).

<sup>16</sup> The global average in 2015 was 6 236 m<sup>3</sup> per year (FAOa, n.d.).

<sup>17</sup> Data refers to year 2015 (FAOa, n.d.).

<sup>18</sup> Data refers to year 2015 (FAOa, n.d.).



## 2.2 FARMING SYSTEMS

The diversity of climate zones, landscapes and available natural resources along with the high population growth and heterogeneity in socio-economic and political conditions of countries have contributed to creating largely diverse agro-ecological zones and thereby, farming systems in the region. Based on agro-ecological geo-spatial information combined with socio-economic data, 15 major farming systems were identified in the region (FAO and WB, 2001).

In Eastern Asia, sparse (arid) and pastoral systems occupy 31 percent and 30 percent, respectively, of total land area, while upland intensive mixed systems cover one-fifth of total area and 28 percent of the total population. There are also small shares of lowland rice and temperate mixed farming systems (10 and 9 percent of total area, respectively). The largest number of cattle is found in the highland extensive mixed farming system (35 percent of total cattle stock). **Table 1** outlines the share of area and population by farming system in Eastern Asia, as well as the principal livelihood activities in each.

**TABLE 1.**

### MAJOR FARMING SYSTEMS IN EASTERN ASIA

FARMING SYSTEM	TOTAL AREA (%)	POPULATION (%)	PRINCIPAL PRODUCTIONS
PASTORAL	27%	4%	LIVESTOCK WITH, IRRIGATED CROPS
SPARSE (ARID)	27%	2%	LOCAL GRAZING WHERE WATER AVAILABLE, OFF-FARM WORK
UPLAND INTENSIVE MIXED	18%	25%	RICE, PULSES, MAIZE, SUGARCANE, OIL SEEDS, FRUITS, VEGETABLES, LIVESTOCK, OFF-FARM WORK
LOWLAND RICE	9%	39%	RICE, MAIZE, PULSES, SUGARCANE, OIL SEEDS, VEGETABLES, LIVESTOCK, AQUACULTURE, OFF-FARM WORK
TEMPERATE MIXED	8%	19%	WHEAT, MAIZE, PULSES, OIL CROPS, LIVESTOCK, OFF-FARM WORK

Source: FAO and WB, 2001; Oak Ridge National Laboratory, 2010; and FAO, 2014.

South Eastern Asia has a well-balanced share of farming systems in terms of area. The largest share is of upland intensive mixed type (about 26%). This is followed by 25% of lowland rice system, 24% of sparse forested area and lastly, 22% of tree crop mixed system. However, 54% of the cattle population and 61% of the total population are found in the lowland rice areas.

**TABLE 2.**

### MAJOR FARMING SYSTEMS IN SOUTH-EASTERN ASIA

FARMING SYSTEM	TOTAL AREA (%)	POPULATION (%)	PRINCIPAL PRODUCTIONS
UPLAND INTENSIVE MIXED	26%	24%	RICE, PULSES, MAIZE, SUGARCANE, OIL SEEDS, FRUITS, VEGETABLES, LIVESTOCK, OFF-FARM WORK
LOWLAND RICE	23%	59%	RICE, MAIZE, PULSES, SUGARCANE, OIL SEEDS, VEGETABLES, LIVESTOCK, AQUACULTURE, OFF-FARM WORK
SPARSE FOREST	21%	2%	HUNTING, GATHERING, OFF-FARM WORK
TREE CROP-MIXED	20%	13%	RUBBER, OIL PALM, COCONUTS, COFFEE, TEA, COCOA, SPICES, RICE, LIVESTOCK, OFF-FARM WORK
HIGHLAND EXTENSIVE MIXED	9%	2%	UPLAND RICE, PULSES, MAIZE, OIL SEEDS, FRUITS, FOREST PRODUCTS, LIVESTOCK, OFF-FARM WORK

Source: FAO and WB, 2001; Oak Ridge National Laboratory, 2010; and FAO, 2014.

In Southern Asia, the dominant farming system is rain-fed mixed, which occupies around one-third of the total area and home to around 30 percent of the population, as well as the majority of cattle in the sub-region (37 percent of total cattle stock). Rice wheat systems also occupy a large share of land (19 percent of land area) and hold one-third of the population. Highland mixed, sparse arid and pastoral systems occupy most of the remaining areas. **Table 3** outlines the share of area and population by farming system in Southern Asia, as well as the principal livelihood activities in each.

**TABLE 3.****MAJOR FARMING SYSTEMS IN SOUTHERN ASIA**

FARMING SYSTEM	TOTAL AREA (%)	POPULATION (%)	PRINCIPAL LIVELIHOOD
RAINFED MIXED	29%	30%	CEREALS, LEGUMES, FODDER CROPS, LIVESTOCK, OFF-FARM ACTIVITIES
RICE WHEAT	19%	33%	RICE, WHEAT, VEGETABLES, LIVESTOCK INCLUDING DAIRY, OFF-FARM ACTIVITIES
HIGHLAND MIXED	13%	7%	CEREALS, LIVESTOCK, HORTICULTURE, SEASONAL MIGRATION
PASTORAL	11%	3%	LIVESTOCK, IRRIGATED CROPPING, MIGRATION
SPARSE (ARID)	11%	1%	LIVESTOCK WHERE SEASONAL MOISTURE PERMITS
RICE	7%	17%	RICE (BOTH SEASONS), VEGETABLES, LEGUMES, OFF-FARM ACTIVITIES
SPARSE (MOUNTAIN)	7%	0.4%	SUMMER GRAZING OF LIVESTOCK
COASTAL ARTISANAL FISHING	1%	2%	FISHING, COCONUTS, RICE, LEGUMES, LIVESTOCK

Source: FAO and WB, 2001; Oak Ridge National Laboratory, 2010; and FAO, 2014.

## 2.3 POPULATION AND RURAL ECONOMY

The total population in Asia equates to approximately 4.5 billion, accounting for roughly 60 percent of the world population and is projected to increase – but at a slower rate than before. In Eastern Asia, the current population of about 1.6 billion is projected to decrease to 1.3 billion in 2050 and even further to 1.1 billion in 2100. In contrast, population in Southern Asia is expected to grow from 1.9 billion in 2015 to 2.3 billion in 2050, and then decrease to 2.2 billion by 2100. In South-eastern Asia, the current population of around 655 million is expected to rise to 797 million before falling down to 771 million in 2100. At country level, negative growth rates are reported in Japan (–0.1 percent growth per year), while Mongolia experiences the highest growth rate in Eastern Asia (1.9 percent). In South-eastern Asia, the slowest growth rate is observed in Thailand (0.4 percent), and the highest in Timor-Leste (2.2 percent). Conversely, the slowest growth amongst sub-regions overall is observed in Southern Asia, with Sri Lanka experiencing the slowest (0.5 percent) and Afghanistan the highest population growth rates (3.2 percent) (UN DESA, 2017).

Just over half of the total population in Asia now lives in urban areas and the rate of urbanization is accelerating with three out of 100 people moving to cities each year. Rapid urbanization is taking place in South-eastern Asia and Southern Asia, where the average rate is about 2.9 percent and 2.5 percent per year respectively. The average annual rate of urbanization in Eastern Asia is lower at 0.8 percent. Urbanization rates are positive in all countries across the region (UN DESA, 2018).

**Asia is a key engine of global economic growth accounting for sixty percent of growth in economic output worldwide, with India and China being the largest contributors.** (IMF, 2018).<sup>19</sup> Average annual GDP growth is highest in Southern Asia (6 percent) and the lowest in Eastern Asia (2.9). There is considerable variation across countries and within regions. In Iran, for example, GDP growth is 13.4 percent while negative growth is observed in Brunei Darussalam (-2.5). Average GDP per capita ranges from less than 2 000 USD in Afghanistan to over 80 000 USD in Singapore (WB, n.d.).<sup>20</sup>

**While agriculture still plays a significant role in several Asian economies, particularly in Southern Asia, its relative contribution to total GDP is declining with economic development.** At the regional level, agriculture accounts for 14 percent of GDP. At the sub-regional level, the contribution of the sector to GDP is greatest in Southern Asia (17 percent of total GDP), followed by South-eastern Asia (14 percent) and Eastern Asia (6 percent) (WB, n.d.).<sup>21</sup>

**Agriculture represents a source of income and livelihood for 34 percent of the employed population in region,** ranging from 25 percent in Eastern Asia, to 32 percent in South-eastern and 42 percent in Southern Asia. The gender-ratio in the agriculture sector varies amongst sub-regions, with an average 125, 162 and 273 male to every 100 females in Eastern Asia, South-eastern Asia and Southern Asia, respectively (ILO, n.d.).<sup>22</sup>

**Despite its declining share of GDP, the agriculture sector continues to grow through the adoption of technology and improved practices.** Crop production and yields have continued to grow due to a number of factors including the adoption of new technologies such as new seed varieties and mechanization as well as increased use of inputs such as fertilizer, pesticides and irrigation (FAO, 2018b). Output and output growth in crop production was fastest in Eastern Asia, followed closely by South-eastern and then Southern Asia. Rice remains the most important staple crop for most people in the region, although wheat is the staple in certain areas (FAO, 2018c). In the livestock sector, the wider availability of crop-derived feedstock and improved technologies for livestock management contributed to increased productivity and output across all sub-regions with the largest growth taking place in Eastern Asia. Growth in the output of capture and aquaculture fisheries has also increased substantially across all sub-regions with Eastern Asia having the largest share of both fisheries output and output growth. The increase in output in both sectors has come in response to increased demand for animal products across all regions (FAOb, n.d.).

**Non-wood forest products (NWFP) are also an important source of informal income for rural dwellers.** Republic of Korea is one of the countries where livelihoods are benefiting from NWFP. China and India are also on the top ten list of countries with livelihoods benefiting from NWFPs (FAO, 2015a).

## 2.4 FOOD SECURITY AND NUTRITION

**Asia has made tremendous progress over the last few decades in reducing hunger but 486 million people in the region still remain undernourished** and progress in reducing this number further is stalling. South-eastern Asia experienced the most progress, where the share of the population considered undernourished fell from 22 to 10 percent between 1991 and 2017. Currently, however, there is a slowdown in the rate of change. Around 15 percent of the population in Southern and Eastern Asia is still undernourished, as are 12 percent in South-eastern Asia.<sup>23</sup> The average supply of protein from animals is lowest in Southern Asia (21 percent of total protein), with higher shares in South-eastern (24 percent) and Eastern Asia (37 percent) (FAOb, n.d.).<sup>24</sup> Worryingly, the prevalence and number of severely food insecure people when

<sup>19</sup> IMF (2018). Regional Economic Outlook, Asia Pacific, Good Times, Uncertain Times: A time to Prepare.

<sup>20</sup> Data refers to year 2017 (WB, n.d.).

<sup>21</sup> Data refers to year 2015 (WB, n.d.).

<sup>22</sup> Data refers to year 2015 (ILO, n.d.).

<sup>23</sup> Data refers to year 2017 (FAOb, n.d.).

<sup>24</sup> Data refers to 2011–2013 period (FAOb, n.d.).

measured by direct responses to the Food Insecurity Experience Scale (FIES) is on the rise.<sup>25</sup> Currently, the share of total population with severe food insecurity is greatest in Southern Asia (11.9 percent), followed by South-eastern Asia (7.6 percent), while Eastern Asia experiences the lowest share (1.3 percent). Out of all countries in the region, Afghanistan experiences the most severe of food insecurity situations in the region on average, with one in six people going with only one or no meal a day, annually (FAOb, n.d.).

**Around one-third of children under five years of age in South-eastern and Southern Asia are stunted** (30 and 34 percent, respectively), and around 10 percent are wasted (9 and 14 percent, respectively). In Eastern Asia the number of children stunted and wasted is lower at around nine percent and 2 percent respectively (FAOb, n.d.).<sup>26</sup> Low energy-content diets in the first two years of life, poor nutrition of pregnant women and new mothers and the lack of proper sanitation in households have been associated with high levels of stunting in Southern Asia (UNICEF, 2018). The prevalence of stunting tends to be higher in countries with low GDP and in rural areas generally, although it is still high in many urban areas around the region.

**While obesity rates in Asia are the lowest on average worldwide, at well below 10 percent in all countries, they are rising rapidly.** Dietary related non-communicable diseases including diabetes and heart disease are now the leading risk factors for mortality and burden of disease in the region (FAO, 2018c). The prevalence of overweight children in the region is highest in South-eastern Asia at 5 percent and the lowest in Southern Asia at 2 percent (FAOb, n.d.).<sup>27</sup>

**The threat of increased variability in temperature, precipitation and increased frequencies and intensities of natural disasters, means that food and nutritional security is likely to be severely impacted.** Mounting evidences show that climate variability and exposure to more frequent and intense climate extremes threaten to erode and reverse the progress made towards ending hunger and all forms of malnutrition. The direct and indirect impacts of climate change are channeled through varying combinations of biophysical, economic and socio-economic feedback channels, affecting the basic and underlying factors that drive food security and nutritional status. Climate variability and extremes will have the strongest direct impact on food availability but cascading impacts will also reduce rural income levels and the ability of households to access food; exacerbate price volatility and influence food markets; and jeopardize the nutritional quality and safety of food produced and consumed, ultimately impacting all dimensions of food security<sup>28</sup> (FAO 2016c). Climate variability and extremes could have particular impacts on food security and nutrition outcomes (affecting food availability and access and overall the nutrition uptake) in import dependent Eastern and Southern Asian countries, that are net importers of cereal, such as the Maldives (100 percent cereal import dependency ratio).<sup>29</sup> The extent to which climate variability and extremes negatively affect people's food security and nutrition situation depends on their degree of exposure to climate shocks and vulnerability and resilience to these shocks (FAO, 2018b).

## 2.5 GREENHOUSE GAS EMISSIONS PROFILE

The National Greenhouse Gas Inventory (NGHGI) data from the last available year was collected from national reports submitted to the UNFCCC between 1994 and 2016.<sup>30</sup>

<sup>25</sup> Data refers to year 2017 (FAOb, n.d.).

<sup>26</sup> Data refers to year 2017 (FAOb, n.d.).

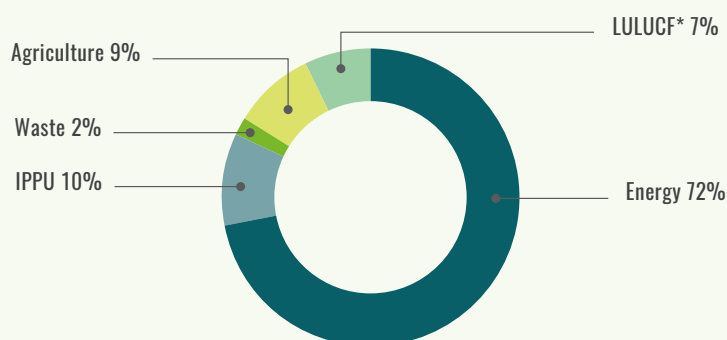
<sup>27</sup> Data refers to year 2016 (FAOb, n.d.).

<sup>28</sup> Food security dimensions include food availability, access, utilization and stability.

<sup>29</sup> Afghanistan, Bangladesh, Brunei Darussalam, China, Democratic People's Republic of Korea, Indonesia, Iran, Japan, Malaysia, Maldives, Mongolia, Nepal, Philippines, Republic of Korea, Sri Lanka and Timor-Leste were net cereal importers in 2011-2013 (FAOb, n.d.).

<sup>30</sup> Data for Japan sourced from NGHGI. Data for Afghanistan, Bangladesh, Bhutan, Brunei Darussalam, Cambodia, Democratic People's Republic of Korea, Indonesia, Iran (Islamic Republic of), Lao PDR, Malaysia, Maldives, Mongolia, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Singapore, Thailand, Timor-Leste and Viet Nam sourced from NCs. Data for China, India and Republic of Korea sourced from BURs.

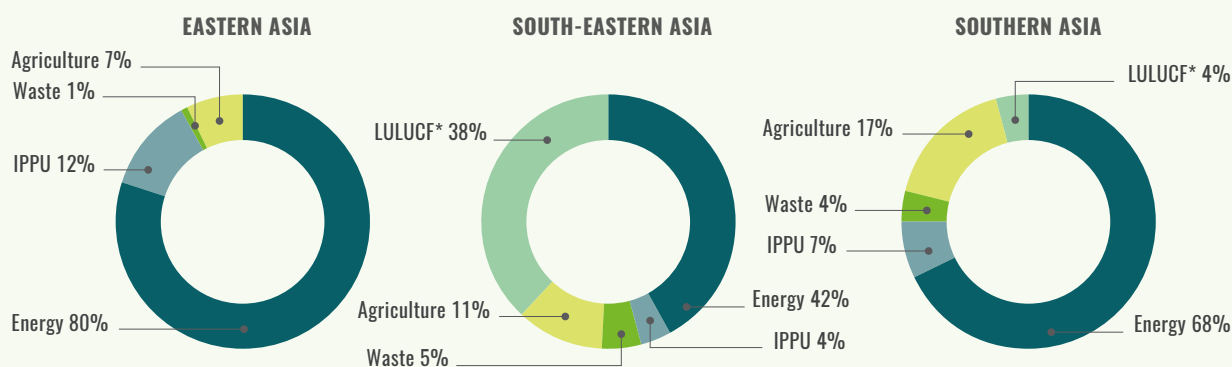
The Agriculture, Forestry and Other Land Use (AFOLU) sector<sup>31</sup> represents the second largest share of emissions in the region (16 percent), after the Energy sector (72 percent), followed by the Industrial Processes and Product Use (IPPU) (10 percent) and Waste (2 percent) sectors. Agriculture emissions alone constitute nine percent of total emissions in the region (1.95 billion tons of carbon dioxide equivalent, Gt CO<sub>2</sub> eq), while those from Land Use, Land Use Change and Forestry (LULUCF) constitute seven percent (1.4 Gt CO<sub>2</sub> eq). If removals are considered, the AFOLU sector represents eight percent of total net emissions and removals in the region (1.42 Gt CO<sub>2</sub> eq). **Figure 4** illustrates the share of economy-wide emissions in the region by sector.

**FIGURE 4.****ECONOMY-WIDE EMISSIONS IN ASIA (SHARE OF TOTAL EMISSIONS BY SECTOR)**

\* Excluding removals.

Source: NGHGI submitted to UNFCCC.

At the sub-regional level, agriculture is a moderate source of emissions in Eastern Asia (7 percent of total emissions), Southern Asia (17 percent) and South-eastern Asia (11 percent). The LULUCF sector represents a relatively low source of emissions in Southern Asia (4 percent) and high source in South-eastern Asia (38 percent), while for Eastern Asia the sector represents a minor source of emissions (0.3 percent). **Figure 5** illustrates the share of economy-wide emissions by sector for each sub-region.

**FIGURE 5.****ECONOMY-WIDE EMISSIONS IN ASIA (SHARE OF TOTAL EMISSIONS IN SUB-REGION BY SECTOR)**

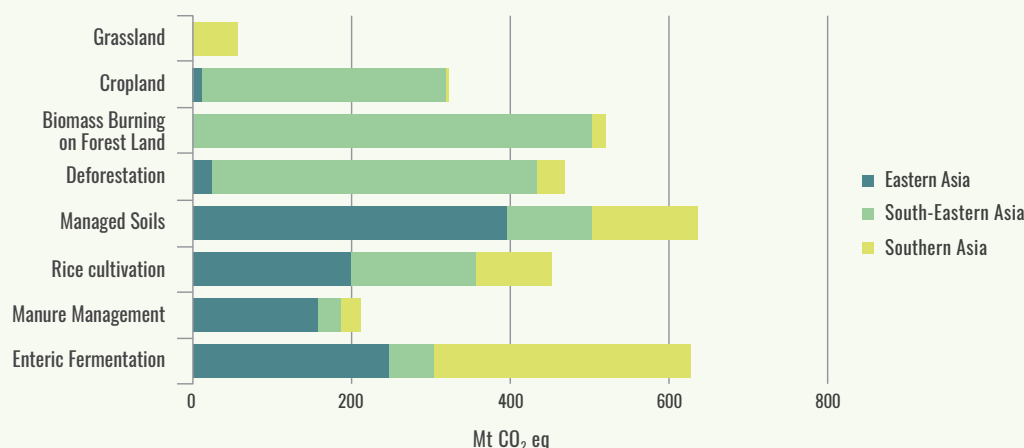
\* Excluding removals.

Note: sectors with a share less than 1% of the total sum are excluded from the figure.

Source: NGHGI submitted to UNFCCC.

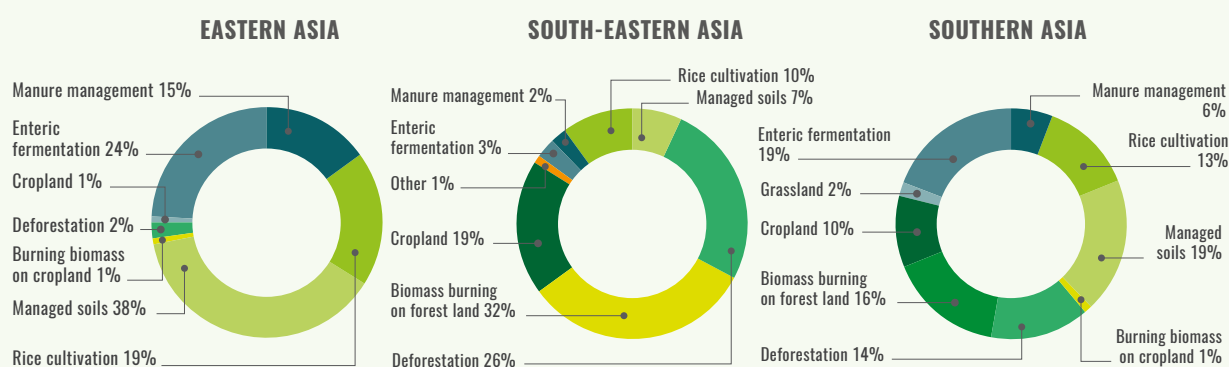
<sup>31</sup> The AFOLU sector refers to the Agriculture and LULUCF sector as defined by IPCC (2006).

Within the AFOLU sector,<sup>32</sup> the most significant GHG sources are enteric fermentation and managed soils<sup>33</sup> (19 percent of AFOLU emissions, respectively), biomass burning on forest land<sup>34</sup> (16 percent) and deforestation<sup>35</sup> (14 percent). **Figure 6** illustrates the emissions in the AFOLU sector by major category and sub-region.

**FIGURE 6.****AFOLU SECTOR EMISSIONS IN ASIA (TOTAL EMISSIONS IN REGION/SUB-REGION BY MAJOR CATEGORY)**

Source: NGHGI submitted to UNFCCC.

At the sub-regional level, the major source of emissions varies between managed soils in Eastern Asia (38 percent of AFOLU emissions), biomass burning on forest land in South-eastern Asia (32 percent) and enteric fermentation in Southern Asia (47 percent). **Figure 7** illustrates the share of emissions in the AFOLU sector per major category.

**FIGURE 7.****AFOLU SECTOR EMISSIONS IN ASIA (SHARE OF TOTAL EMISSIONS IN SUB-REGION BY MAJOR CATEGORY)**

\* The emission categories and sub-categories with a share less than 1% of the total sum are excluded from the figure.

Source: NGHGI submitted to UNFCCC.

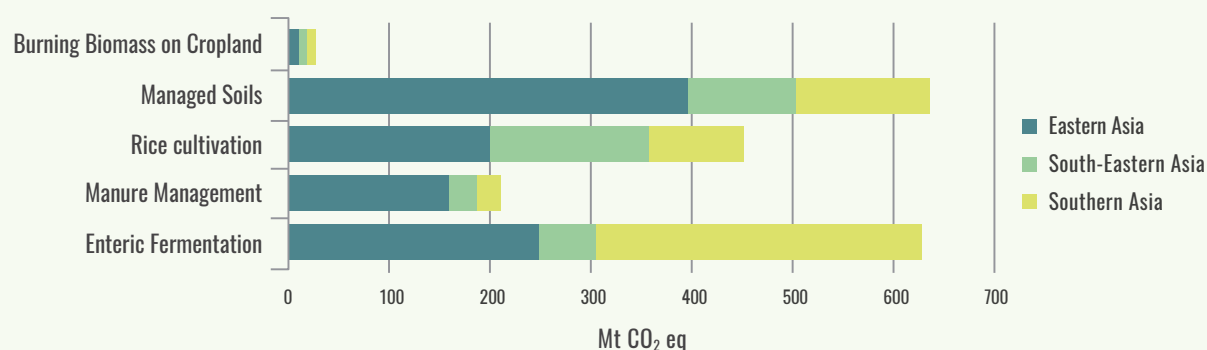
<sup>32</sup> The GHG source/sink categories used in this analysis adhere to IPCC (2006) by integrating country data reported using IPCC (1996) into a common GHG profile framework. The methodological notes (FAO, 2019) illustrate the methodology that links the IPCC (1996) source/sink categories to IPCC (2006) land use categories, carbon pools and non-CO<sub>2</sub> gases.

<sup>33</sup> Corresponds to the IPCC (2006) categories "Direct and indirect N<sub>2</sub>O emissions from agricultural", "Liming", "Urea application" and the IPCC (1996) category "Agricultural soils".

<sup>34</sup> Corresponds to the IPCC (2006) sub-category "Biomass burning" under land use category "Forest land".

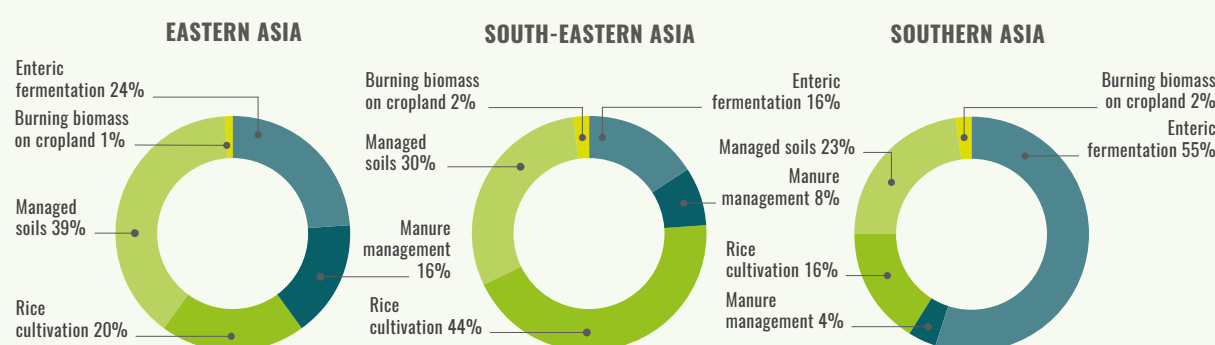
<sup>35</sup> Corresponds to the sum of the 2006 IPCC Guidelines sub-categories "Forest land converted to cropland", "Forest land converted to grassland", "Forest land converted to settlements", "Forest land converted to other land" and the Revised 1996 IPCC Guidelines category "Forest and grassland conversion".

Within the agriculture sector, the largest sources of emissions are managed soils (33 percent), enteric fermentation (32 percent) and rice cultivation (23 percent). **Figure 8** illustrates the emissions in the agriculture sector by major category and sub-region.

**FIGURE 8.****AGRICULTURAL EMISSIONS IN ASIA (TOTAL EMISSIONS IN REGION/SUB-REGION BY MAJOR CATEGORY)**

Source: NGHGI submitted to UNFCCC.

At the sub-regional level, the major source of emissions varies between managed soils in Eastern Asia (39 percent of agriculture emissions), rice cultivation in South-eastern Asia (44 percent) and enteric fermentation in Southern Asia (55 percent). **Figure 9** illustrates the share of emissions in the AFOLU sector per major category.

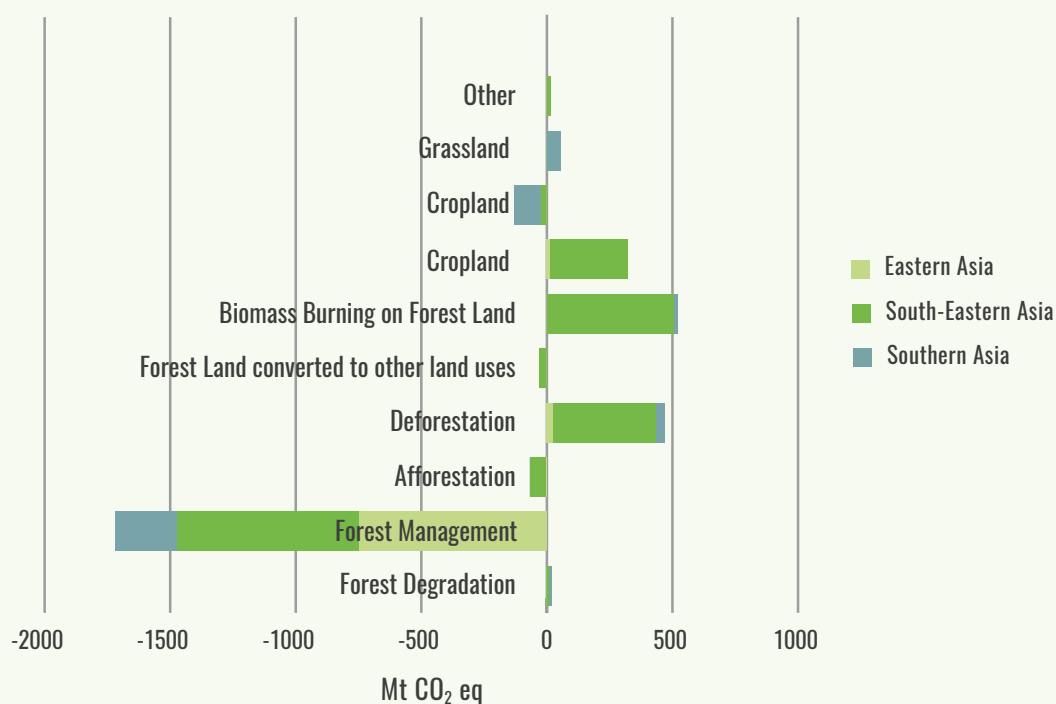
**FIGURE 9.****AFOLU SECTOR EMISSIONS IN ASIA (SHARE OF EMISSIONS IN SUB-REGION BY MAJOR CATEGORY)**

Source: NGHGI submitted to UNFCCC.

The LULUCF sector constitutes a net sink at the regional level, mainly from removals by forest management<sup>36</sup> (88 percent of removals) and cropland (7 percent). Excluding removals, however, emissions from the biomass burning on forest land represent the greatest source of land use emissions (37 percent of emissions), followed by deforestation (33 percent). **Figure 10** illustrates the emissions and removals in the LULUCF sector by major (sub-) category and sub-region.

<sup>36</sup> Forest management accounts for total net emissions related to IPCC (2006) land use category “Forest land remaining forest land” and IPCC (1996) category “Changes in forest and other woody biomass,” when those categories are a net sink at national level.



**FIGURE 10.****LULUCF EMISSIONS AND REMOVALS IN ASIA (TOTAL EMISSIONS AND REMOVALS IN SUB-REGION BY MAJOR CATEGORY)**

Source: NGHGI submitted to UNFCCC.

At the sub-regional level, the LULUCF sector represents a net sink in Eastern Asia, mainly through removals from forest management (99 percent of removals). In South-eastern Asia, the LULUCF sector is a net source, mainly due to emissions from burning biomass on forest land (40 percent of emissions) and deforestation (33 percent). In Southern Asia, the LULUCF sector represents a net sink, mainly through removals from forest and cropland management (69 and 31 percent of removals, respectively).





# CHAPTER 3



# SYNTHESIS OF MITIGATION AND ADAPTATION CONTRIBUTIONS IN THE AGRICULTURE AND LAND USE SECTORS

This chapter provides a systematic review and synthesis of the role of the agriculture and land use sectors in the NDCs of 25 countries in Asia, at the regional and sub-regional levels. It reflects the heterogeneous nature of country commitments and illustrates regional trends. It aims to identify the structural characteristics of the NDCs and to assess the scope, specificity, measurability and timeline of the mitigation contribution in the agriculture and land use sectors and adaptation component related to agriculture, food security and nutrition. The data informs the gap and opportunity analysis in **Chapter 4**, which seeks to support countries to enhance their NDCs by 2020 and future revision cycles, as well as guide the prioritization of international support options.

## 3.1 MITIGATION CONTRIBUTION

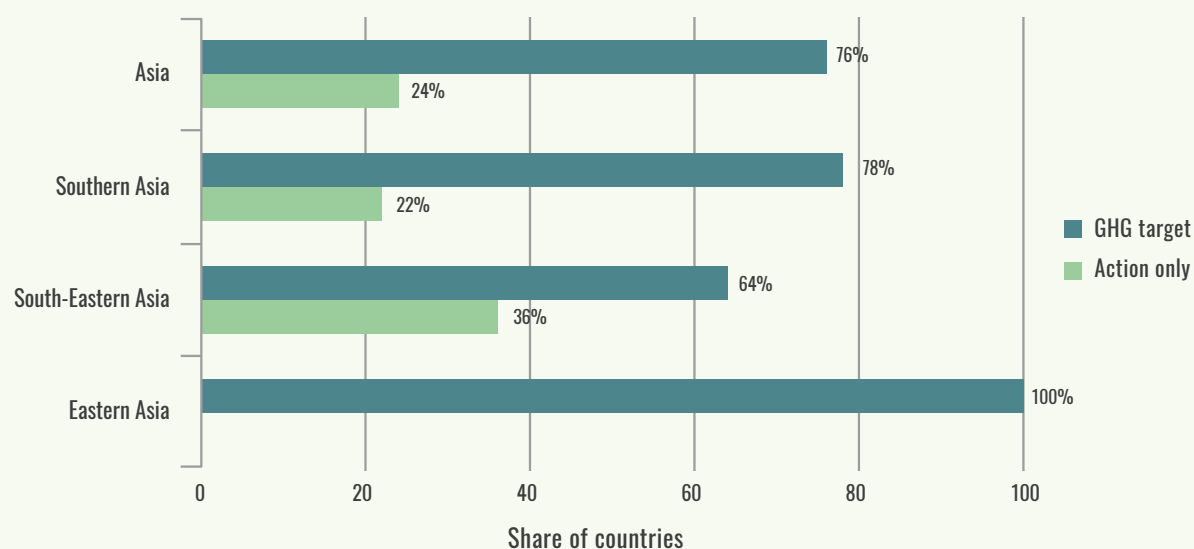
This section synthesizes the mitigation contributions in the agriculture and land use sectors communicated in the NDCs of 25 countries in Asia at the regional and sub-regional levels. The data from the NDCs were supplemented with information reported in NCs to the UNFCCC.

### 3.1.1 General mitigation contribution

All 25 countries in Asia communicated a mitigation contribution in their NDC, 19 of which (76 percent) set a GHG target and six<sup>37</sup> (24 percent) qualify their contribution in terms of “Action-only.” At the sub-regional level, countries communicated a mix of GHG targets and “Action-only” as their respective mitigation contribution, with the exception of Eastern Asia with all countries setting a GHG target. **Figure 11** illustrates the shares of countries with a mitigation contribution, at the regional and sub-regional level, by type of contribution.

**FIGURE 11.**

**GENERAL MITIGATION CONTRIBUTION EXPRESSED IN THE NDCs OF ASIAN COUNTRIES, BY TYPE (SHARE OF COUNTRIES IN REGION/SUB-REGION BY TYPE OF CONTRIBUTION)**



Source: NDCs.

**Around one-third of mitigation contributions are economy-wide in scope**, covering emissions from all IPCC sectors – Energy, Industrial Products and Processing (IPPU), AFOLU and Waste. Two-thirds cover emissions from multiple sectors. At the sub-regional level, a mix of economy-wide and multi-sectoral contributions are set forth, with Eastern Asia countries presenting the greatest share of economy-wide contributions.

**The majority of countries in the region (79 percent) express their GHG target as an absolute reduction of net emissions**, while four countries<sup>38</sup> express the reduction in terms of emission intensity per unit of GDP. Around three-fourths (74 percent) set their target in comparison to the level of emissions under a business as usual (BAU) scenario, and the remaining countries (26 percent) set their GHG target against emissions from a specific base year.

**The timeline of the contributions vary between 2016 and 2035**, with the majority of countries specifying an implementation period between 2020/21 and 2030. One country<sup>39</sup> sets an end date of 2035. **Annex 2** contains detailed information on each country’s general mitigation contribution.

**Around 85 percent of countries in the region include the agriculture sector and almost 90 percent include the LULUCF sector** in their general mitigation contributions. Taken together, 92 percent of countries in the region include agriculture and/or the LULUCF sectors, and 64 percent include both

<sup>37</sup> Brunei Darussalam, Lao PDR, Myanmar, Timor-Leste, Bhutan and Nepal.

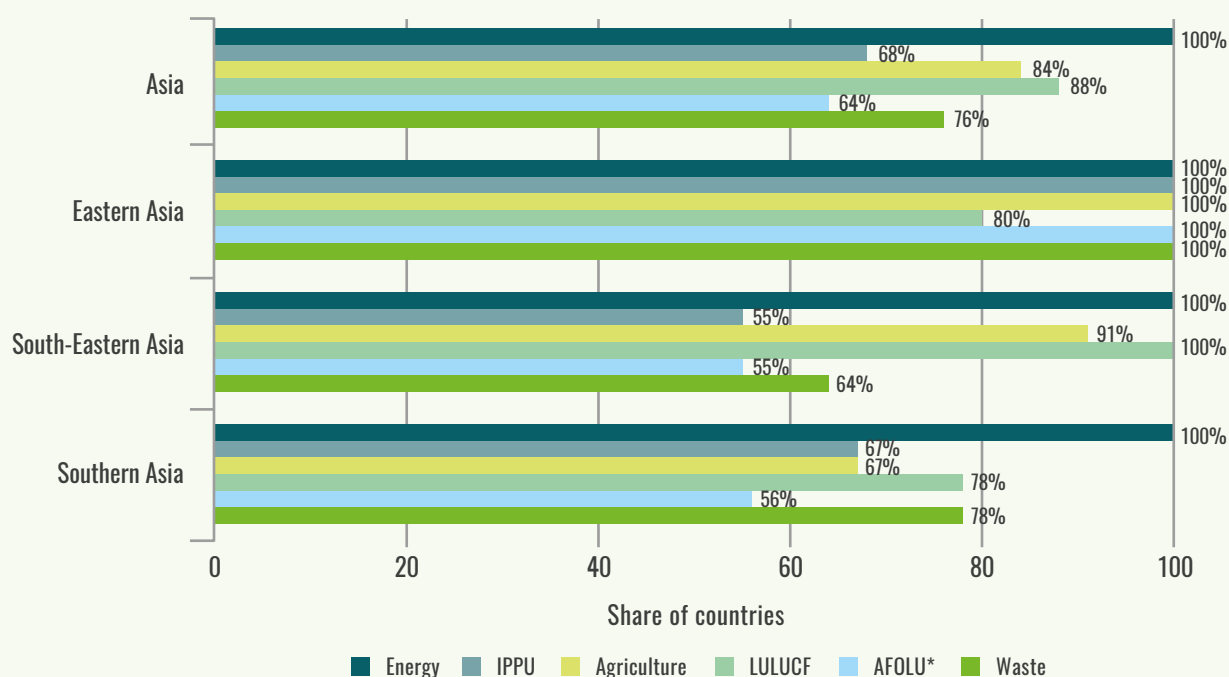
<sup>38</sup> China, India, Singapore and Malaysia.

<sup>39</sup> Brunei Darussalam.

sectors (i.e. AFOLU). At the sub-regional level, the inclusion of agriculture and LULUCF sectors in country mitigation contributions vary. **Figure 12** illustrates the share of countries, at the regional and sub-regional level, with IPCC sectors included in their general mitigation contributions, by sector.

**FIGURE 12.**

**IPCC SECTORS INCLUDED IN GENERAL MITIGATION CONTRIBUTIONS IN NDCs OF ASIAN COUNTRIES “BY SECTOR”**



\* AFOLU refers to when both the agriculture and LULUCF sectors were included.

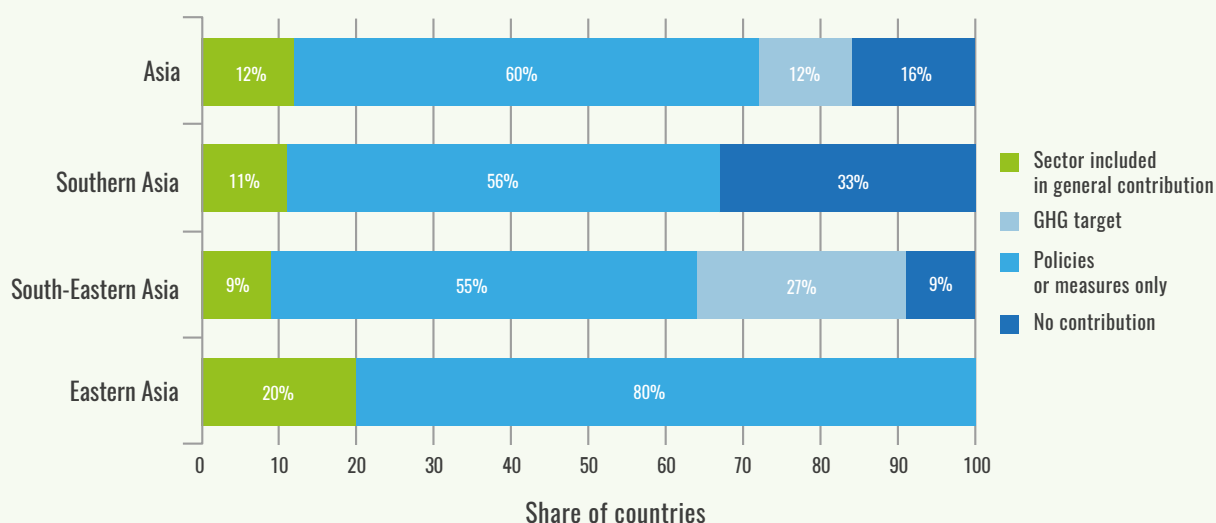
Source: NDCs.

### 3.1.2 Mitigation in the agriculture and land use sectors

**The degree to which the agriculture and/or LULUCF sectors are integrated into the mitigation contribution varies amongst countries:** no contribution, sector included in general contribution, policies or measures only, non-GHG target and GHG target. The level of integration, however, does not attest to the net impact of a country's mitigation contribution but provides a general overview of how countries integrate agricultural priorities within their mitigation commitments.

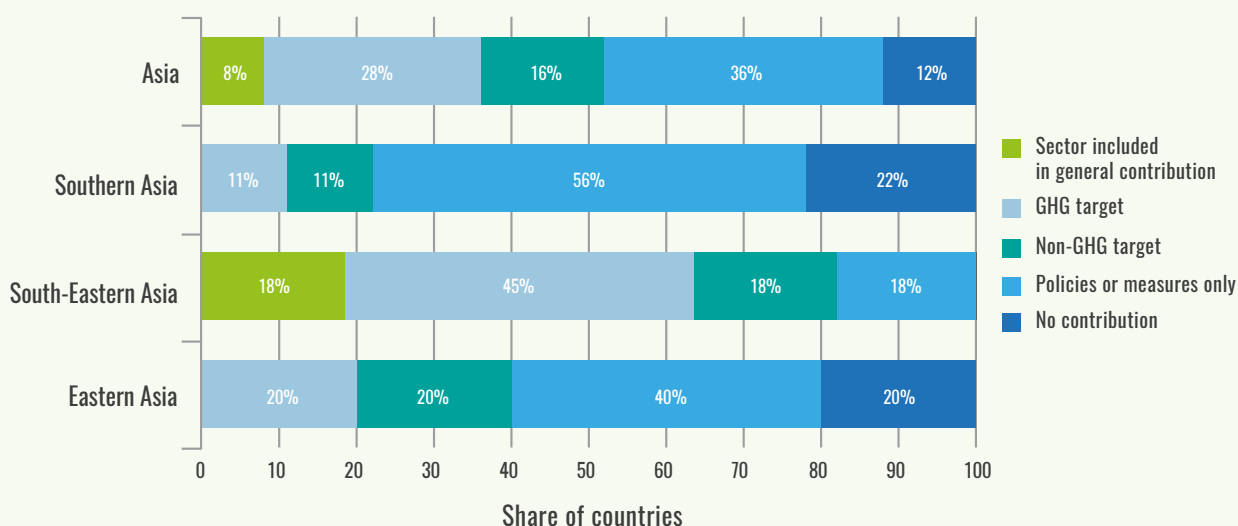
**Out of the 21 countries that include mitigation in the agriculture sector, three<sup>40</sup> set sectoral GHG targets**, expressed as an absolute reduction of net emissions compared to a BAU scenario, fifteen include a set of mitigation policies or measures only and the remaining three countries include the sector in their general mitigation contribution. **Figure 13** illustrates the share of countries, at the regional and sub-regional level, with a mitigation contribution in the agriculture sector by type of contribution. **Annex 3** contains detailed information on each country's agricultural mitigation contribution.

<sup>40</sup> Malaysia (NC), Vietnam (NC) and Indonesia (NDC).

**FIGURE 13.****MITIGATION CONTRIBUTIONS IN THE AGRICULTURE SECTOR IN THE NDCs OF ASIAN COUNTRIES**

Source: NDCs.

Out of the 22 countries that include mitigation in the LULUCF sector, seven<sup>41</sup> set sectoral GHG targets, expressed as an absolute reduction of net emissions compared to net emissions either from a base year or in a BAU scenario, four<sup>42</sup> include a non-GHG target, nine include a set of policies or measures only and the remaining two countries include the sector in their general mitigation contribution. **Figure 14** illustrates the share of countries, at the regional and sub-regional level, with a mitigation contribution in the LULUCF sector by type of contribution. **Annex 4** contains detailed information on each country's LULUCF mitigation contribution.

**FIGURE 14.****MITIGATION CONTRIBUTIONS IN THE LULUCF SECTOR**

Source: NDCs.

<sup>41</sup> Japan (NDC), Cambodia (NDC), Indonesia (NDC), Lao PDR (NDC), Malaysia (NC), Viet Nam (NC) and India (NDC).

<sup>42</sup> China, mainland (NDC), Brunei Darussalam (NDC), Timor-Leste (NDC) and Bhutan (NDC).

## Policies and measures in the agriculture and land use sectors

Countries often include mitigation in their contribution as policies or measures that aim to reduce net emissions or emission intensity, or enhance carbon sinks, from a particular agriculture activity and/or land use. The methodological notes (FAO, 2019c) contains the methodological matrix for how policies and measures in the agriculture and land use sectors are categorized in relation to corresponding GHG source and sink categories in line with IPCC Guidelines (IPCC, 2006).

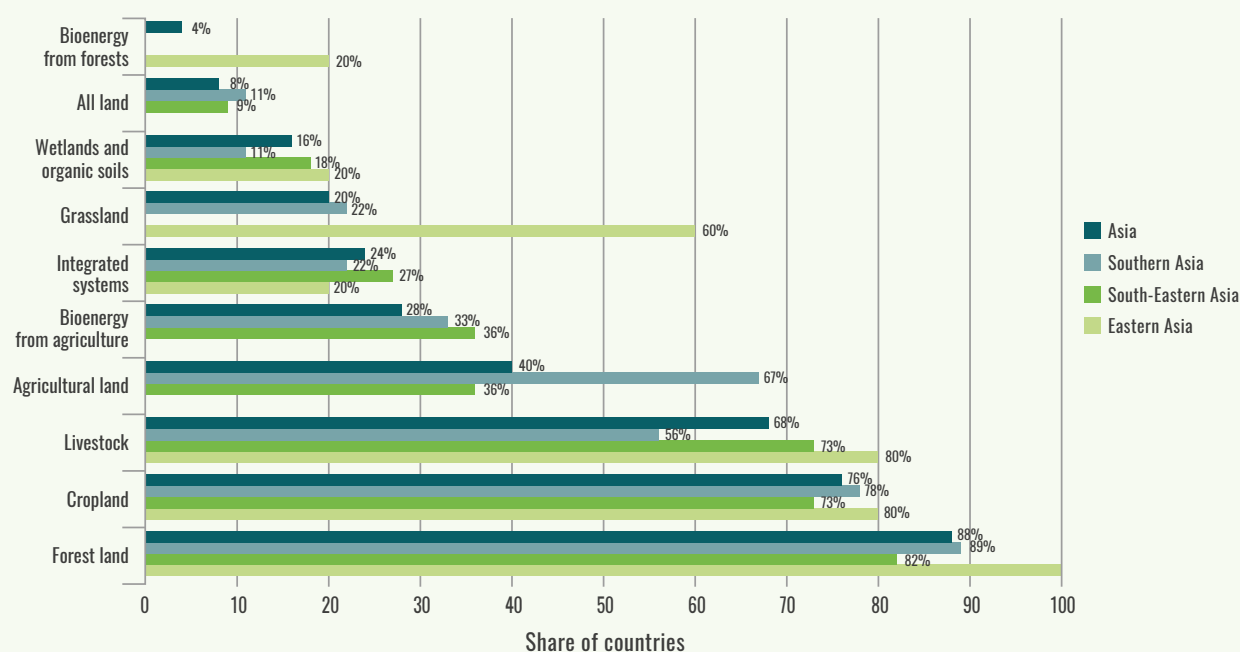
The policies and measures in the agriculture and land use sectors were categorized by management activity, agriculture sub-sector and IPCC land use category, and aggregated into ten main sub-sector/land use categories: 1) all land;<sup>43</sup> 2) agricultural land;<sup>44</sup> 3) cropland; 4) integrated systems; 5) livestock; 6) grassland; 7) forest land; 8) wetlands and organic soils; 9) bioenergy from agriculture; and 10) bioenergy from forests.

**Overall, the majority of policies or measures in Asia are biophysical-related approaches to mitigation** (94 percent of measures), with a small share of institutional and regulatory and control-related ones (<10 percent each). Of those policies or measures, around 40 percent have quantified targets, half of which are quantified in terms of GHG emission reductions. Eighty percent require a combination of domestic and international financial support, while 10 percent are fully conditional to international finance and the other 10 percent unconditional to it.

**Around 90 percent of countries in the region include at least one or more mitigation policy or measure in the agriculture and land use sectors, with the majority promoting mitigation on forest land** (88 percent). Around three-fourths of countries promote mitigation on cropland, followed by mitigation in the livestock sector (68 percent), on agricultural land in general (40 percent), via bioenergy production from agriculture (28 percent), and in integrated systems (24 percent), grasslands (20 percent) and wetlands and organic soils (16 percent), amongst others. **Figure 15** illustrates the share of countries, at the regional and sub-regional level, in Asia with one or more (to avoid bias of representation) policies or measures in the agriculture and land use sectors, by land use category/sub-sector.

**FIGURE 15.**

### MITIGATION POLICIES AND MEASURES IN THE AGRICULTURE AND LAND USE SECTORS IN THE NDCs OF ASIAN COUNTRIES BY LAND USE/SUB-SECTOR



Source: NDCs.

<sup>43</sup> For the purpose of this document, “all land” refers to agriculture, forestry and other land uses.

<sup>44</sup> For the purpose of this document, “agricultural land” refers to a combination of cropland and grassland.



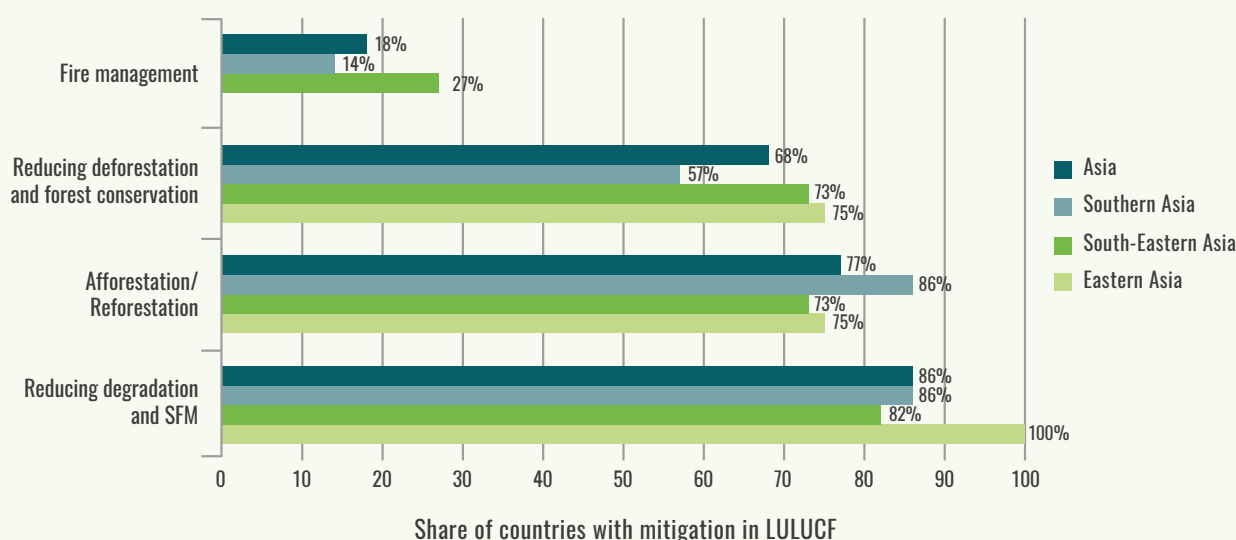
The coverage of policies and measures in the agriculture and land use sectors are presented by prevalence amongst countries in Asia, in descending order.

## FOREST LAND

**Eighty-eight percent of countries in the region include at least one mitigation policy or measure on forest land.** The majority of those countries aim to reduce land use emissions and/or enhance removals on forest land by reducing degradation and promoting sustainable forest management (SFM) (86 percent of countries with mitigation in LULUCF), followed by afforestation/reforestation (77 percent) and reducing deforestation and improving forest conservation (68 percent) and fire management (18 percent), amongst others. **Figure 16** illustrates the share of countries, at the sub-regional level, with one or more (to avoid bias of representation) policy or measure on forest land out of countries with mitigation in the LULUCF sector, by management activity.

**FIGURE 16.**

### MITIGATION POLICIES AND MEASURES ON FOREST LAND IN THE NDCs OF ASIAN COUNTRIES BY TYPE



Source: NDCs.

**TABLE 4.**

### EXAMPLES OF MITIGATION POLICIES AND MEASURES ON FOREST LAND

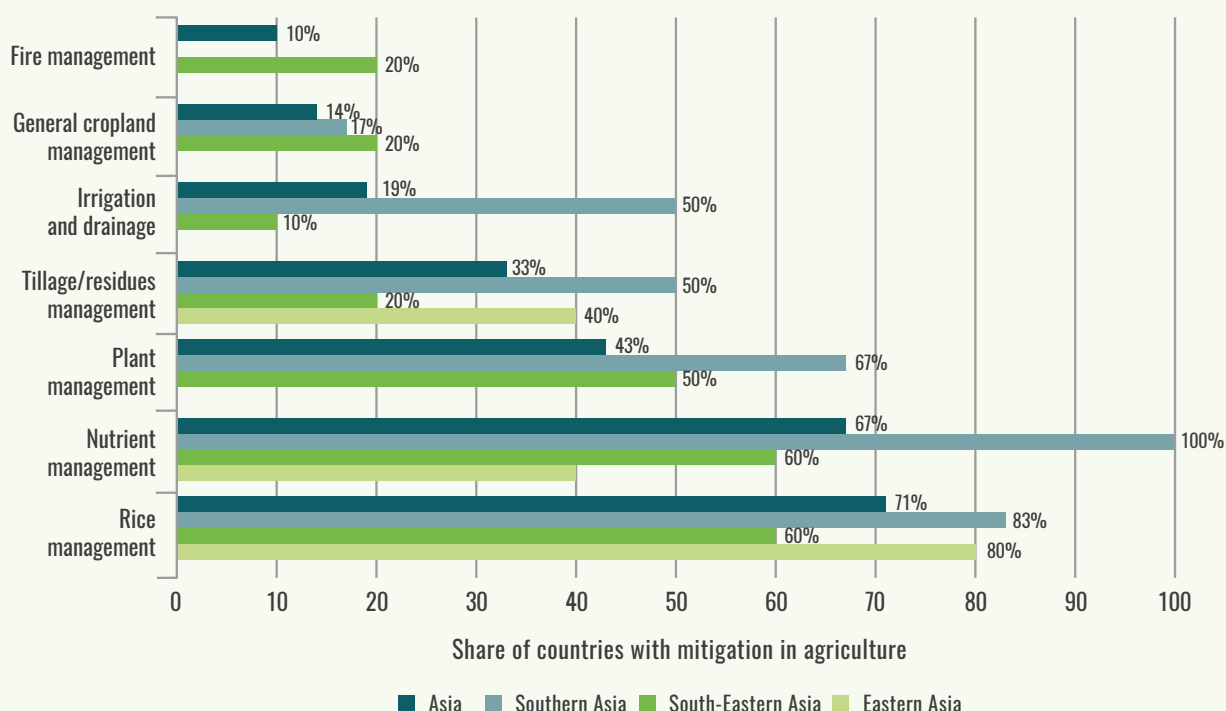
COUNTRY	MANAGEMENT ACTIVITY	METRIC	2030 TARGET
CAMBODIA	INCREASE FOREST COVER TO 60% OF NATIONAL LAND AREA FROM 57% BY 2030	GHG QUANTIFIED	-4.7 T CO <sub>2</sub> EQ/HA/YR
NEPAL	DECREASE DEFORESTATION RATE BY 0.05 PERCENT FROM ABOUT 0.44 PERCENT AND 0.18 PERCENT IN THE TERAI AND CHURE RESPECTIVELY	NON-GHG QUANTIFIED	-0.5 PERCENT
TIMOR-LESTE	ENHANCE COASTAL RESILIENCE AND EXPLORING CARBON SEQUESTRATION IN MANGROVE PLANTATIONS	NON-QUANTIFIED	
INDONESIA	REDUCE FOREST FIRES	GHG QUANTIFIED	-21 770 KT CO <sub>2</sub> EQ
NEPAL	EQUIP EVERY HOUSEHOLD IN RURAL AREAS WITH SMOKELESS (IMPROVED) COOKING STOVES BY 2030	NON-GHG QUANTIFIED	450 000 COOKSTOVES

## CROPLAND

Seventy-six percent of countries in the region include at least one mitigation policy or measure on cropland. The majority of those countries aim to reduce land use emissions and/or enhance removals on cropland through improved rice management (71 percent of countries with mitigation in agriculture), followed by nutrient management (67 percent), plant management (43 percent), tillage/residue management (33 percent) and irrigation and drainage (19 percent), amongst others. **Figure 17** illustrates the share of countries, at the regional and sub-regional level, with one or more (to avoid bias of representation) policy or measure on cropland out of countries with mitigation in agriculture, by management activity.

**FIGURE 17.**

### MITIGATION POLICIES AND MEASURES ON CROPLAND IN THE NDCs OF ASIAN COUNTRIES BY TYPE



Source: NDCs.

TABLE 5.

## EXAMPLES OF MITIGATION POLICIES AND MEASURES ON CROPLAND

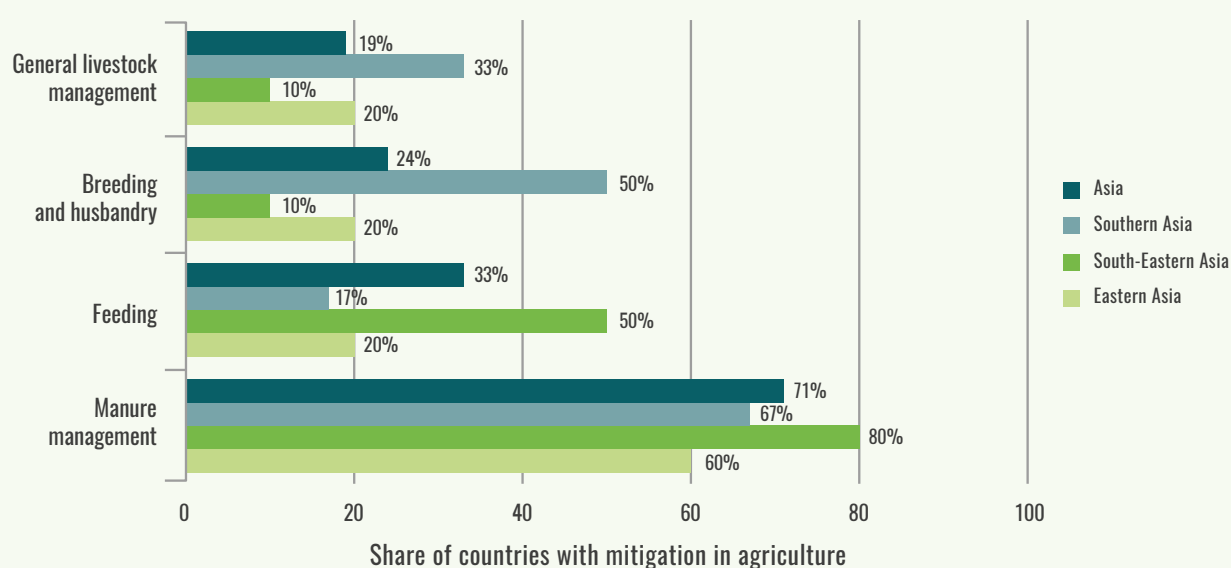
COUNTRY	MANAGEMENT ACTIVITY	METRIC	2030 TARGET
THAILAND	ABOUT 78 600 FARMERS WILL BE PROMOTED TO AVOID BURNING CROP RESIDUES BY 2036	NON-GHG QUANTIFIED	78 600 FARMERS
BANGLADESH	INCREASE THE SHARE OF ORGANIC MANURE IN THE USED FERTILIZER MIX	NON-GHG QUANTIFIED	35% INCREASE IN ORGANIC FERTILIZER USE
CAMBODIA	SWITCH TO SULPHUR FERTILIZER INSTEAD OF UREA FOR RICE CULTIVATION	GHG QUANTIFIED	2472 KT CO <sub>2</sub> EQ (15 PERCENT GHG REDUCTION COMPARED TO 2000)
MALAYSIA	INCREASE PALM OIL YIELD FROM 20.5% IN 2009 TO 23% BY 2020, AND AVERAGE FRESH FRUIT BUNCH (FFB) YIELDS FROM 21 T/HA/YEAR IN 2009 TO 26 T/HA/YEAR BY 2020	NON-GHG QUANTIFIED	23% PALM OIL YIELD AND 26 T/HA/YEAR FFB YIELD
BRUNEI DARUSSALAM	DEVELOP DROUGHT-TOLERANT RICE VARIETIES	NON-QUANTIFIED	
THAILAND	ORGANIC FARMING TO INCREASE SOIL AND TREE SEQUESTRATION BY 25 AEROBIC COMPOSTING PLANTS WITH A PRODUCTION CAPACITY OF 120 TONS PER PLANT	NON-GHG QUANTIFIED	120 TONS COMPOST PER PLANT

## LIVESTOCK SYSTEMS

**Sixty-eight percent of countries in the region include at least one mitigation policy or measure in livestock systems.** The majority of those countries aim to reduce emissions and/or emission intensity in livestock systems through improved manure management (71 percent of countries with mitigation in agriculture), followed by better feeding practices (33 percent), improved breeding and husbandry (24 percent) and general livestock management (19 percent). **Figure 18** illustrates the share of countries, at the regional and sub-regional level, with one or more (to avoid bias of representation) policy or measure in the livestock sub-sector out of countries with mitigation in agriculture, by management activity.

FIGURE 18.

## MITIGATION POLICIES AND MEASURES IN LIVESTOCK IN THE NDCs OF ASIAN COUNTRIES BY TYPE



Source: NDCs.

TABLE 6.

## EXAMPLES OF MITIGATION POLICIES AND MEASURES IN LIVESTOCK

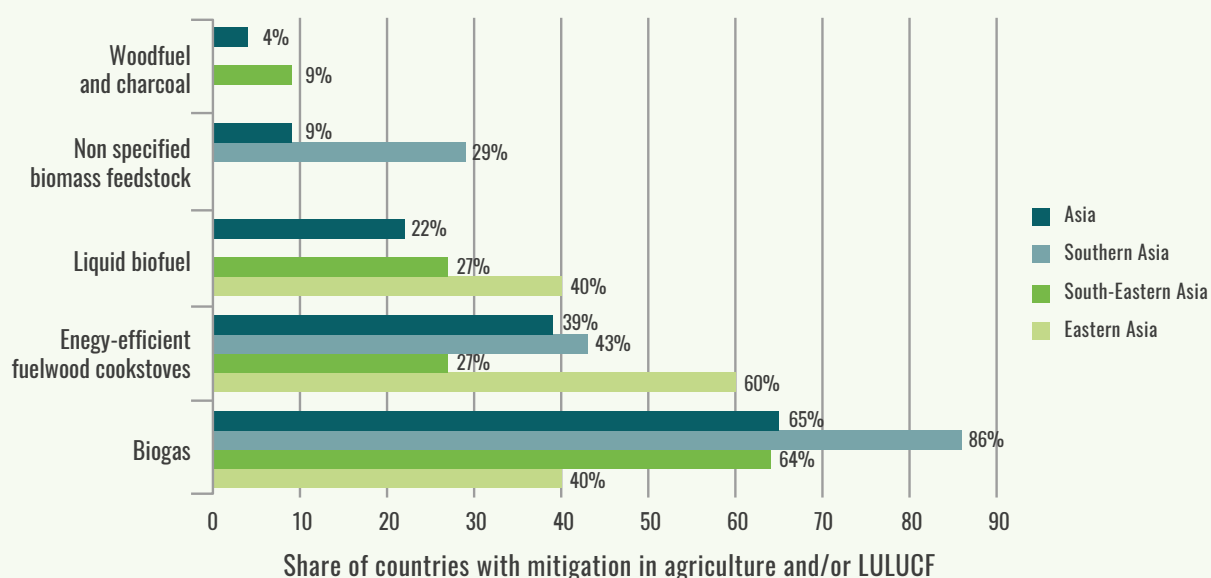
COUNTRY	MANAGEMENT ACTIVITY	METRIC	2030 TARGET
PAKISTAN	DEVELOP AND ADOPT NEW BREEDS OF CATTLE WHICH ARE MORE PRODUCTIVE IN TERMS OF MILK AND MEAT, AND HAVE LOWER METHANE PRODUCTION FROM ENTERIC FERMENTATION	NON-GHG QUANTIFIED	35% INCREASE IN ORGANIC FERTILIZER USE
VIETNAM	292 000 DAIRY CATTLE WILL BE FED MOLASSES UREA BLOCK (MUB) BY 2030. THE NUMBER OF MUB-FED CATTLE WILL BE 73 000 HEADS IN 2010, 182 000 BY 2020 AND 292 000 BY 2030	GHG QUANTIFIED	-7.9 MT CO <sub>2</sub> EQ
AFGHANISTAN	DEVELOP 2 000 BIOGAS SYSTEMS	NON-GHG QUANTIFIED	2 000 SYSTEMS
BHUTAN	PROMOTE CLIMATE SMART LIVESTOCK FARMING PRACTICES TO CONTRIBUTE TOWARDS POVERTY ALLEVIATION AND SELF SUFFICIENCY	NON-QUANTIFIED	

## BIOENERGY FROM AGRICULTURE AND FORESTS

Twenty-eight percent of countries in the region include at least one mitigation policy or measure targeting bioenergy production from agricultural biomass, and one country<sup>45</sup> (4 percent) includes at least one targeting bioenergy production from forest biomass. The majority of those countries aim to reduce net emissions across all sectors by substituting fossil fuel as a source of energy through the production of biogas (65 percent of countries with mitigation in agriculture and/or LULUCF), followed by the use of more energy-efficient woodfuel cookstoves (39 percent), the substitution of fossil fuels with liquid biofuels (22 percent) and non-specified biomass stock (9 percent) and more sustainable woodfuel and charcoal production (4 percent). **Figure 19** illustrates the share of countries, at the sub-regional level, with one or more (to avoid bias of representation) bioenergy-related policy or measure, out of countries with mitigation in agriculture and/or LULUCF, by management activity.

FIGURE 19.

## BIOENERGY-RELATED MITIGATION POLICIES AND MEASURES IN THE NDCs OF ASIAN COUNTRIES BY TYPE



Source: NDCs.

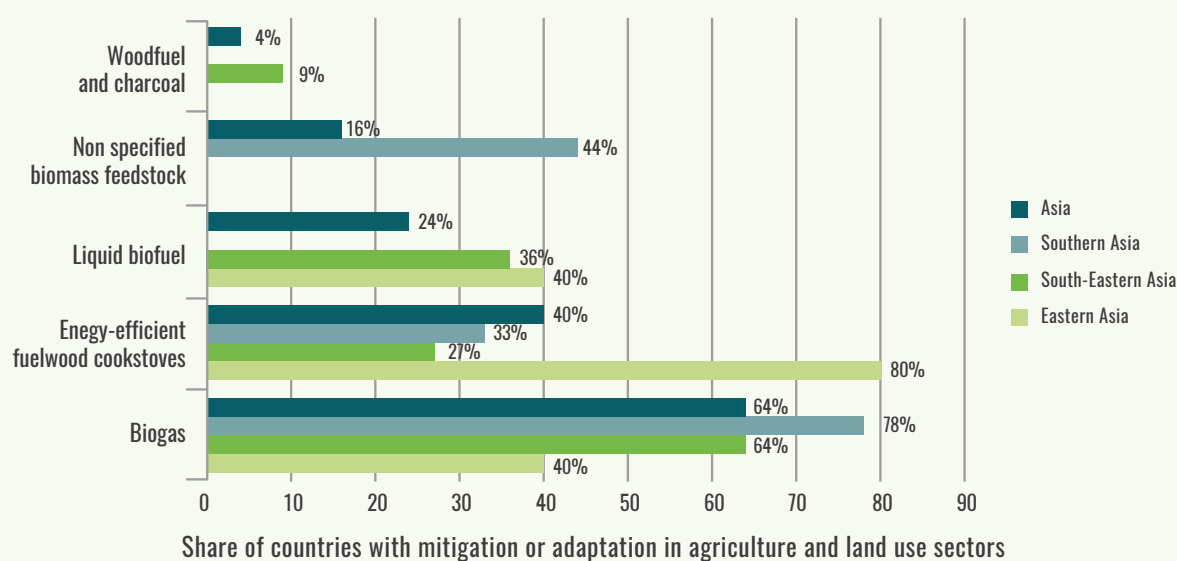
<sup>45</sup> Republic of Korea.

## BOX 1: BIOENERGY IN THE NDCS OF ASIA

**Around 80 percent of countries in the region promote bioenergy from agricultural and forest biomass as a strategy for mitigation and/or adaptation.** The majority of countries promote biogas production (64 percent of countries with mitigation and/or adaptation in the agriculture and land use sectors), followed by the use of energy-efficient fuelwood cookstoves (40 percent), liquid biofuels (24 percent), bioenergy production for non-specified biomass feedstock (16 percent) and sustainable woodfuel and charcoal production (4 percent). **Figure 20** illustrates the share of countries, at the regional and sub-regional level, that promote bioenergy-related policies or measures as adaptation or mitigation, by type of bioenergy.

**FIGURE 20.**

### BIOENERGY-RELATED POLICIES AND MEASURES IN THE NDCs OF ASIAN COUNTRIES BY TYPE



Source: NDCs.

Overall, the majority of countries promote bioenergy production or use as a mitigation strategy, while access to energy, or energy self-efficiency, represent a priority for adaptation.

## INTEGRATED SYSTEMS

**Twenty-four percent of countries in the region include at least one mitigation policy or measure in integrated systems.** All of those countries aim to reduce emissions and/or enhance removals in the agriculture and land use sectors through agroforestry (29 percent of countries with mitigation in agriculture). At the sub-regional level, over 30 percent of countries in South-eastern and Southern Asia, respectively, promote agroforestry.

**TABLE 7.**

### EXAMPLES OF MITIGATION POLICIES AND MEASURES IN INTEGRATED SYSTEMS

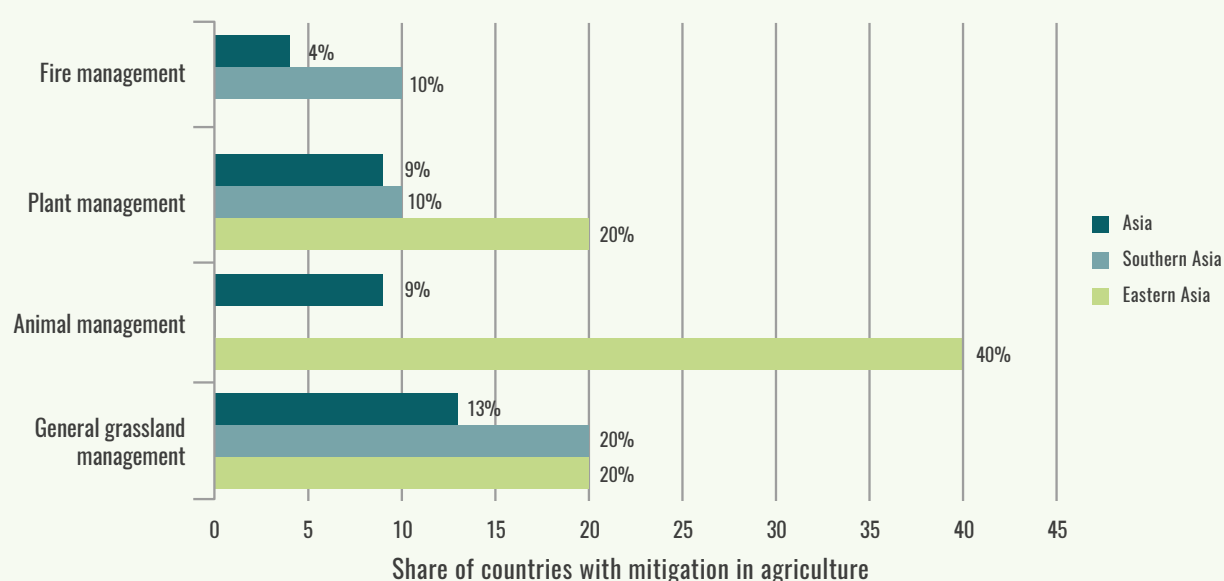
COUNTRY	MANAGEMENT ACTIVITY	METRIC	2030 TARGET
PAKISTAN	IMPLEMENT AGROFORESTRY PRACTICES THROUGH PLANTATION OF MULTIPURPOSE AND FAST GROWING TREE SPECIES	NON-QUANTIFIED	
MYANMAR	AGROFORESTRY	NON-GHG QUANTIFIED	-176 T C/HA AFTER A PERIOD OF 10 YEARS (ESTIMATED FOR TROPICAL REGIONS)
BHUTAN	AGRO-FORESTRY OR AGRO-SILVO PASTORAL SYSTEMS FOR FODDER PRODUCTION	NON-QUANTIFIED	

## GRASSLAND

Twenty percent of countries in the region include at least one mitigation policy or measure on grassland. The majority of those countries aim to reduce emissions and/or enhance removals on grassland through general grassland management (13 percent of countries with mitigation in agriculture), followed by animal and plant management (9 percent each) and fire management (<5 percent). At the sub-regional level, animal management is promoted by the greatest share of countries in Eastern Asia, while general grassland management is in Southern Asia. **Figure 21** illustrates the share of countries, at the regional sub-regional level, with one or more (to avoid bias of representation) policy or measure on grassland out of countries with mitigation in agriculture, by management activity.

**FIGURE 21.**

### MITIGATION POLICIES AND MEASURES IN THE NDCs OF ASIAN COUNTRIES BY TYPE



Source: NDCs.

**TABLE 8.**

### EXAMPLES OF MITIGATION POLICIES AND MEASURES ON GRASSLAND

COUNTRY	MANAGEMENT ACTIVITY	METRIC	2030 TARGET
AFGHANISTAN	15% OF THE EXISTING DEGRADED RANGELAND AREAS WILL BE REGENERATED, COVERING APPROXIMATELY 4.5 MILLION HECTARES OF RANGELANDS	NON-GHG QUANTIFIED	4.5 MHA RANGELAND
CHINA	PROMOTE MECHANISM OF MAINTAINING THE BALANCE BETWEEN GRASS STOCK AND LIVESTOCK, TO PREVENT GRASSLAND DEGRADATION, TO RESTORE VEGETATION OF GRASSLAND	NON-QUANTIFIED	
BHUTAN	INTRODUCE CONTROLLED BURNING OR MECHANICAL CLEARING OF SHRUBS FOLLOWED BY RESEEDING WITH SELECTED SPECIES AND PROTECTION FROM GRAZING BASED ON APPLIED RESEARCH AND EXTENSION	NON-QUANTIFIED	

## WETLANDS AND ORGANIC SOILS

Sixteen percent of countries in the region include at least one mitigation policy or measure on wetlands and organic soils. The majority of those countries aim to reduce emissions and/or enhances removals on wetlands and organic soils through wetlands management in general (9 percent of countries with mitigation in LULUCF), followed by rewetting organic soils drained for agriculture (4 percent).

## WETLANDS AND ORGANIC SOILS

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TABLE 9.

### EXAMPLES OF MITIGATION POLICIES AND MEASURES ON WETLANDS AND ORGANIC SOILS

COUNTRY	MANAGEMENT ACTIVITY	METRIC	2030 TARGET
VIETNAM	OVER A 15-YEAR PERIOD, 50 000 HA OF MELALEUCA FORESTS WILL BE PLANTED ON ALKALINE WETLANDS AT AN AVERAGE RATE OF 5 000 HA/YEAR	GHG QUANTIFIED	-25 MT CO <sub>2</sub> EQ
CHINA	STRENGTHEN THE PROTECTION AND RESTORATION OF WETLANDS AND TO INCREASE CARBON STORAGE CAPACITY OF WETLANDS	NON-QUANTIFIED	

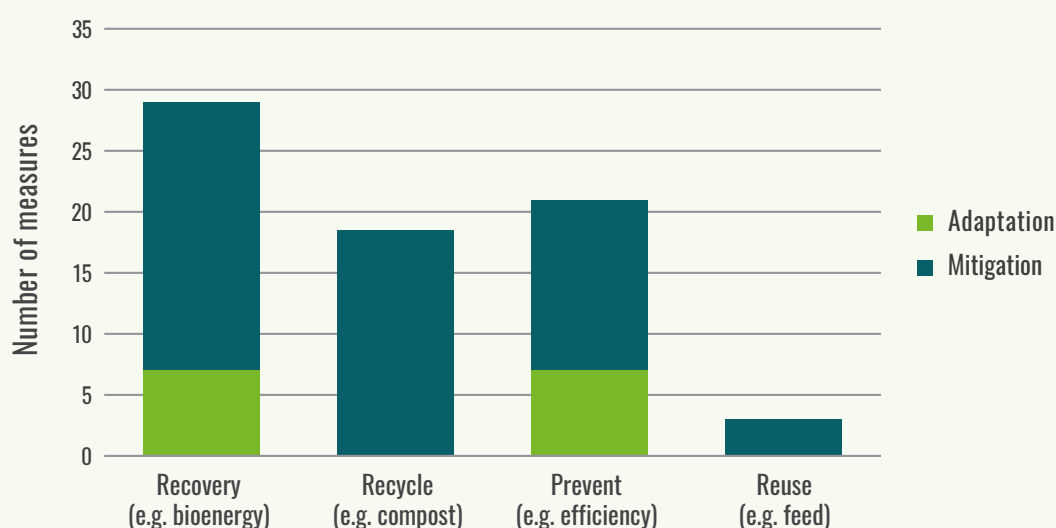
## BOX 2: FOOD SYSTEMS IN THE NDCs OF ASIA

Climate actions in agricultural and food systems present opportunities for leveraging mitigation and adaptation synergies, as efficiency- and substitution-based interventions along the food value chain may generate emissions, and cost reductions, per unit of production. Overall, around 90 percent of climate actions in the agriculture and land use sectors, spanning the mitigation and adaptation options set forth in country NDCs, target the primary production phase of the food and agricultural value chain. The remaining ten percent of climate actions promote interventions along various stages of the value chain, including post-harvest operations, processing and packaging, transport, storage and distribution and consumption.

**Approximately 90 percent of countries in the region promote food loss and waste reduction-related measures in their NDCs, primarily as a mitigation priority.** Climate actions that target food loss and waste reduction are mostly concentrated around recovering biomass, such as for bioenergy, followed by recycling biomass, such as the use of waste for organic fertilizer, preventing biomass losses in general, such as better storage or post-harvest operations, and reusing biomass, such as the use of crop residues for feed. **Figure 22** illustrates the number of food loss and waste reduction-related climate actions in the region, by type.

FIGURE 22.

### FOOD LOSS AND WASTE REDUCTION-RELATED POLICIES AND MEASURES IN THE NDCs OF ASIAN COUNTRIES BY TYPE



Source: NDCs.

## 3.2 ADAPTATION CONTRIBUTION

Climate change directly affects the natural resources and ecosystems upon which agricultural production, food systems and rural livelihoods rely. Climate change impacts are transmitted to food security and nutrition through different pathways, and the severity of the impact is determined by climate drivers and risks, and by the underlying vulnerability of ecosystems, agro-ecosystems, rural economies and households (FAO, 2016c).

**A key way to moderate, reduce and/or avoid climate-related impacts is to reduce a system's underlying vulnerabilities, strengthen its adaptive capacity and increase its resilience** (FAO, 2016d). Adaptation to climate change refers to changes in processes, practices and structures to moderate potential damages from climate change, or to benefit from opportunities associated with such changes. Adaptation in the agriculture and land use sectors signifies modifying agricultural production and socio-economic institutional systems in response to and in preparation for actual or expected climate variability and change and their impacts, to moderate harmful effects and exploit beneficial opportunities. Resilience is generally understood as the capacity of individuals, groups, communities and institutions to anticipate, absorb (cope), adapt and transform in the face of climate variability and extremes that undermine food security and nutrition (FAO, 2018d). Adaptive capacity encompasses two dimensions: the capacity to manage or moderate climate risks (including extreme climatic events), and the capacity to gradually respond to longer-term climate changes (FAO, 2017c).

**This section synthesizes, at the regional and sub-regional levels, the adaptation component in the agriculture and land use sectors communicated in the NDCs of 25 countries in Asia.** It also contains a summary of the major climate-related hazards, impacts and vulnerabilities reported in ecosystems and social systems. The data from the NDCs were supplemented with information reported in NCs.

### 3.2.1 Climate-related hazards, impacts, and vulnerabilities

In order to contextualize the fairness and ambition of the NDCs, as well as to inform adaptation planning, all countries in the region, with the exception of one,<sup>46</sup> include a description of observed and/or expected climate variability and extremes, as well as cite the climate-related hazards, impacts and vulnerabilities in ecosystems and/or social systems that are already being observed or are expected in the future.

#### Climate variability and extremes

**Out of those countries that include climate-related impacts, 92 percent report observed and/or projected changes in meteorological variables,** namely variations in mean annual precipitation and surface air temperature and the frequency and intensity of climate extremes.

#### Climate-related hazards

**Countries often report observed and/or projected climate-related hazards, including hydro-meteorological, climatological and biological processes or phenomenon** that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems, and environmental resources.<sup>47</sup>

**The majority of countries in the region report the occurrence of floods** amongst observed and/or projected climate-related hazards<sup>48</sup> (96 percent of countries with impacts reported, respectively), followed by drought (88 percent), storms (71 percent) and invasion by pests and non-native species in agriculture (50 percent), amongst others. At the sub-regional level, invasion by pests and non-native species in agriculture represents the greatest climate-related hazard in Eastern Asia while floods represent the

<sup>46</sup> Japan.

<sup>47</sup> Definition of climate-related hazard adapted from IPCC (2014b) and EM-DAT (n.d.).

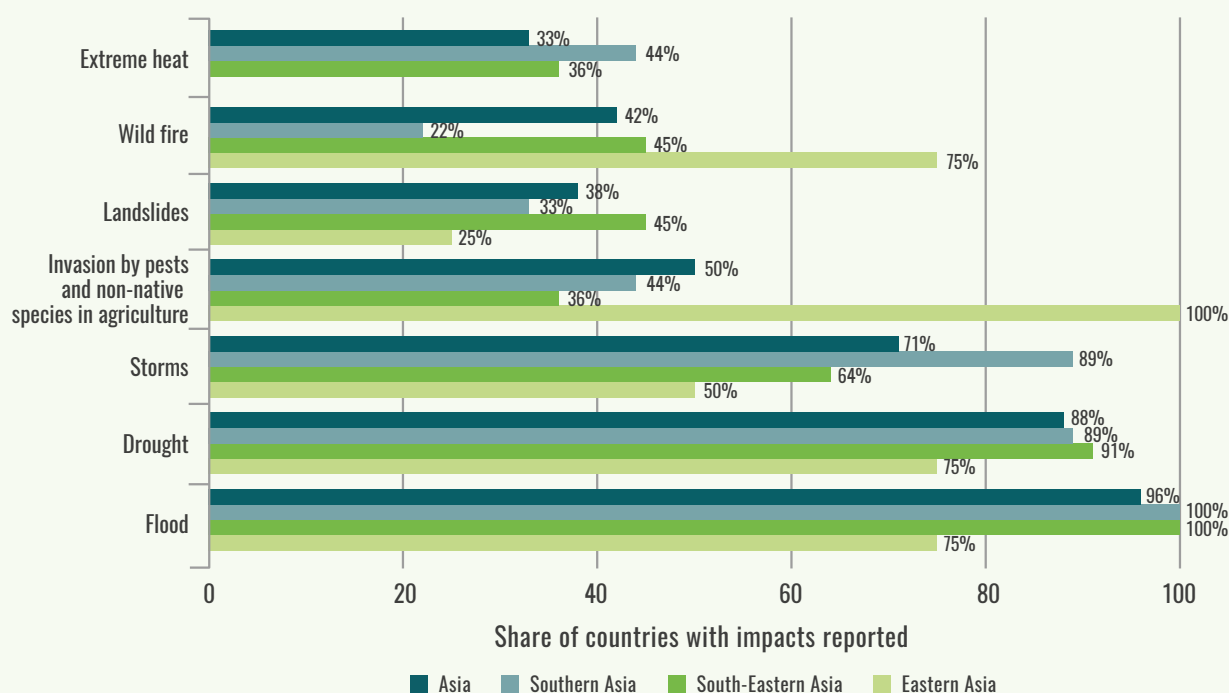
<sup>48</sup> Definition of climate-related hazard adapted from IPCC (2014b) and EM-DAT (n.d.).



greatest hazard in South-eastern and Southern Asia. **Figure 23** illustrates the share of countries, at the regional and sub-regional level, that report observed and/or projected climate-related hazards out of countries with climate impacts reported, by type of hazard.

**FIGURE 23.**

**OBSERVED AND/OR PROJECTED CLIMATE-RELATED HAZARDS REPORTED IN ASIA, BY TYPE**



Source: NDCs and NCs.

**TABLE 10.**

**EXAMPLES OF OBSERVED AND/OR CLIMATE-RELATED HAZARDS REPORTED**

COUNTRY	CLIMATE-RELATED HAZARD	DESCRIPTION
BANGLADESH	DROUGHT	WESTERN PARTS OF THE COUNTRY WILL BE AT GREATER RISK OF DROUGHT DURING TWO PERIODS, THE MONTHS OF JANUARY – MAY AND JUNE – OCTOBER. DROUGHT SEVERITY WILL INCREASE WITH INCREASING TEMPERATURE
INDIA	FLOOD	ALMOST 85% OF INDIA'S AREA IS VULNERABLE TO ONE OR MULTIPLE HAZARD. 23 STATES AND UNION TERRITORIES COVERING 45.64 MILLION HECTARES OF LAND ARE SUBJECT TO FLOODS, AND ARE PRONE TO FLOOD DISASTERS
TIMOR-LESTE	STORMS	DECREASE IN FREQUENCY OF TROPICAL CYCLONES, BUT LIKELY INCREASE IN INTENSITY OF CYCLONES
PHILIPPINES	LANDSLIDES	WATERSHED DISASTERS SUCH AS LANDSLIDES AND FLOODS ARE RAPIDLY INCREASING BECAUSE OF THE INCREASING OCCURRENCE OF HEAVY RAINFALL
BRUNEI DARUSSALAM	WILD FIRE	REDUCED PRECIPITATION DURING THE DRY PERIOD FROM FEBRUARY TO MARCH, COUPLED WITH INCREASING TEMPERATURE CAN RESULT IN INCIDENCES OF FOREST AND BUSH FIRES AFFECTING FORESTS COVER AND QUALITY OF AIR
IRAN	INVASION BY PESTS AND NON-NATIVE SPECIES IN AGRICULTURE	OUTBREAKS OF PESTS AND DISEASES SUCH AS PASTURES WITH DRYING OAK FORESTS

## Climate-related slow onset events

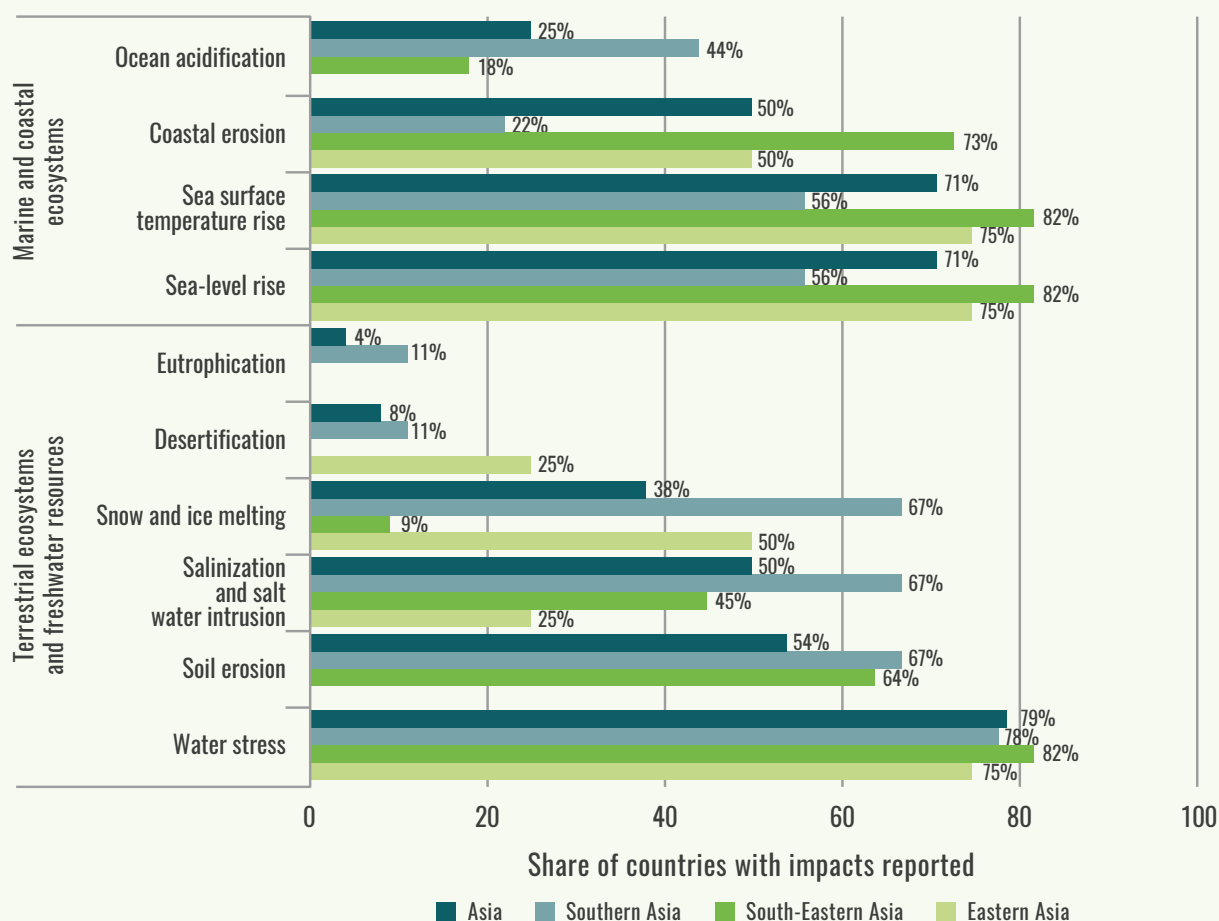
Countries often report observed and/or projected climate-related chemical, biological, and physical changes, leading to slow onset events.<sup>49</sup>

**In marine and coastal ecosystems, sea level rise and sea surface temperature rise are reported most frequently amongst observed and/or projected climate-related slow onset events** (71 percent of countries with impacts reported, respectively), followed by coastal erosion and acidification (50 and 25 percent, respectively). At the sub-regional level, ocean acidification in South-eastern Asia and coastal erosion in Southern Asia are amongst the most frequent slow onset events reported in marine and coastal ecosystems.

**In terrestrial and freshwater ecosystems, water stress is reported most amongst observed and/or projected climate-related slow onset events** (79 percent of countries with impacts reported), followed by soil erosion (54 percent), salt water intrusion (50 percent,) and snow and ice melting (38 percent), amongst others. **Figure 24** illustrates the share of countries, at the regional and sub-regional level, that report observed and/or projected climate-related slow onset events out of countries with climate impacts reported, by type of event.

**FIGURE 24.**

### OBSERVED AND/OR PROJECTED CLIMATE-RELATED SLOW ONSET EVENT REPORTED IN ASIA, BY TYPE



Source: NDCs and NCs.

<sup>49</sup> Definition of climate-related slow onset events adopted from IPCC (2014b).

TABLE 11.

## EXAMPLES OF OBSERVED AND/OR CLIMATE-RELATED SLOW ONSET EVENTS REPORTED

COUNTRY	CLIMATE-RELATED HAZARD	DESCRIPTION
MONGOLIA	TERRESTRIAL ECOSYSTEMS AND FRESHWATER RESOURCES	SNOW AND ICE MELTING
INDIA		THE MELTING OF PERMAFROST AND GLACIERS
CHINA		SALT WATER INTRUSION
MYANMAR		THE COASTAL AREAS OF BANGLADESH FACE SALINITY INTRUSION AND FRESH WATER SCARCITY DURING THE DRY SEASON WHICH WILL AGGRAVATE DUE TO SEA LEVEL RISE. AS A RESULT, AN ADDITIONAL 7.6 MILLION PEOPLE WILL BE EXPOSED TO HIGH SALINITY
IRAN		DESERTIFICATION
TIMOR-LESTE	MARINE AND COASTAL ECOSYSTEMS	ROCKY DESERTIFICATION
PHILIPPINES		SOIL EROSION
MALDIVES		RIVER BANK EROSION
MALAYSIA		WATER STRESS
		IN THE NEXT 15 YEARS (UP TO 2030) THE AMOUNT OF SURFACE RUNOFFS WILL CONTINUE TO DECREASE BY 25%
	MARINE AND COASTAL ECOSYSTEMS	SEA LEVEL RISE
		SEA LEVEL RISE HIGHER IN THE SOUTH COAST THAN NORTH COAST. ON AVERAGE, RISE IS 5.5 MM/YEAR
		OCEAN ACIDIFICATION
		SEA SURFACE TEMPERATURE RISE
	MARINE AND COASTAL ECOSYSTEMS	WARMING OF THE OCEAN SURFACE LEADS TO SIGNIFICANT CORAL BLEACHING
		COASTAL EROSION
		MALAYSIA HAS ABOUT 5 267 KM OF COASTLINE AND 29% OF THESE FACES EROSION PROBLEMS

## Climate-related vulnerabilities

### NON-CLIMATIC DRIVERS OF VULNERABILITY

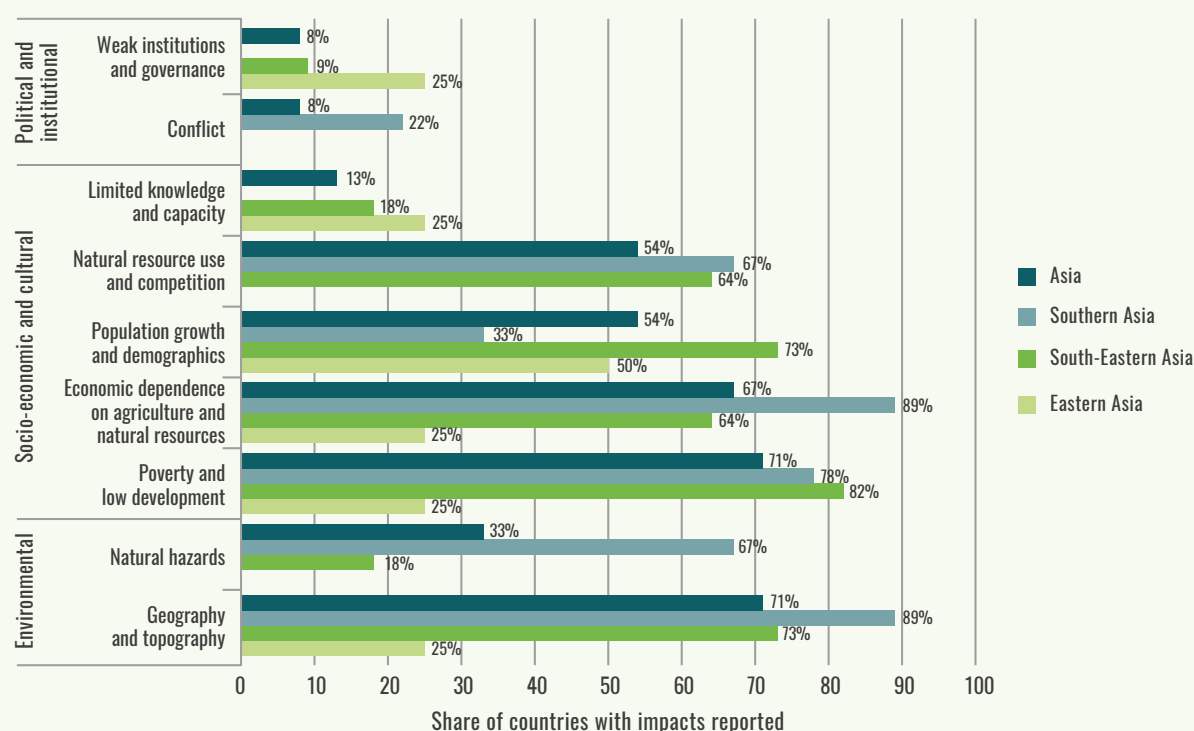
Countries often report on the intersecting environmental, social, economic, cultural, political and institutional variables, or stressors, that can affect individual adaptive capacity to respond, as well as the level of exposure to climate change, creating new or exacerbating existing vulnerabilities to climate change.<sup>50</sup>

Overall, poverty and low levels of development, along with geography and topography, are reported as the largest non-climatic drivers of vulnerability (71 percent of countries with impacts reported, respectively), followed by the economic dependence on agriculture and natural resources (67 percent), population growth and demographics and natural resource use and competition (54 percent, respectively), amongst others. At the sub-regional level, population growth and demographic changes constitute the greatest non-climatic drivers of vulnerability, while geography and topography are dominant stressors in Southern and South-eastern Asia. Figure 25 illustrates the share of countries, at the sub-regional level, that report non-climatic drivers of climate change vulnerability by type of stressor out of countries with climate impacts reported.

<sup>50</sup> Definition of non-climatic stressors adapted from IPCC (2014b).

FIGURE 25.

## NON-CLIMATIC DRIVER OF CLIMATE CHANGE VULNERABILITY REPORTED IN ASIA, BY TYPE



Source: NDCs and NCs.

TABLE 12.

## EXAMPLES OF NON-CLIMATIC DRIVERS OF VULNERABILITY REPORTED

COUNTRY	NON-CLIMATIC DRIVER	DESCRIPTION
INDONESIA	ENVIRONMENTAL	GEOGRAPHY AND TOPOGRAPHY AS AN ARCHIPELAGIC COUNTRY WITH EXTENSIVE LOW-LYING AND SMALL ISLAND AREAS, INDONESIA FACES A HIGH RISK OF COASTAL INUNDATION AND SEA LEVEL RISE THAT MAY AFFECT UP TO 42 MILLION PEOPLE LIVING IN LOW LAYING COASTAL ZONES
MYANMAR		NATURAL HAZARDS TSUNAMI, EARTHQUAKES, VOLCANOES
CAMBODIA	SOCIO-ECONOMIC AND CULTURAL	LIVELIHOOD DEPENDENCE ON AGRICULTURE AND NATURAL RESOURCES THE COUNTRY'S MOST IMPORTANT AGRICULTURAL PRODUCTION SYSTEM IS DEPENDENT EITHER ON RAINFALL OR ON THE ANNUAL FLOODING AND RECESSION OF THE TONLE SAP GREAT LAKE. THE SECTOR IS THEREFORE PARTICULARLY SENSITIVE TO POTENTIAL CHANGES IN LOCAL CLIMATE AND MONSOON REGIMES. AGRICULTURE EMPLOYS 75% OF THE POPULATION. AN ESTIMATED ONE MILLION CAMBODIANS DEPEND ON INLAND FISHERIES FOR THEIR LIVELIHOODS
INDIA		POPULATION GROWTH AND DEMOGRAPHICS INDIA IS PROJECTED TO BECOME THE MOST POPULATED COUNTRY BY 2030 AND WILL NEED TO PRODUCE AN ADDITIONAL 100 MILLION TONNES OF FOOD GRAINS TO FEED THE LARGE POPULATION. OCCUPYING ALMOST 2.3% OF THE WORLD'S LAND AREA, IT IS THE 7TH LARGEST COUNTRY IN THE WORLD BUT HOLDS NEARLY 18% OF THE WORLD'S POPULATION
TIMOR-LESTE		POVERTY AND LOW ECONOMIC DEVELOPMENT ABOUT 30.3% OF THE POPULATION IS ESTIMATED TO LIVE BELOW THE POVERTY LINE. HIGH RATE OF UNEMPLOYMENT AND RURAL-URBAN MIGRATION. POVERTY REMAINS A CHALLENGE, WHILE UNEMPLOYMENT AND UNDEREMPLOYMENT ARE STILL RELATIVELY HIGH. ABOUT 41% OF THE POPULATION HAS A PER CAPITA INCOME OF LESS THAN USD \$0.88 PER DAY
CAMBODIA		NATURAL RESOURCE USE AND COMPETITION COASTAL ZONE RESOURCES ALREADY FACE A NUMBER OF PRESSURES, INCLUDING FROM OVER-FISHING, OVER-EXPLOITATION OF FOREST RESOURCES AND MANGROVE ECOSYSTEMS LEADING TO INCREASED EROSION
MONGOLIA		LIMITED KNOWLEDGE AND CAPACITY INSUFFICIENT HUMAN RESOURCES CAPACITY AND A LACK OF TECHNICAL TRAINING ON CLIMATE CHANGE AND LIMITED ENGAGEMENT OF ACADEMIC INSTITUTIONS
AFGHANISTAN	POLITICAL AND INSTITUTIONAL	CONFLICT AND VIOLENCE DECADES OF WAR AND SOCIAL UNREST
MONGOLIA		WEAK INSTITUTIONS AND GOVERNANCE WEAK COORDINATION AND INTEGRATION AMONG VARIOUS SECTORS

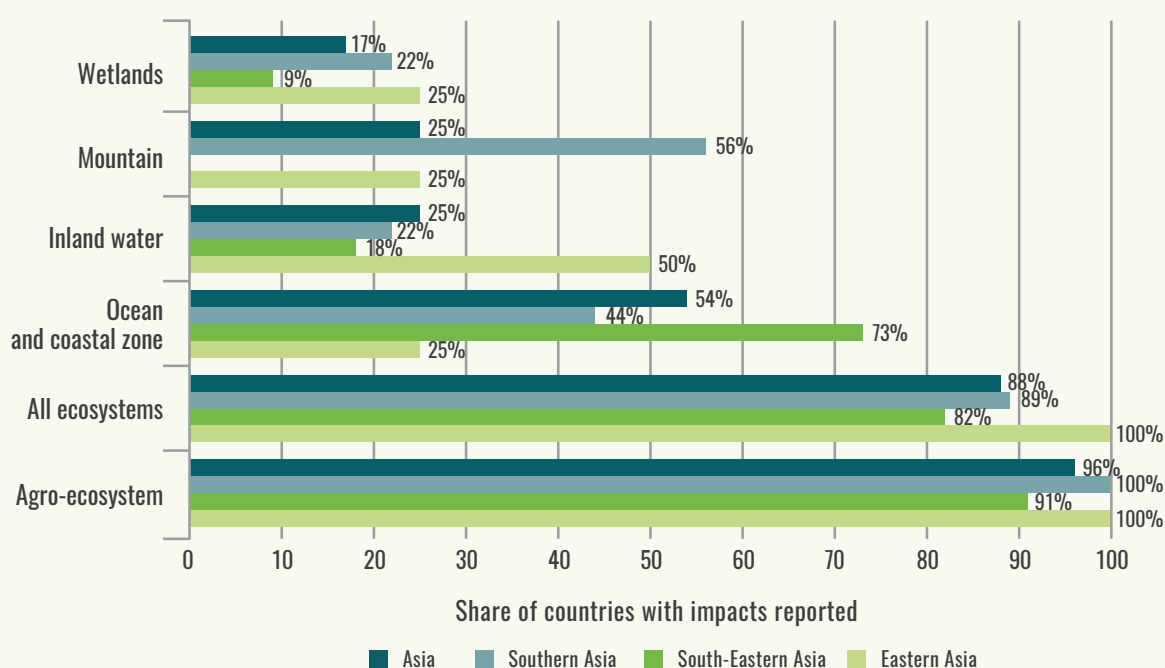
## CLIMATE-RELATED IMPACTS, VULNERABILITIES AND RISKS IN ECOSYSTEMS

Countries often report observed and/or projected climate-driven impacts, vulnerabilities and risks in ecosystems.<sup>51</sup> The impacts of climate change refer generally to the effects of extreme weather and climate events and of climate change on the lives, livelihoods, health, ecosystems, economies, societies, cultures, services, and infrastructure, due to the interaction of climate changes or hazardous climate events occurring within a specific time period and the vulnerability of an exposed society or system. The vulnerability of an exposed system depends on sensitivity and lack of capacity to cope and adapt. The probability of occurrence compounded by the impact, or risk, results from the interaction of vulnerability, exposure, and hazard.<sup>52</sup>

All countries in the region, with the exception of one,<sup>53</sup> identify at least one observed and/or expected impact, vulnerability and risk induced by climate change in ecosystems, of which agro-ecosystems are considered the most vulnerable (96 percent of countries with impacts reported), followed by ecosystems in general (88 percent), oceans and coastal zones (54 percent), inland water and mountain ecosystems (25 percent, respectively), wetlands (17 percent). At the sub-regional level, after agroecosystems and ecosystems, inland water ecosystems in Eastern Asia, ocean and coastal zones in South-eastern Asia and mountain ecosystems in Southern Asia are reported amongst most vulnerable ecosystems. Figure 26 illustrates the share of countries, at the sub-regional level, that report one or more observed and/or expected climate-related impact, vulnerability and risk in ecosystems out of countries that report climate impacts, by type of ecosystem.

**FIGURE 26.**

**OBSERVED AND/OR PROJECTED CLIMATE-DRIVEN IMPACTS, VULNERABILITIES AND RISKS IN ECOSYSTEMS REPORTED IN ASIA, BY ECOSYSTEM**



Source: NDCs and NCs.

<sup>51</sup> Definition of ecosystems elaborated from MEA (2005).

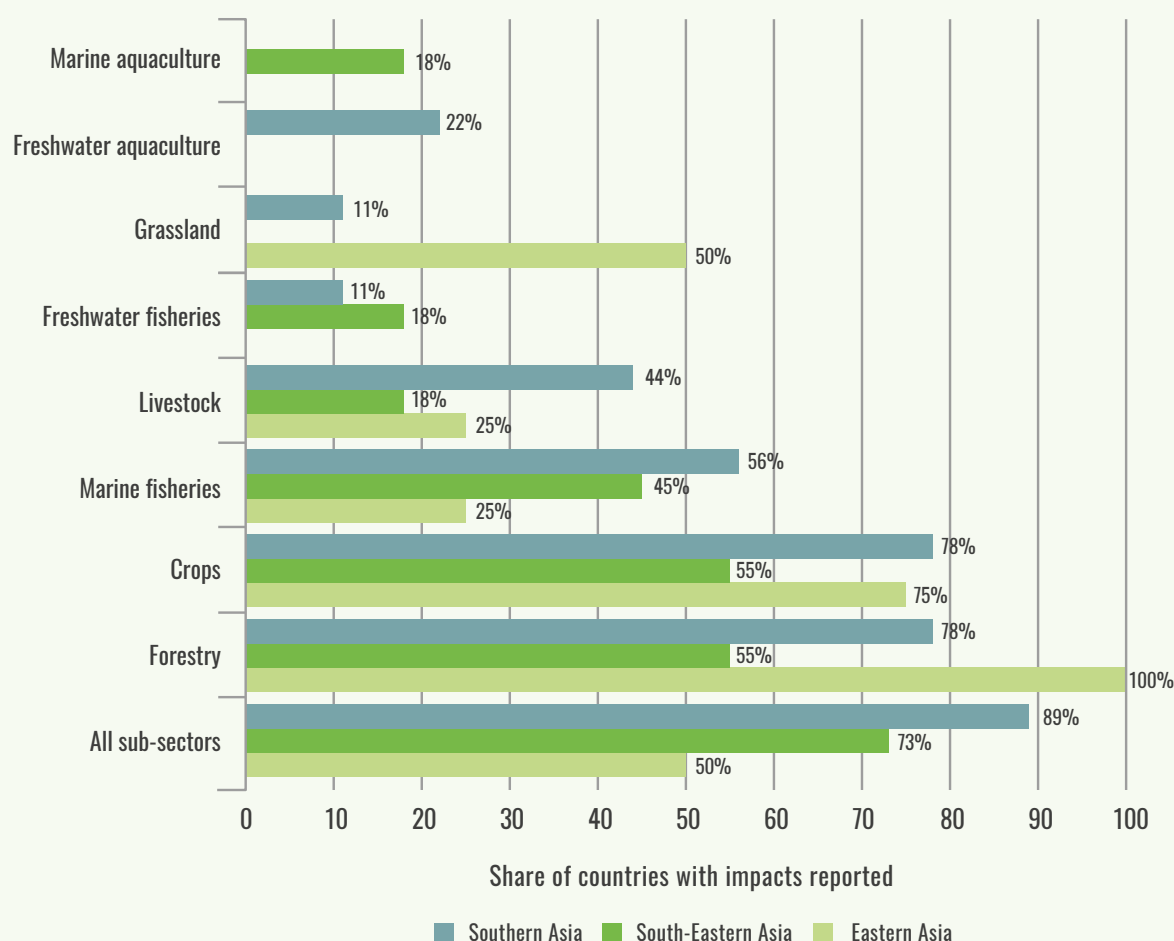
<sup>52</sup> Definition of impact, vulnerability and risk in ecosystems adapted from IPCC (2014b).

<sup>53</sup> Japan.

In agro-ecosystems, the majority of countries indicate the agriculture sector in general and forestry as the most vulnerable sub-sector to climate change (75 and 71 percent of countries with impacts reported, respectively), followed by the crops (67 percent), marine fisheries (46 percent) and livestock sub-sectors (29 percent), amongst others. At the sub-regional level, over half of countries in Eastern Asia report the forestry and crops sub-sectors as most vulnerable to climate change, while forestry, crops and marine fisheries are reported amongst the most vulnerable in South-eastern and Southern Asia. **Figure 27** illustrates the share of countries, at the sub-regional level, that report one or more observed and/or expected climate-related impact, vulnerability and risk in agro-ecosystems out of countries that report climate impacts, by sub-sector/land use category.

**FIGURE 27.**

**OBSERVED AND/OR PROJECTED CLIMATE-DRIVEN IMPACTS, VULNERABILITIES AND RISKS IN AGRO-ECOSYSTEMS IN THE PACIFIC, BY SUB-SECTOR/LAND USE**

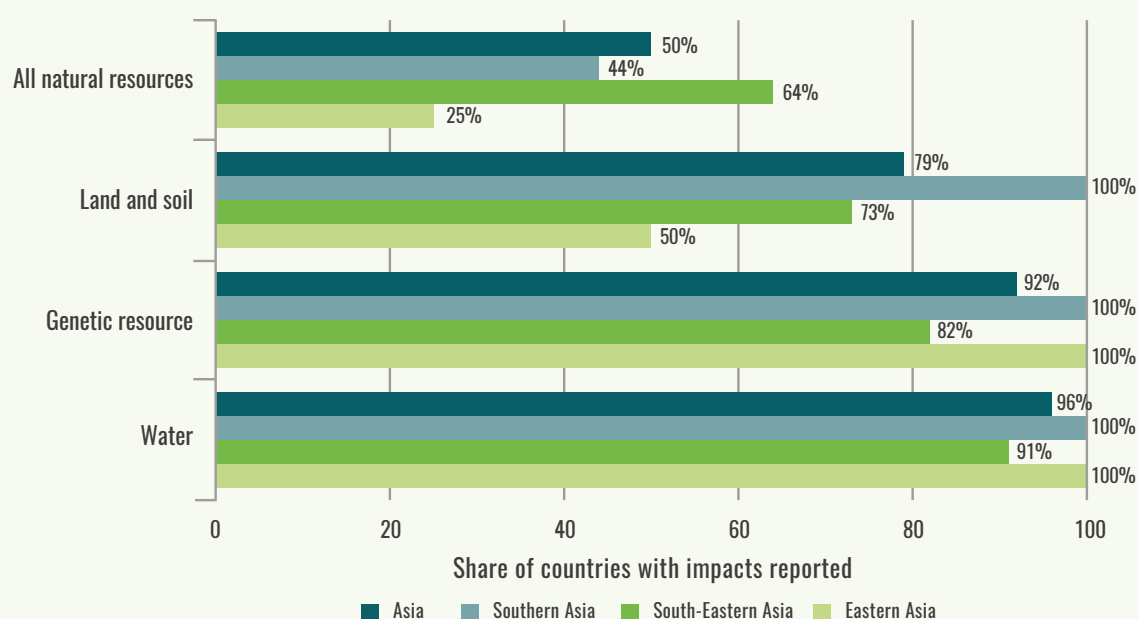


Source: NDCs and NCs.

**Climate-driven impacts, vulnerabilities and risks in ecosystems vary by natural resource and ecosystem service affected.** Observed and/or projected climate-related impacts reported by countries were qualified by the type of natural resource and ecosystem service primarily affected.

**Overall, water resources are reported most frequently amongst climate-related impacts on natural resources** across all ecosystems, followed by genetic resources and land and soil. At the sub-regional level, ecosystem-specific impacts become more evident. In Eastern Asia, genetic resources and land and soil resources are most vulnerable in agro-ecosystems while water resources in inland water and mountain ecosystems

are most often reported amongst climate-related impacts. In South-eastern Asia, genetic resources in agro-ecosystems and land and soil resources in ocean and coastal zones are reported as most vulnerable. In Southern Asia, genetic resources in agro-ecosystems, land and soil resources in ocean and coastal zones and water resources in mountain ecosystems are most often reported amongst climate-related impacts. **Figure 28** illustrates the share of countries, at the regional and sub-regional level, that reported observed and/or projected climate-related impacts in ecosystems out of countries with impacts reported, by natural resource impact category per sub-region.

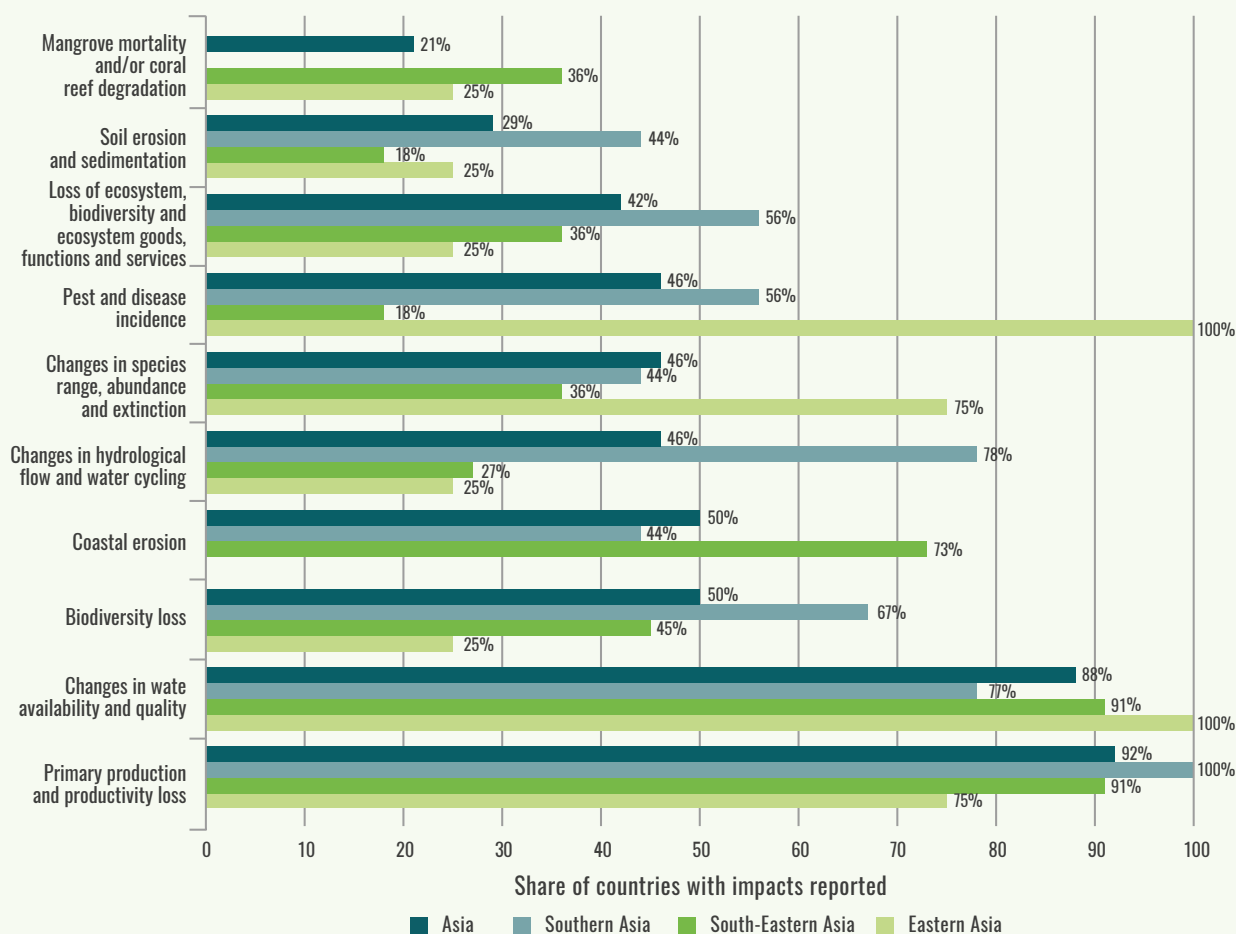
**FIGURE 28.****OBSERVED AND/OR PROJECTED CLIMATE-RELATED IMPACTS REPORTED ON NATURAL RESOURCES IN ASIA, BY TYPE**

Source: NDCs and NCs.

**Loss of primary production and productivity and changes in water availability and quality are most frequently reported amongst climate-related impacts on ecosystem services** across all ecosystems followed by biodiversity loss and coastal erosion. amongst others. At the sub-regional level, ecosystem-specific impacts become more evident. In Eastern Asia, all countries with impacts reported refer to changes in water availability and quality, primarily in the crops sub-sector and inland water ecosystems, as well as pest and disease incidence, particularly in the forestry sub-sector. In South-eastern Asia, changes in primary production are mostly observed in the crops and marine fisheries sub-sector, and changes in water availability and quality is observed across all ecosystems. In South-eastern Asia, changes in primary production are mostly observed in the crops and marine fisheries sub-sector, and changes in hydrological flow and water cycling is observed primarily in mountain ecosystems. **Figure 29** illustrates the share of countries, at the regional and sub-regional level, with observed and/or projected climate-related impacts in ecosystems by ecosystem service impact category.

FIGURE 29.

## OBSERVED AND/OR PROJECTED CLIMATE-RELATED IMPACTS REPORTED ON ECOSYSTEM SERVICES IN ASIA, BY TYPE



\* Impacts reported by 20 percent or less of countries are excluded from the figure.  
Source: NDCs and NCs.

TABLE 13.

## EXAMPLES OF OBSERVED AND/OR PROJECTED CLIMATE-RELATED IMPACTS, VULNERABILITIES AND RISKS REPORTED IN ECOSYSTEMS

COUNTRY	ECOSYSTEM	SECTOR	CLIMATE-RELATED RISK
MALAYSIA	AGRO-ECOSYSTEM	AQUACULTURE	TEMPERATURE RISE COMBINED WITH BAD WATER QUALITY WILL CAUSE STRESS TO THE CULTURED FISH THAT WILL BE SUSCEPTIBLE TO DISEASE INFECTION. FOR BRACKISH WATER CAGE AQUACULTURE, CLIMATE CHANGE HAS CONTRIBUTED TO SIGNIFICANT LOSS IN CULTURE PRODUCTION. RISING TEMPERATURE CAN CAUSE ALGAE BLOOM DUE TO OXYGEN DEPLETION AND THIS WILL INTOXICATE THE WATER
CHINA		FISHERIES	AMONG THE MARINE CATCHES IN THE TAIWAN STRAIT, THE SHARE OF WARM WATER FISHES HAVE INCREASED, WHILE TEMPERATE WATER FISHES HAVE DECREASED BY 10-20%
NEPAL		FORESTRY	DUE TO CONTINUOUS RAINFALL AFTER CONVENTIONAL MONSOON PERIOD, RISE IN TEMPERATURE, AND OTHER UNKNOWN FACTORS VARIOUS PESTS AND DISEASES ARE SEEN INCREASING IN FOREST ECOSYSTEMS
BANGLADESH		CROPS	BORO RICE WHICH ACCOUNTS FOR AROUND 60% OF DOMESTIC OUTPUT WILL BE HIGHLY VULNERABLE TO CLIMATE CHANGE IMPACTS. STUDY RESULTS INDICATE OUTPUT WILL REDUCE BY 4.74% (2050)
AFGHANISTAN		LIVESTOCK	LIVESTOCK NUMBERS MAY BE REDUCED BY UP TO 50% DURING THE PERIODS OF DROUGHT DUE TO OUTWARD MIGRATION AND STARVATION, REDUCED AVAILABILITY OF ANIMAL FEED, LESS FUNDS AVAILABLE FOR LIVESTOCK HUSBANDRY



MONGOLIA	INLAND WATER	THE DRYING UP OF LAKES, RIVERS AND SPRINGS AND MELTING OF GLACIERS HAS INTENSIFIED IN THE LAST DECADES. THE RECENT SURFACE WATER RESOURCE INVENTORY CONFIRMED THAT 12% OF RIVERS, 21% OF LAKES AND 15% OF SPRINGS HAVE DRIED UP
BHUTAN	MOUNTAIN	GLACIERS AND GLACIAL LAKE OUTBURST FLOODS IN THE HIMALAYANS
VIETNAM	OCEAN AND COASTAL ZONE	CLIMATE CHANGE MAY HAVE SERIOUS IMPACTS ON COASTAL ECOSYSTEMS, RESERVES AND MANGROVE FORESTS. SEA-LEVEL RISE WOULD EXACERBATE SALINIZATION IN COASTAL ZONES, CAUSING THE RETREAT OF MANGROVE FORESTS WITH ACCOMPANYING LOSSES IN HABITAT FOR NUMEROUS SPECIES
IRAN	WETLANDS	DRYING OF WETLANDS

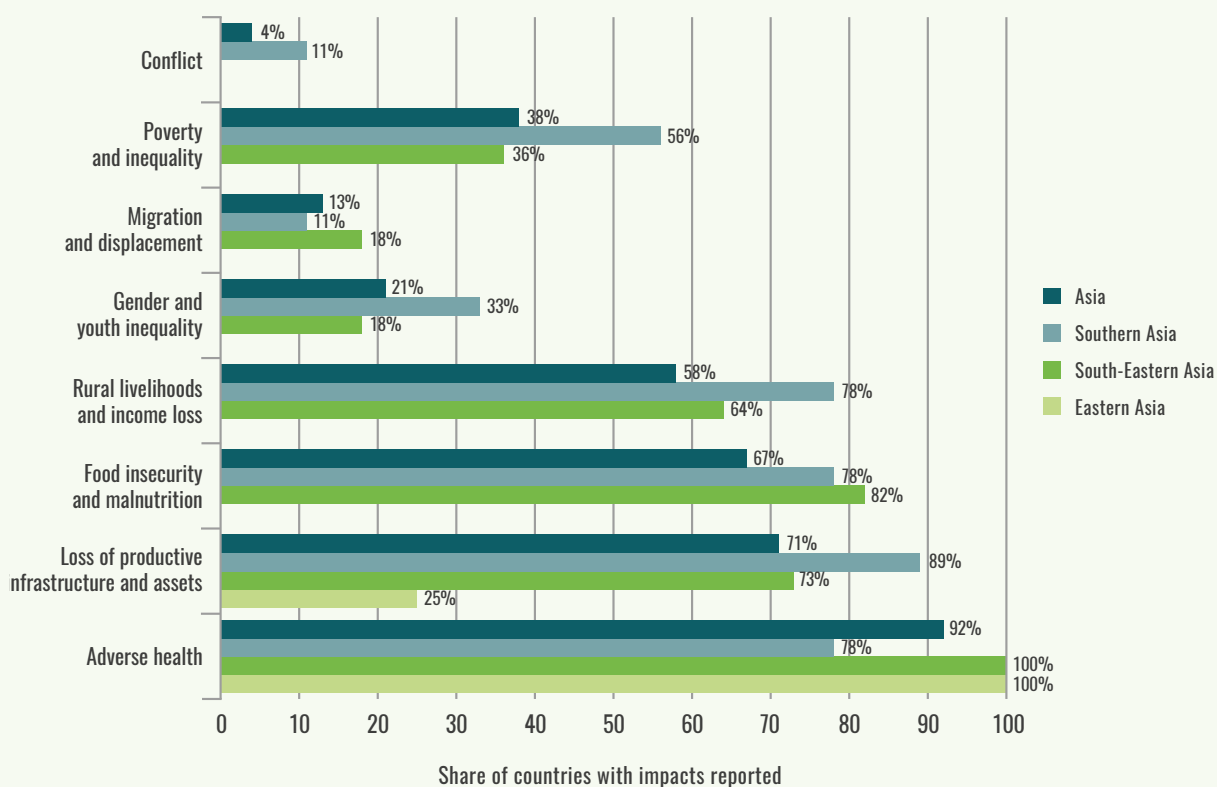
## CLIMATE-RELATED IMPACTS, VULNERABILITIES AND RISKS IN SOCIAL SYSTEMS

All countries in the region, with the exception of three,<sup>54</sup> identify at least one observed and/or expected impact, vulnerability and risk induced by climate change in social systems.<sup>55</sup> For the sake of this analysis, the climate-related impacts are differentiated across three main pillars: socio-economics and well-being; knowledge and capacity; and institutions and governance.

Overall, the majority of those countries report health as the social dimension most at risk under climate change (92 percent of countries with impacts reported), followed by productive infrastructure and assets (71 percent), food security and nutrition (67 percent) and rural livelihoods and incomes (58 percent), amongst others. Sub-regional trends reflect those observed at the regional level, with increased poverty and inequality constituting a major climate-related risk amongst those reported in Southern Asia. Figure 30 illustrates the share of countries, at the sub-regional level, that report one or more observed and/or expected climate-related impact, vulnerability and risk in social systems out of countries with impacts reported, by risk type.

FIGURE 30.

### OBSERVED AND/OR PROJECTED CLIMATE-RELATED IMPACTS, VULNERABILITIES AND RISKS REPORTED IN ASIA, BY TYPE



Source: NDCs and NCs.

<sup>54</sup> China, Japan and Republic of Korea.

<sup>55</sup> Definition of impact, vulnerability and risk in social systems adapted from IPCC (2014b).

TABLE 14.

## EXAMPLES OF OBSERVED AND/OR PROJECTED CLIMATE-RELATED IMPACTS, VULNERABILITIES AND RISKS REPORTED IN SOCIAL SYSTEMS

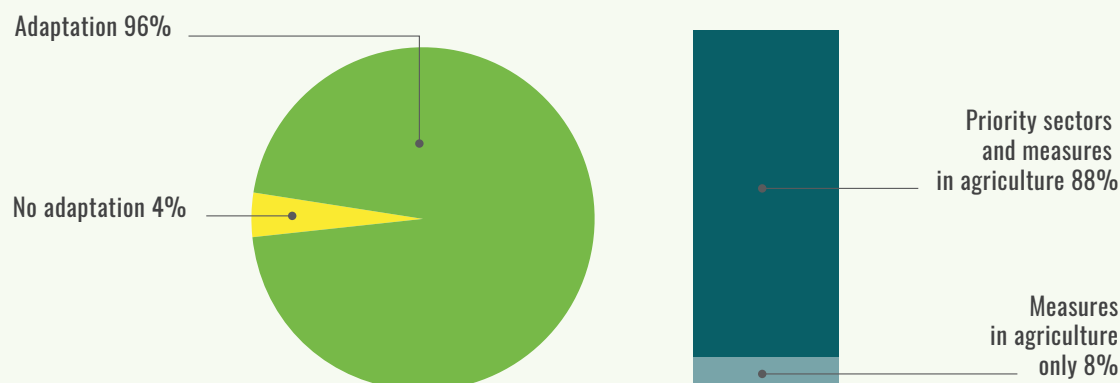
COUNTRY	CLIMATE-RELATED RISK	DESCRIPTION
BANGLADESH	LOSS OF PRODUCTIVE INFRASTRUCTURE AND ASSETS	EXTREME WEATHER-RELATED EVENTS SUCH AS FLOODS, HEAVY RAINS WITHIN A VERY SHORT TIME, CYCLONES AND STORM SURGES CAUSE NOT ONLY LOSS OF LIVES, BUT ALSO DESTROY ESSENTIAL RURAL AND URBAN INFRASTRUCTURE. ABOUT 0.1 MILLION PEOPLE BECOME HOMELESS EVERY YEAR IN THE COUNTRY DUE TO RIVER EROSION
BRUNEI DARUSSALAM	ADVERSE HEALTH	INCREASED HEAT STRESS COULD RESULT IN EXTREME DROUGHT EVENTS AND A HIGHER RISK OF WATER SCARCITY, ALONG WITH ADVERSELY AFFECTING THE HEALTH OF WORKERS AND INCREASING THE OCCURRENCE OF FOREST FIRES. VECTOR-BORNE DISEASES, PARTICULARLY DENGUE FEVER, ARE THE MOST COMMON TYPE OF CLIMATE-SENSITIVE DISEASES
INDONESIA	FOOD INSECURITY AND MALNUTRITION	CLIMATE CHANGE PRESENTS SIGNIFICANT RISKS FOR INDONESIA'S NATURAL RESOURCES THAT WILL, IN TURN, IMPACT THE PRODUCTION AND DISTRIBUTION OF FOOD, WATER, AND ENERGY
AFGHANISTAN	RURAL LIVELIHOODS AND INCOME LOSS	BY 2060, LARGE PARTS OF THE AGRICULTURAL ECONOMY WILL BECOME MARGINAL WITHOUT SIGNIFICANT INVESTMENT IN WATER MANAGEMENT AND IRRIGATION
BANGLADESH	GENDER AND YOUTH INEQUALITY	WOMEN MAY FACE CERTAIN BIO-PHYSICAL STRESSES DUE TO CLIMATE CHANGE AND ITS IMPACTS. THESE ARE SOME TIME ACCENTUATED BY THEIR SOCIAL, REPRODUCTIVE AND CARE-GIVER ROLE IN THE FAMILY AS WELL AS THEIR SOCIAL DIFFERENTIATION THAT THEY MAY FACE
AFGHANISTAN	CONFLICT	FURTHER POLITICAL INSTABILITY
MYANMAR	MIGRATION AND DISPLACEMENT	OBSERVED CHANGES IN THE LAST DECADES INCLUDE RAIN PATTERNS VARIATIONS THAT ARE CAUSING CLIMATE-DRIVEN MIGRATION
TIMOR-LESTE	POVERTY AND INEQUALITY	LOSSES IN AGRICULTURAL PRODUCTION WILL INCREASE POVERTY AND VULNERABILITY

### 3.2.2 Adaptation in the agriculture and land use sectors

All countries in Asia, with the exception of one,<sup>56</sup> communicated an adaptation component, all of which include the agriculture and land use sectors. The level of detail included in each country's adaptation component varies, as some countries detailed their adaptation visions, goals and measures, while other countries made reference to national adaptation and climate change plans. The majority of countries include a set of priority sector(s) and measures in the agriculture and land use sectors (96 percent of countries with adaptation) and two countries<sup>57</sup> only include measures. **Figure 31** illustrates the share of countries with an adaptation component and adaptation in the agriculture and land use sectors, by type.

<sup>56</sup> Japan.

<sup>57</sup> Republic of Korea and Pakistan.

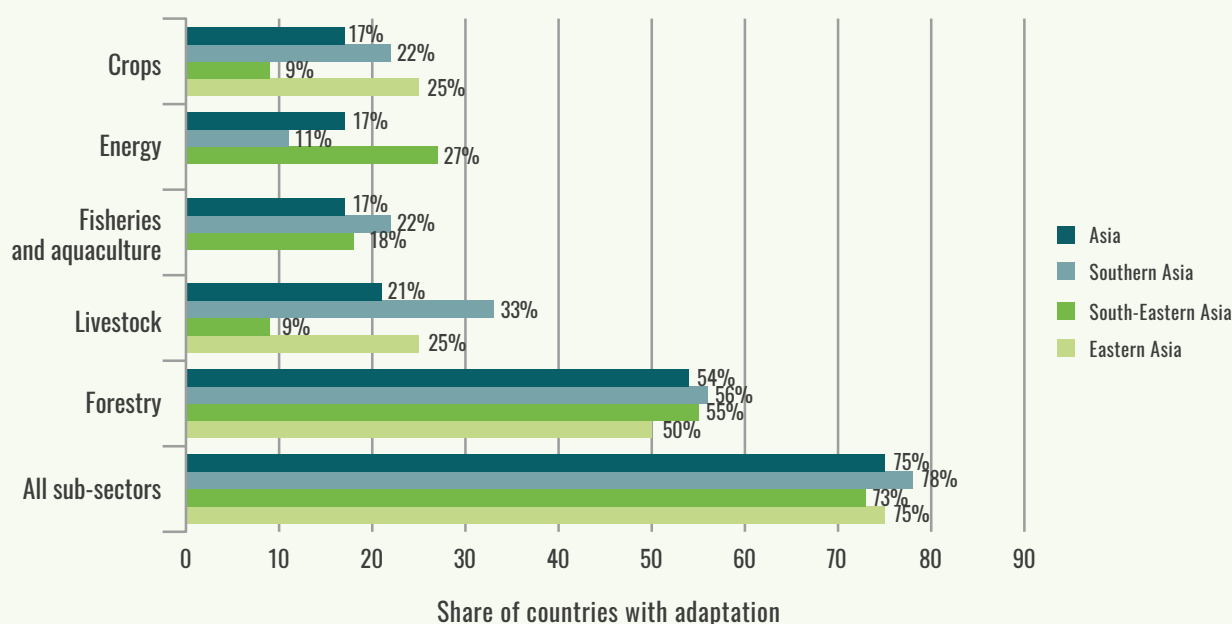
**FIGURE 31.****ADAPTATION COMPONENT IN THE AGRICULTURE AND LAND USE SECTORS EXPRESSED IN THE NDCs OF ASIAN COUNTRIES**

Source: NDCs.

## Priority sectors and cross-sectoral priorities

Countries often identify a number of priority (sub-) sectors and cross-sectoral priorities in ecosystems and social systems as part of their adaptation strategy in the agriculture and land use sectors.

Amongst priority sectors for adaptation, the majority of countries promote agriculture in general (75 percent of countries with an adaptation component). Fifty-four percent of the countries specifically refer to the forestry sub-sector, followed by the livestock (21 percent). Fisheries and aquaculture, energy, crops are promoted to a comparable degree (17 percent each). Figure 32 illustrates the share of countries with an adaptation component, at the regional and sub-regional level, with priority sectors in agriculture by sub-sector.

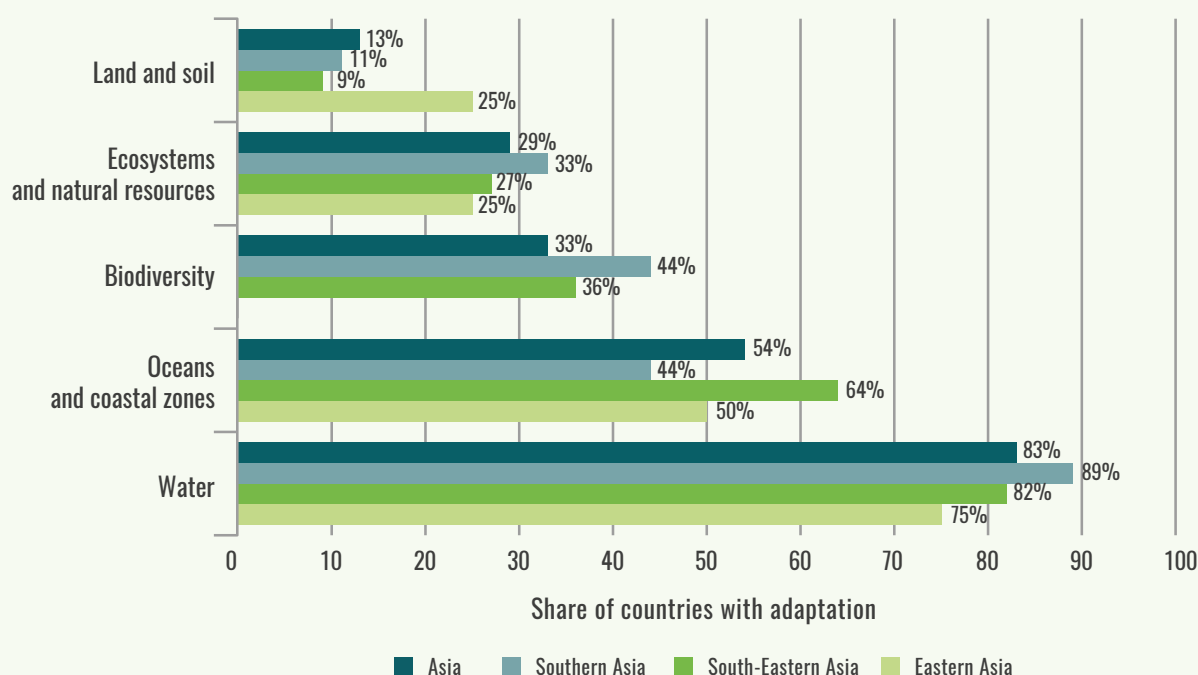
**FIGURE 32.****ADAPTATION PRIORITY SECTORS IN AGRICULTURE IN THE NDCs OF ASIAN COUNTRIES, BY (SUB-) SECTOR**

Source: NDCs.

Amongst cross-sectoral priorities for adaptation, water is promoted most frequently (83 percent of countries with an adaptation component), followed by oceans and coastal zones (54 percent of countries), biodiversity (33 percent), ecosystems and natural resources (29 percent) land and soil (13 percent). **Figure 33** illustrates the share of countries with an adaptation component, at the regional and sub-regional level, with cross-sectoral priorities in ecosystems, by type.

**FIGURE 33.**

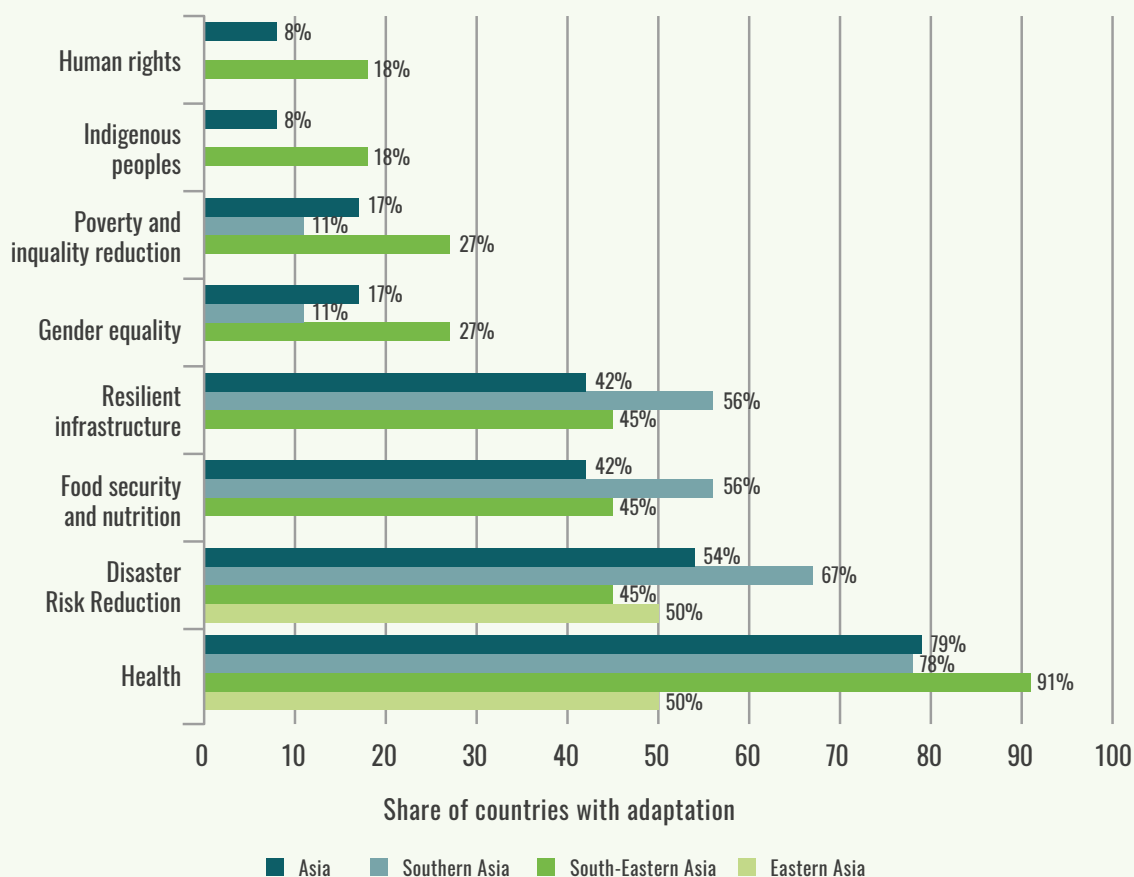
**CROSS-SECTORAL ADAPTATION PRIORITIES IN ECOSYSTEMS IN THE NDCs OF ASIAN COUNTRIES, BY TYPE**



Source: NDCs.

Countries often identify a number of cross-cutting priorities in social systems as part of their adaptation strategy.

**Health represents the most frequently promoted cross-cutting adaptation measure in social systems amongst countries in the region** (79 percent of countries with an adaptation component), followed by Disaster Risk Reduction (DRR) (54 percent), food security and nutrition and resilient infrastructure (42 percent, respectively). Gender equality and poverty and inequality reduction are included to a comparable degree (17 percent each). The distribution of priorities at the sub-regional level reflects regional trends, with indigenous peoples and human rights specific to adaptation in South-eastern Asia. **Figure 34** illustrates the share of countries with an adaptation component, at the regional and sub-regional level, with cross-cutting priorities in social systems by type.

**FIGURE 34.****CROSS-CUTTING ADAPTATION PRIORITIES IN SOCIAL SYSTEMS IN THE NDCs OF ASIAN COUNTRIES, BY TYPE**

Source: NDCs.

## Adaptation measures in ecosystems and social systems

Adaptation measures in ecosystems are differentiated by type of ecosystem, natural resource and ecosystem service supported and management activity. Adaptation measures in social systems are differentiated by dimension and intervention option. The methodology section contains more details on the categorization process. It should be noted that the objective of adaptation measures and their entry-points are often multiple, as their impacts are often cross-cutting. For this reason, adaptation measures are categorized thematically, depending on the level of detail provided, and categories are not considered mutually exclusive.

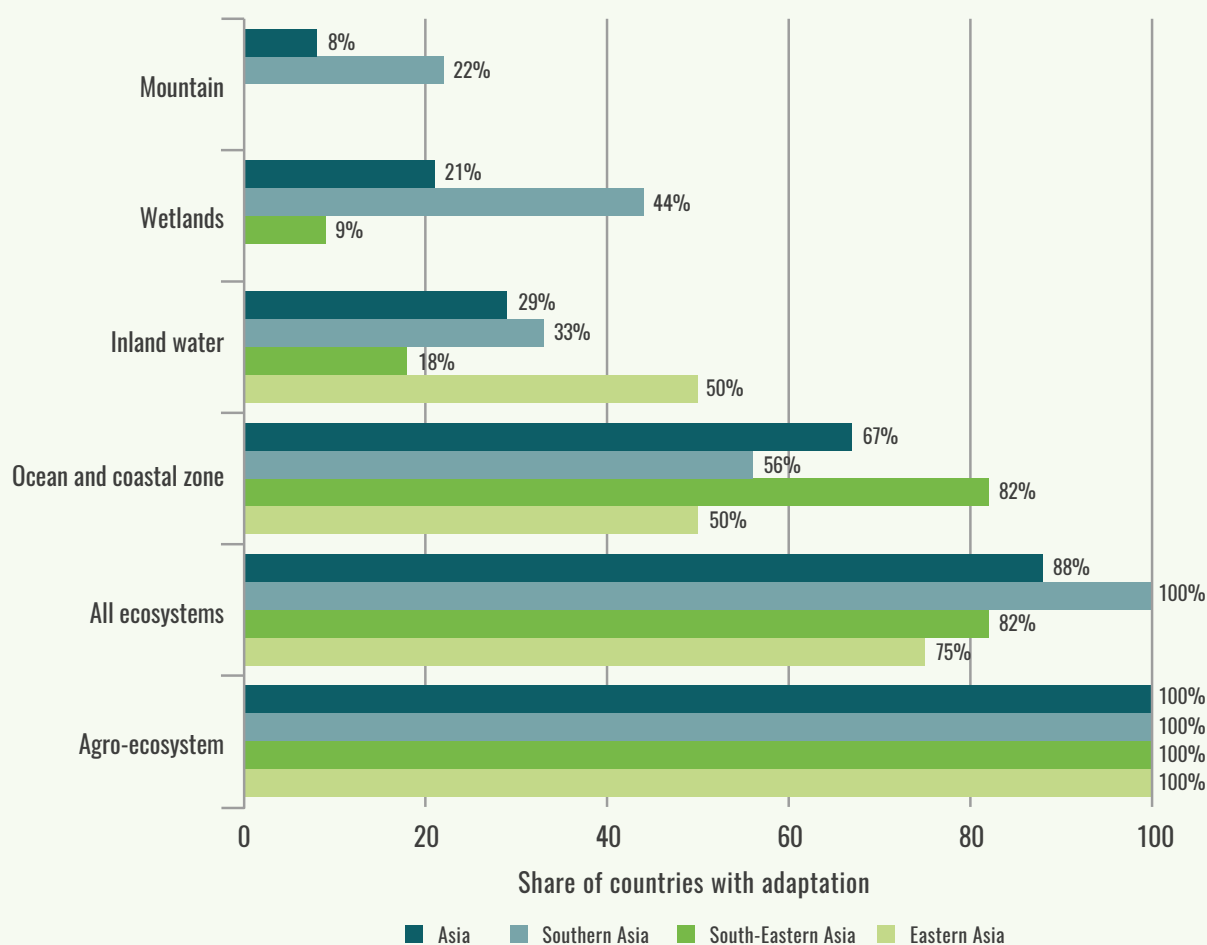
Overall, the majority of adaptation measures in Asia take the form of biophysical- and institutional-related approaches, with a small share of regulatory and control, economic and informational-based measures. Only around 5 percent of adaptation measures have quantified targets, likely due to the challenges related to measuring adaptation baselines and outcomes at the local and national scale. Ninety percent require a combination of domestic and international financial support, while only a small share of policies or measures are fully conditional to international finance and an even smaller share are unconditional to it.

## ADAPTATION MEASURES IN ECOSYSTEMS

All countries with an adaptation component in Asia identify at least one adaptation measure in ecosystems, particularly in agro-ecosystems (100 percent of countries with an adaptation component), followed by ecosystems in general (88 percent) and oceans and coastal zones (67 percent), and inland water ecosystems (29 percent), amongst others. Figure 35 illustrates the share of countries, at the regional and sub-regional level, that include one or more (to avoid bias of representation) adaptation measure in ecosystems out of countries with an adaptation component, by type of ecosystem.

**FIGURE 35.**

### ADAPTATION MEASURES IN ECOSYSTEMS IN THE NDCs OF ASIAN COUNTRIES, BY ECOSYSTEM TYPE

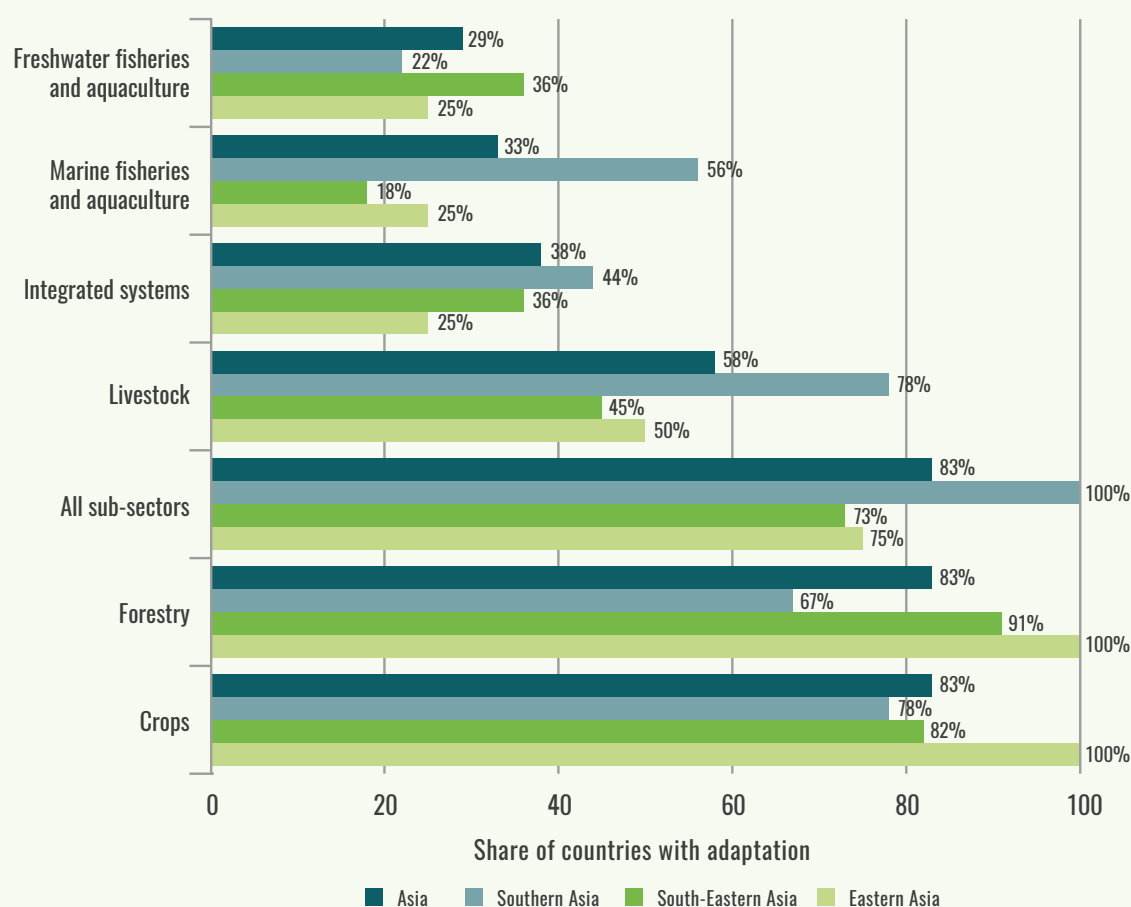


Source: NDCs.

The adaptation measures in ecosystems are described by ecosystem type and management activity in order of regional priority.

## Agro-ecosystems

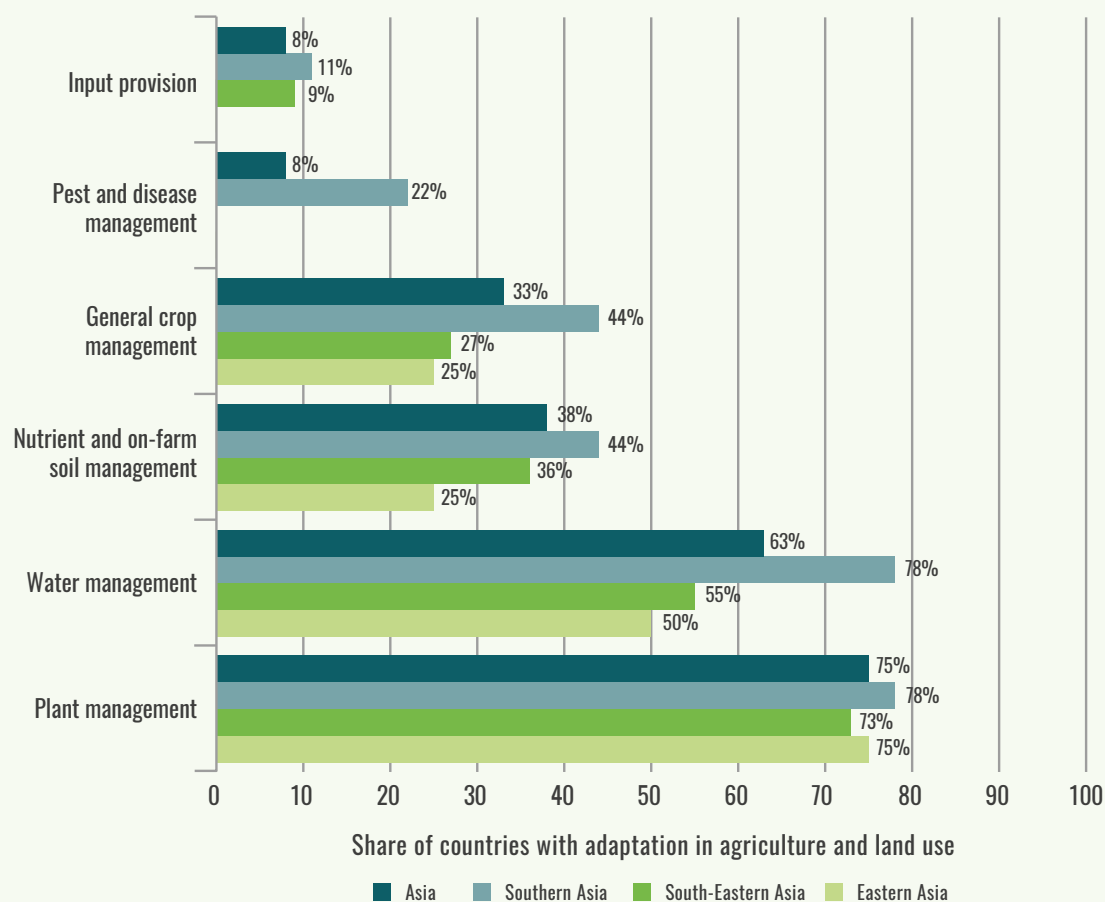
All countries in the region identify at least one adaptation measure in agro-ecosystems. The majority of countries promote adaptation in crops, forestry and agriculture in general (83 percent of countries with adaptation, respectively), followed by livestock (58 percent), integrated systems (28 percent), marine fisheries and aquaculture (33 percent) and freshwater fisheries and aquaculture (29 percent). Figure 36 illustrates the share of countries, at the regional and sub-regional level, with one or more (to avoid bias of representation) adaptation measure in agro-ecosystems out of countries with an adaptation component, by sub-sector.

**FIGURE 36.****ADAPTATION MEASURES IN AGRO-ECOSYSTEMS IN THE NDCs OF ASIAN COUNTRIES, BY SUB-SECTOR**

Source: NDCs.

**CROPS**

Eighty-three percent of countries with an adaptation component include adaptation in the crops sub-sector. The majority of those countries promote plant management (75 percent of countries with adaptation in agriculture and land use sectors, respectively), followed by water management (63 percent), nutrient and on-farm soil management and general crop management (38 percent, respectively), amongst others. **Figure 37** illustrates the share of countries, at the regional and sub-regional level, with one or more (to avoid bias of representation) adaptation measure in the crops sub-sector out of countries with an adaptation in agriculture and land use sectors, by management activity.

**FIGURE 37.****ADAPTATION MEASURES IN THE CROPS SUB-SECTOR IN THE NDCs OF ASIAN COUNTRIES, BY TYPE**

Source: NDCs.

**TABLE 15.****EXAMPLES OF ADAPTATION MEASURES IN THE CROPS SUB-SECTOR**

COUNTRY	MANAGEMENT ACTIVITY	METRIC	2030 TARGET
SRI LANKA	ADOPT KAKULAN OR MANAWARI CULTIVATION PRACTICES (REFER TO AN INDIGENOUS SYSTEM OF DRY SEEDBED PREPARATION WHEN WATER SUPPLY IS LIMITED)	NON-QUANTIFIED	
PHILIPPINES	USE OF DRYERS AND OTHER POST-HARVEST FACILITIES THAT WILL MINIMIZE LOSSES AND HANDLE PRODUCTION SURPLUS	NON QUANTIFIED	
MALAYSIA	MULCHING WITH OIL PALM CROP RESIDUES AND PLANTING OF COVER CROPS ARE ESSENTIAL TO INCREASE SOIL ORGANIC MATTER AND REDUCE IMPACTS FROM FLOODING, EROSION, DRY SPELL AND HEAVY RAIN	NON-QUANTIFIED	

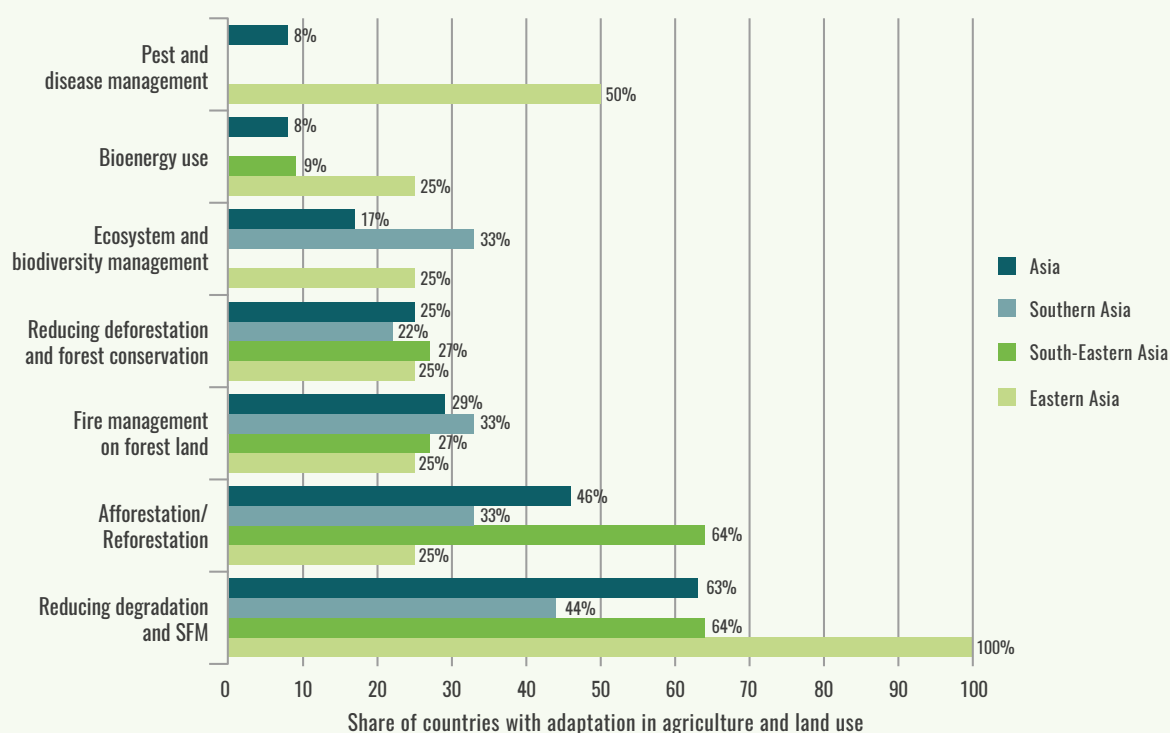


## FORESTRY

Eighty-three percent of countries with an adaptation component include adaptation in the forestry sub-sector. The majority of those countries promote reducing degradation and SFM (63 percent of countries with adaptation in agriculture and land use sectors), followed by afforestation/reforestation (46 percent), fire management (29 percent) and reducing deforestation and forest conservation (25 percent) and ecosystem and biodiversity management (17 percent), amongst others. Sub-regional specificities include pest and disease management in Eastern Asia; fire management in Southern and South-eastern Asia; and shifts in the consumption of forest products in South-eastern Asia. **Figure 38** illustrates the share of countries, at the regional and sub-regional level, with one or more (to avoid bias of representation) adaptation measure in the forestry sub-sector, out of countries with an adaptation in agriculture and land use sectors, by management activity.

**FIGURE 38.**

### ADAPTATION MEASURES IN FORESTRY IN THE NDCs OF ASIAN COUNTRIES, BY TYPE



Source: NDCs.

**TABLE 16.**

### EXAMPLES OF ADAPTATION MEASURES IN THE FORESTRY SUB-SECTOR

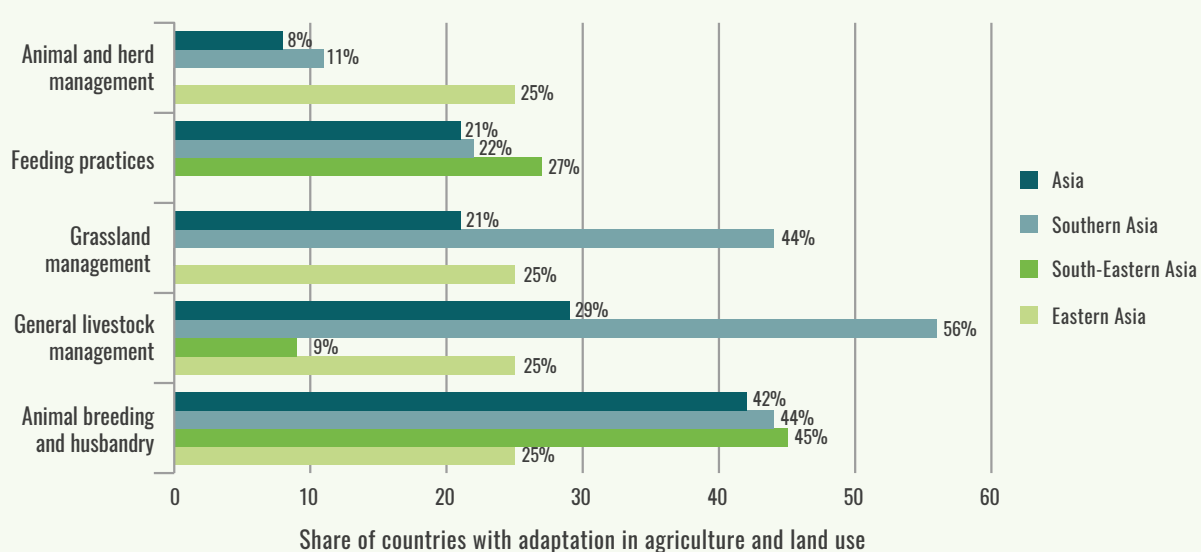
COUNTRY	MANAGEMENT ACTIVITY	METRIC	2030 TARGET
THAILAND	INCREASE NATIONAL FOREST COVER TO 40% THROUGH LOCAL COMMUNITY PARTICIPATION, INCLUDING IN PARTICULAR HEADWATER AND MANGROVE FORESTS TO ENHANCE ADAPTIVE CAPACITIES OF RELATED ECOSYSTEM	QUANTIFIED	40% FOREST COVER
AFGHANISTAN	COMMUNITY BASED FOREST MANAGEMENT AND AFFORESTATION PROJECTS IN WAYS THAT CONSERVE LAND, WATER RESOURCES AND WOOD PRODUCTION; REALIZE AFFORESTATION OF CATCHMENT AREAS AND STABILIZATION OF UNSTABLE SLOPES	NON-QUANTIFIED	
NEPAL	PLANTS TREES IN AT LEAST 10% OF THE CURRENT OPEN/BARREN LAND	QUANTIFIED	10% BARREN LAND
NEPAL	MONITORING OF FOREST HEALTH THROUGH MANAGEMENT OF LANDSCAPE-LEVEL ECOSYSTEM AND CORRIDOR, IMPROVED ECOLOGICAL CONNECTIVITY, RESTORED ECOSYSTEM AND SPECIES, AND CONTROL OF INVASIVE SPECIES	NON-QUANTIFIED	

## LIVESTOCK

Fifty-eight percent of countries with an adaptation component include adaptation in the livestock sub-sector. The majority of those countries promote animal breeding and husbandry measures (42 percent of countries with adaptation in agriculture and land use sectors), followed by general livestock management (29 percent), grassland management and improved feeding practices (21 percent, respectively) and animal and herd management (8 percent), amongst others. **Figure 36** illustrates the share of countries, at the regional and sub-regional level, with one or more (to avoid bias of representation) adaptation measure in the livestock sub-sector out of countries with an adaptation in agriculture and land use sectors, by management activity.

**FIGURE 39.**

### ADAPTATION MEASURES IN THE LIVESTOCK SUB-SECTOR IN THE NDCs OF ASIAN COUNTRIES, BY TYPE



Source: NDCs.

**TABLE 17.**

### EXAMPLES OF ADAPTATION MEASURES IN THE LIVESTOCK SUB-SECTOR

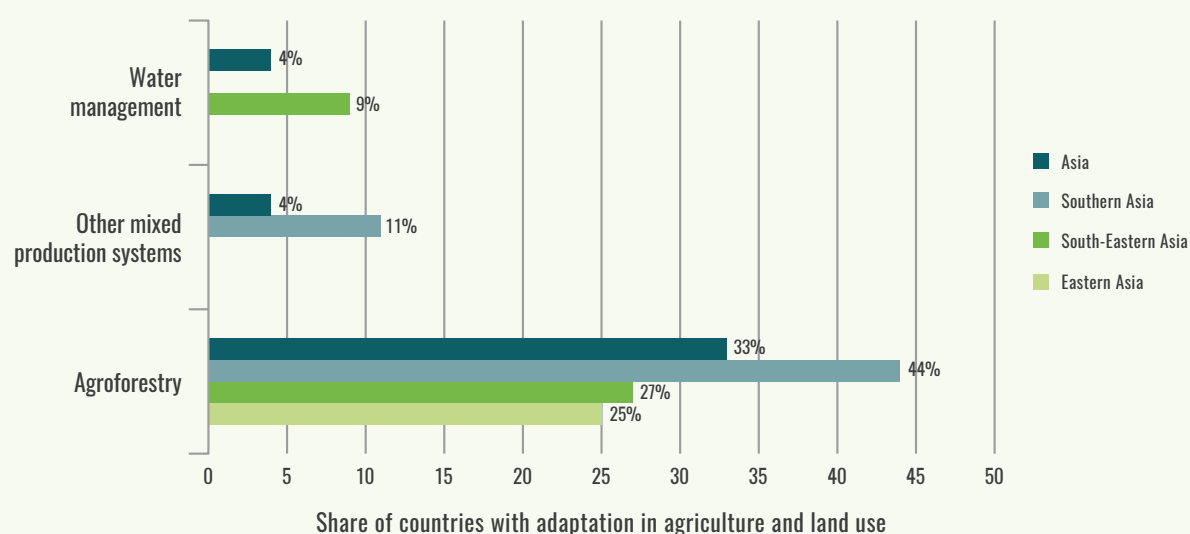
COUNTRY	MANAGEMENT ACTIVITY	METRIC	2030 TARGET
BHUTAN	LIVESTOCK INSURANCE AGAINST CLIMATE INDUCED EXTREMES	NON-QUANTIFIED	
AFGHANISTAN	DEVELOPMENT AND IMPLEMENTATION OF SYSTEM OF ROTATIONAL GRAZING AND PRODUCTION OF IMPROVED FODDER ALONG GRAZING ROUTES (MIXED GRASSES, LEGUME)	NON-QUANTIFIED	
IRAN	PROTECTION OF THE BIODIVERSITY OF IRANIAN ANIMAL BREEDS AND MANAGEMENT OF ANIMAL DISEASES	NON-QUANTIFIED	

## INTEGRATED SYSTEMS

Thirty-eight percent of countries with an adaptation component include adaptation in integrated systems. The majority of those countries promote agroforestry (33 percent of countries with adaptation in agriculture and land use sectors), followed by other mixed production systems and water management (11 percent, respectively). Figure 40 illustrates the share of countries, at the regional and sub-regional level, with one or more (to avoid bias of representation) adaptation measure in integrated systems out of countries with an adaptation in agriculture and land use sectors, by management activity.

**FIGURE 40.**

### ADAPTATION MEASURES IN INTEGRATED SYSTEMS IN THE NDCs OF ASIAN COUNTRIES, BY TYPE



Source: NDCs.

**TABLE 18.**

### EXAMPLES OF ADAPTATION MEASURES IN INTEGRATED SYSTEMS

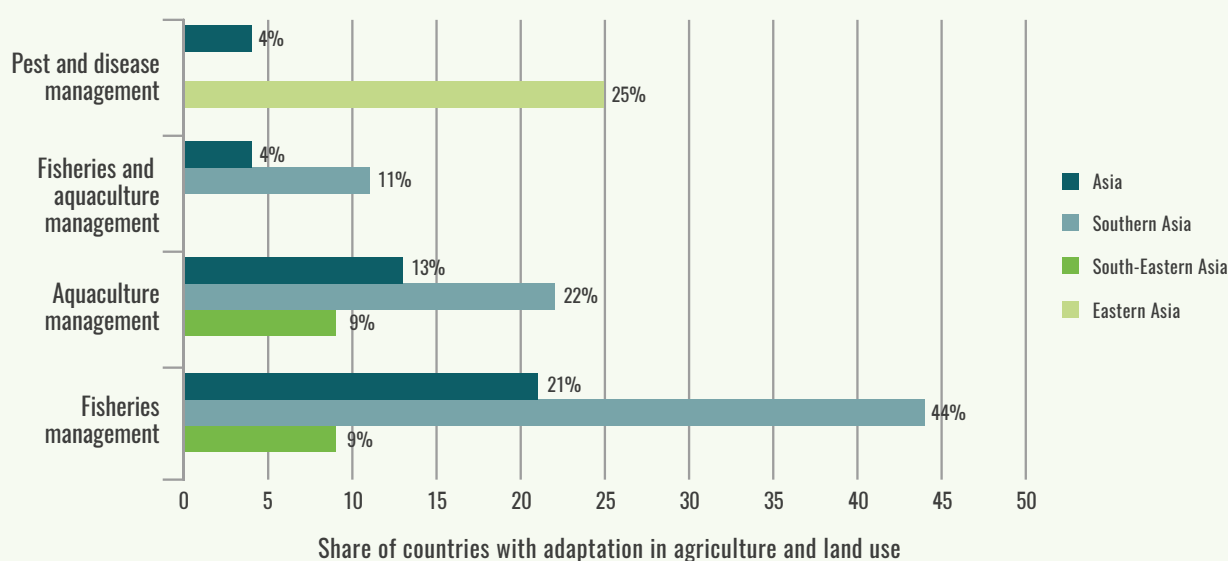
COUNTRY	MANAGEMENT ACTIVITY	METRIC	2030 TARGET
BANGLADESH	CULTIVATION OF BEANS, GOURDS, OKRA AND OTHER VEGETABLES ON THE EMBANKMENTS BETWEEN PRAWN PONDS	NON-QUANTIFIED	
AFGHANISTAN	TERRACING, AGRO-FORESTRY, AND AGRO-SILVO-PASTORAL SYSTEM THAT REDUCE SOIL EROSION AND RUN OFF ON STEEP SLOPES	NON-QUANTIFIED	
INDIA	ADOPT TREE-BASED/MIXED FARMING SYSTEMS TO CONSERVE BIODIVERSITY OF MOUNTAIN FARMING SYSTEMS; AND ADOPT AN APPROPRIATE FRAMEWORK FOR USE OF BARREN AND UNPRODUCTIVE LAND IN HILLY AREAS	NON-QUANTIFIED	

## MARINE FISHERIES AND AQUACULTURE

Thirty-three percent of countries with an adaptation component promote adaptation in marine fisheries and aquaculture. The majority of those countries promote fisheries management (21 percent of countries with adaptation in agriculture and land use sectors), followed by aquaculture management (13 percent) and pest and disease management and fisheries and aquaculture management combined (4 percent, respectively). **Figure 41** illustrates the share of countries, at the regional and sub-regional level, with one or more (to avoid bias of representation) adaptation measure in marine fisheries and aquaculture, out of countries with an adaptation in agriculture and land use sectors, by management activity.

**FIGURE 41.**

### ADAPTATION MEASURES IN MARINE FISHERIES AND AQUACULTURE IN THE NDCs OF ASIAN COUNTRIES, BY TYPE



Source: NDCs.

**TABLE 19.**

### EXAMPLES OF ADAPTATION MEASURES IN MARINE FISHERIES AND AQUACULTURE

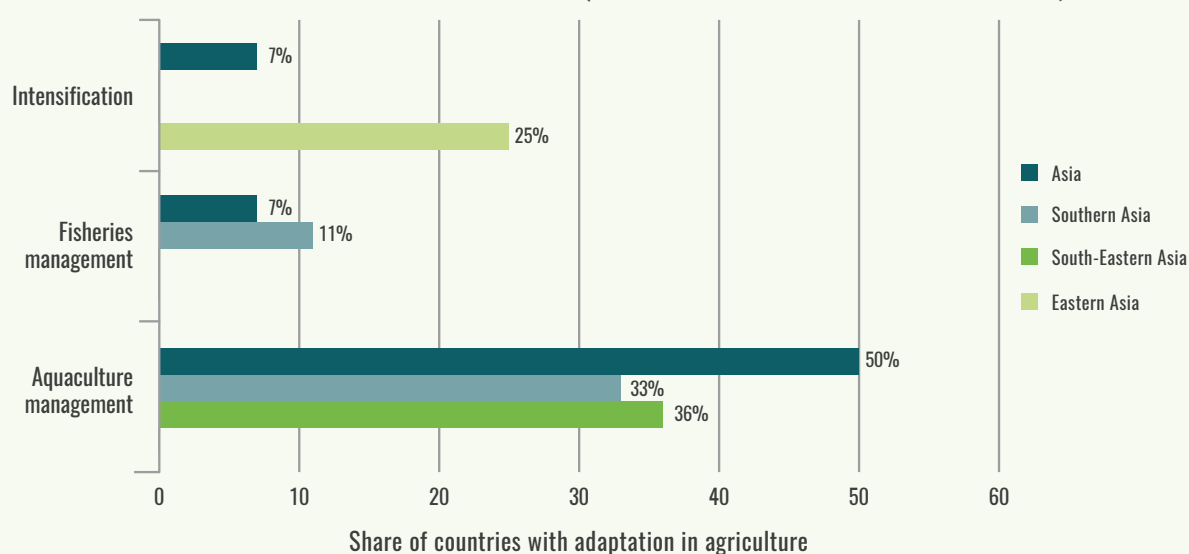
COUNTRY	MANAGEMENT ACTIVITY	METRIC	2030 TARGET
BANGLADESH	COLLECTION, REARING AND FEEDING OF CRABS FOR A PERIOD OF 15 DAYS TO INCREASE THEIR MARKET VALUE	QUANTIFIED	15 DAYS
MALDIVES	FACILITATE FISHERIES INDUSTRY TO ADAPT TUNA CATCH FROM SHALLOW WATER TO DEEP WATER	NON-QUANTIFIED	
SRI LANKA	DEVELOP TEMPERATURE TOLERANT SPECIES FOR AQUACULTURE AND PROMOTE MARI-CULTURE	NON-QUANTIFIED	
MYANMAR	PRESERVE AND RESTORE SPAWNING, FEEDING AND NESTING HABITATS	NON-QUANTIFIED	
PHILIPPINES	FARMING OF 255 000 HA OF SHALLOW COASTAL WATERS	QUANTIFIED	255 000 HA
MYANMAR	ENFORCEMENT OF FISHING REGULATIONS IN MANGROVE AREAS	NON-QUANTIFIED	
MALDIVES	IMPROVE FISH FINDING AND FISH HARVESTING AND HANDLING	NON-QUANTIFIED	

## FRESHWATER FISHERIES AND AQUACULTURE

Twenty-nine percent of countries with an adaptation component include adaptation in freshwater fisheries and aquaculture. The majority of those countries promote aquaculture management (50 percent of countries with adaptation in agriculture and land use sectors), followed by intensification and aquaculture and fisheries management and intensification (7 percent, respectively). At the sub-regional level, freshwater fisheries and aquaculture is mentioned in all sub-regions, particularly aquaculture in South-eastern Asia. **Figure 42** illustrates the share of countries, at the regional and sub-regional level, with one or more (to avoid bias of representation) adaptation measure in freshwater fisheries and aquaculture, out of countries with an adaptation in agriculture and land use sectors, by management activity.

**FIGURE 42.**

### ADAPTATION MEASURES IN FRESHWATER FISHERIES AND AQUACULTURE IN THE NDCs OF ASIAN COUNTRIES, BY TYPE



Source: NDCs.

**TABLE 20.**

### EXAMPLES OF ADAPTATION MEASURES IN FRESHWATER FISHERIES AND AQUACULTURE

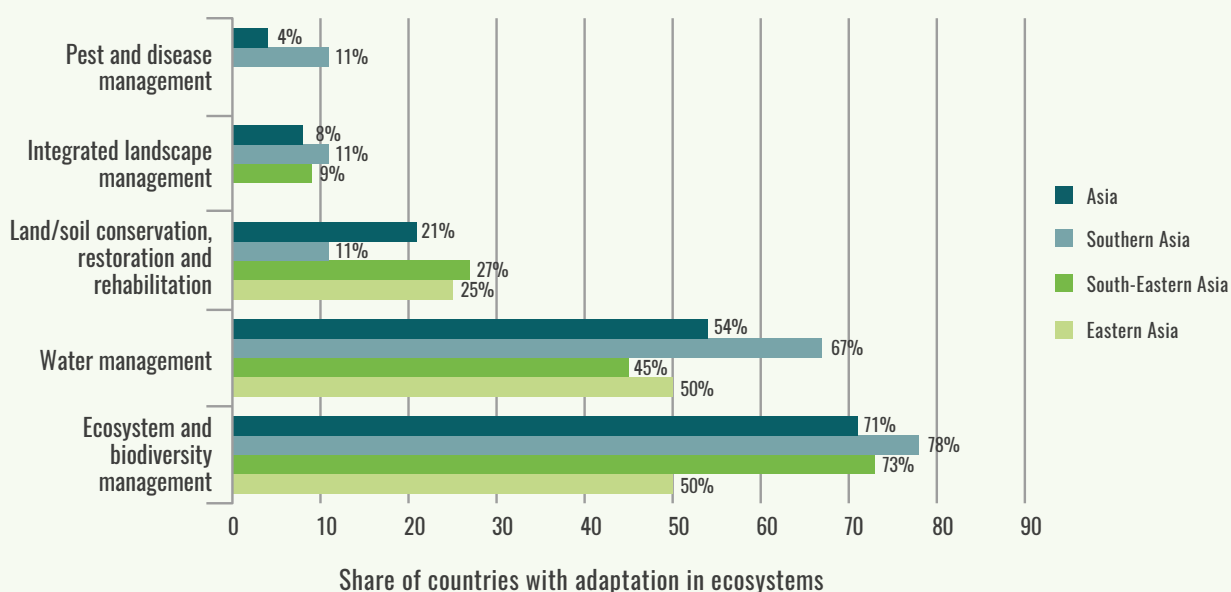
COUNTRY	MANAGEMENT ACTIVITY	METRIC	2030 TARGET
BANGLADESH	ENHANCEMENT OF CULTURE FISHERIES BY RETAINING WATER FOR LONGER PERIOD THROUGH POND DEEPENING, REMOVAL OF SLUDGE, POND DYKE TREE PLANTATION AND FLOATING MACROPHYTES, PUMPING FACILITIES AND HARVESTING OF RUN-OFF WATER	NON-QUANTIFIED	
BANGLADESH	PROTECTION AND IMPROVEMENT OF FLOODPLAIN CAPTURE FISHERIES HABITAT THROUGH EXCAVATION OF SILT FROM BEEL, RIVER AND CANAL BED, SANCTUARY ESTABLISHMENT, AND CONNECTIVITY IMPROVEMENT	NON-QUANTIFIED	
SRI LANKA	INCREASE THE PRODUCTION CAPABILITIES OF FISHERIES, AQUATIC RESOURCES IN LAGOONS	NON-QUANTIFIED	
NEPAL	PROVISION OF MINIMUM FLOW WATER REQUIREMENT IN RIVER FOR FISH AND AQUATIC SPECIES	NON-QUANTIFIED	
BANGLADESH	ENCOURAGE PADDY CUM FISH POLYCULTURE	NON-QUANTIFIED	
MYANMAR	IMPROVE AQUACULTURAL PRACTICES BY REPLACING THE TRADITIONAL METHODS CURRENTLY IN USE WITH MODERNIZED TECHNIQUES SUCH AS PEN CULTURE AND CAGE CULTURE FOR SEABASS, GROUPER AND MILKFISH SPECIES IN THE RAKHINE AND TANINTHARYI COASTAL AREAS	QUANTIFIED	THE TOTAL INLAND FISHERIES PRODUCTION WILL INCREASE BY 4.11 MMT OR 2.20 TONS PER HECTARE
VIETNAM	INTRODUCE HEAT-TOLERANT VARIETIES IN AQUAFARMING		

## All ecosystems

Eighty-eight percent of countries with an adaptation component include adaptation in ecosystems in general. The majority of those countries promote ecosystem and biodiversity management (71 percent of countries with adaptation measures in ecosystems), followed by water management (45 percent), land/soil management, restoration and rehabilitation (34 percent) and pest and disease management (21 percent), amongst others. **Figure 43** illustrates the number of countries, at the regional and sub-regional level, with one or more (to avoid bias of representation) adaptation measure in all ecosystems of countries with adaptation measures in ecosystems, by management activity.

**FIGURE 43.**

### ADAPTATION MEASURES IN ALL ECOSYSTEMS IN THE NDCs OF ASIAN COUNTRIES, BY TYPE



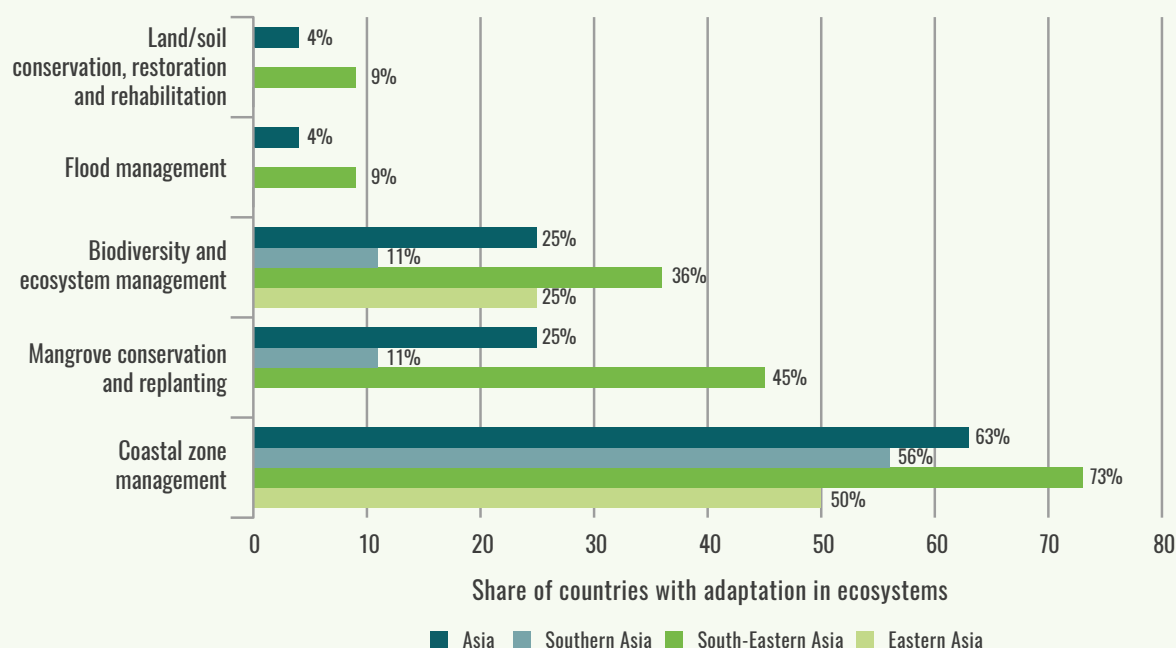
Source: NDCs.

## Ocean and coastal zone ecosystems

Sixty-seven percent of countries with an adaptation component include adaptation in ocean and coastal zone ecosystems. The majority of those countries promote coastal zone management (63 percent of countries with adaptation in ecosystems), followed by mangrove conservation and replanting and biodiversity and ecosystem management (25 percent, respectively) and flood management (4 percent). **Figure 44** illustrates the number of countries, at the regional and sub-regional level, with one or more (to avoid bias of representation) adaptation measure in ocean and coastal zone ecosystems out of countries with adaptation measures in ecosystems, by management activity.

FIGURE 44.

## ADAPTATION MEASURES IN OCEAN AND COASTAL ZONE ECOSYSTEMS IN THE NDCs OF ASIAN COUNTRIES, BY TYPE



Source: NDCs.

TABLE 21.

## EXAMPLES OF ADAPTATION MEASURES IN OCEAN AND COASTAL ZONE ECOSYSTEMS

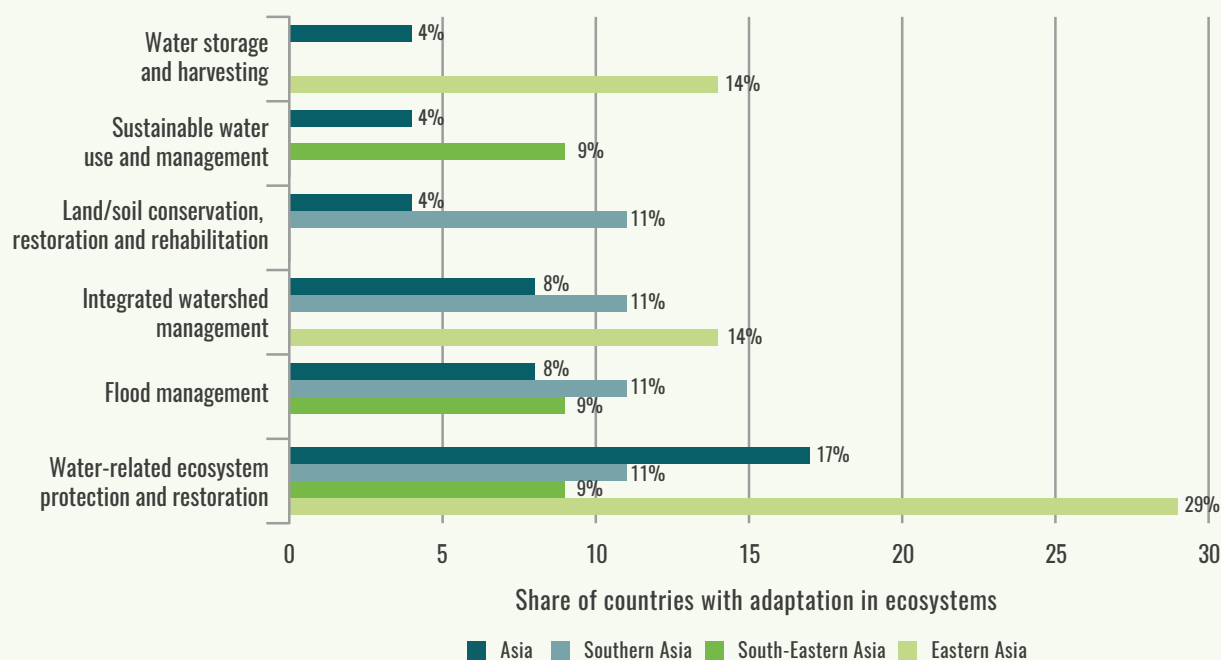
COUNTRY	MANAGEMENT ACTIVITY	METRIC	2030 TARGET
INDIA	BIOSHIELDS WITH LOCAL VEGETATION (MANGROVES) AND OTHER SOFT PROTECTION MEASURES, AND THE CONSERVATION OF BEACHES AND SAND DUNES	NON-QUANTIFIED	
MALAYSIA	MAINTAIN THE BIOLOGICAL DIVERSITY AND THE ECOSYSTEM SERVICES PROVIDED BY MARINE AND COASTAL RESOURCES THAT ARE PARTICULARLY CRITICAL TO INCOME, LIVELIHOODS AND FOOD SECURITY OF COASTAL COMMUNITIES		
VIETNAM	PROTECT, RESTORE, PLANT AND IMPROVE THE QUALITY OF COASTAL FORESTS, INCLUDING MANGROVES, ESPECIALLY IN COASTAL ESTUARIES AND THE MEKONG AND RED RIVER DELTAS	QUANTIFIED	AREA OF PROTECTION FOREST IN COASTAL AREAS IS INCREASED TO 380 000 HECTARES, INCLUDING 20 000 TO 50 000 HA OF ADDITIONAL MANGROVE PLANTING
SRI LANKA	ESTABLISH 1000 HA OF COASTAL FORESTS AND GREEN BELT ALONG THE COASTAL LINE OF THE ISLAND	QUANTIFIED	1000 HA

## Inland water ecosystems

Twenty-nine percent of countries with an adaptation component include adaptation in inland water ecosystems. The majority of those countries aim to protect and restore water-related ecosystems (17 percent of countries with adaptation in ecosystems), followed by flood management and integrated water management (8 percent, respectively), and equal shares of land/soil management, restoration and rehabilitation, sustainable water use and management and water storage and harvesting (4 percent, respectively). Figure 45 illustrates the share of countries, at the regional and sub-regional level, with one or more (to avoid bias of representation) adaptation measure in inland water ecosystems out of countries with adaptation measures in ecosystems, by management activity.

FIGURE 45.

## ADAPTATION MEASURES IN INLAND WATER ECOSYSTEMS IN THE NDCs OF ASIAN COUNTRIES, BY TYPE



Source: NDCs.

TABLE 22.

## EXAMPLES OF ADAPTATION MEASURES IN INLAND WATER ECOSYSTEMS

COUNTRY	MANAGEMENT ACTIVITY	METRIC	2030 TARGET
INDIA	IMPLEMENTATION OF PROPER TIDAL RIVER MANAGEMENT IN THE LONGER RUN TO AVOID WATER LOGGING	NON-QUANTIFIED	
BANGLADESH	RIVER FLOOD AND EROSION PROTECTION	NON-QUANTIFIED	
INDIA	CONSERVATION OF RIVERS, LAKES AND WETLANDS IN THE COUNTRY AND IMPROVING THE WATER QUALITY WHICH COVERS STRETCHES OF 40 RIVERS IN 190 TOWNS SPREAD OVER 20 STATES	QUANTIFIED	190 TOWNS

## Wetland ecosystems

Twenty-one percent of countries with an adaptation component include adaptation in wetland ecosystems. The majority of those countries promote wetlands management in general (8 percent of countries with adaptation in ecosystems), followed by ecosystem management, conservation and restoration and integrated watershed management (4 percent, respectively). All adaptation measures in wetlands are found in Southern and South-eastern Asia.



TABLE 23.

## EXAMPLES OF ADAPTATION MEASURES IN WETLANDS ECOSYSTEMS

COUNTRY	MANAGEMENT ACTIVITY	METRIC	2030 TARGET
BHUTAN	IMPLEMENT PROPER LAND USE PLANNING IN WATERSHED AREAS, REFORESTATION IN DEGRADED AREAS, PROTECTION OF WETLANDS, SPREAD OF GREENBELT AND IMPLEMENT POLICY MEASURES TO HELP CONSERVE WATERSHEDS	NON-QUANTIFIED	
LAO PDR	MORE THAN 60 000 HA OF WETLANDS AND ECOSYSTEMS IN SUB-CATCHMENTS ARE MANAGED TO ENSURE MAINTENANCE OF CRITICAL ECOSYSTEM SERVICES, ESPECIALLY WATER PROVISIONING, FLOOD CONTROL AND PROTECTION UNDER INCREASING CLIMATE CHANGE-INDUCED STRESSES IN SEKONG AND SARAVANE PROVINCES		60 000 HA
NEPAL	TERAI WETLAND MANAGEMENT	NON-QUANTIFIED	
BANGLADESH	COMMUNITY BASED CONSERVATION OF WETLANDS AND COASTAL AREAS	NON-QUANTIFIED	

## Mountain ecosystems

Two countries<sup>58</sup> (8 percent of countries with adaptation in ecosystems) include adaptation in mountain ecosystems, with measures equally distributed amongst ecosystem management, conservation and restoration, integrated watershed management and land/soil conservation, restoration and rehabilitation. All adaptation measures in mountain ecosystems are found in Southern Asia.

TABLE 24.

## EXAMPLES OF ADAPTATION MEASURES IN MOUNTAIN ECOSYSTEMS

COUNTRY	MANAGEMENT ACTIVITY	METRIC	2030 TARGET
INDIA	ENHANCE, MAINTAIN, AND CONSERVE SOIL AND PLANT CARBON POOLS ON HIGHLY VULNERABLE MOUNTAIN SLOPES	NON-QUANTIFIED	
NEPAL	BUILDING CLIMATE RESILIENCE OF WATERSHEDS IN MOUNTAIN ECO REGIONS	NON-QUANTIFIED	

## Natural resources

Natural resource use and management options are integrated within each of the ecosystem-based approaches to adaptation identified above due to their cross-cutting nature. The distribution of those management options are presented from a natural resource lens below.

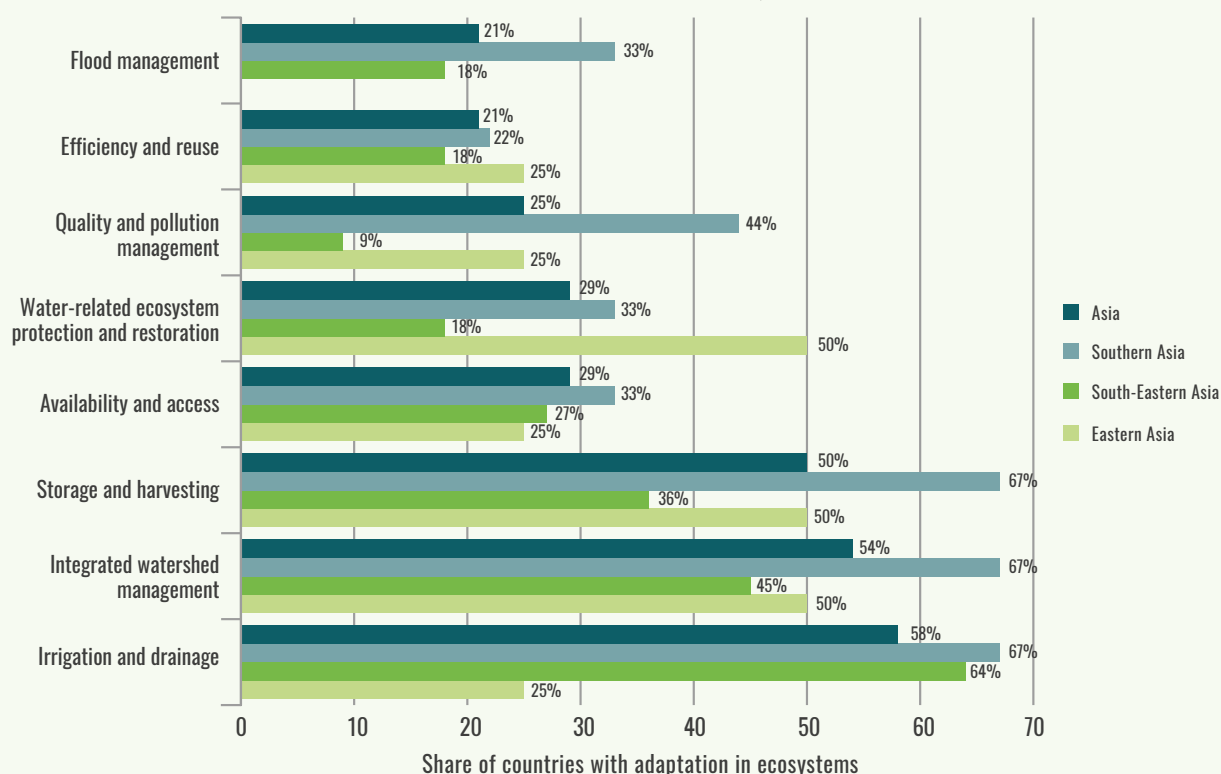
## WATER RESOURCES

All countries in Asia with an adaptation component promote water resource use and management amongst adaption options. The majority of those countries promote irrigation and drainage, integrated watershed management and water storage and harvesting to a comparable degree (50 to 58 percent of countries with adaptation in ecosystems), followed by water availability and access and water-related ecosystem protection and restoration (29 percent, respectively) and water quality and pollution management (25 percent), amongst others. **Figure 46** illustrates the share of countries, at the regional sub-regional level, with one or more (to avoid bias of representation) water-related adaptation measure across all ecosystems out of countries with adaptation measures in ecosystems, by resource use and management option.

<sup>58</sup> India and Nepal.

FIGURE 46.

## WATER-RELATED ADAPTATION MEASURES IN THE NDCs OF ASIAN COUNTRIES, BY TYPE



Source: NDCs.

TABLE 25.

## EXAMPLES OF WATER-RELATED ADAPTATION MEASURES

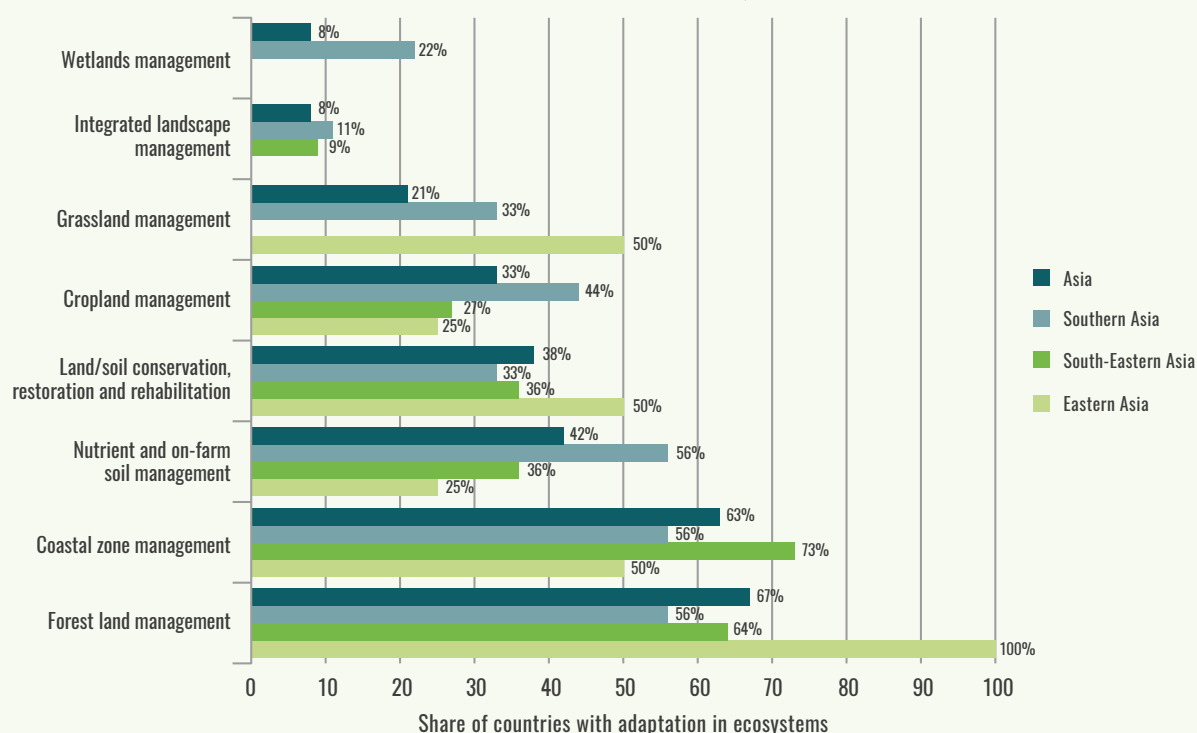
COUNTRY	MANAGEMENT ACTIVITY	METRIC	2030 TARGET
SRI LANKA	RESTORATION AND REHABILITATION OF ALL ABANDONED TANKS AND IRRIGATION CANALS IN SRI LANKA	NON-QUANTIFIED	
TIMOR-LESTE	CREATE AND ENHANCE HOUSEHOLD AND VILLAGE BASED WATER HARVESTING MODELS (CAPTURE AND STORAGE) AND WATER DISTRIBUTION SYSTEMS	NON-QUANTIFIED	
BRUNEI DARUSSALAM	FLOODPLAINS RESTORATION THAT ACT AS SPONGES AND SEND WATER DOWN INTO GROUNDWATER SUPPLIES AND FILTER POLLUTION OUT OF RIVERS	NON-QUANTIFIED	
NEPAL	SLOPE STABILIZATION AND LANDSLIDE CONTROL	NON-QUANTIFIED	
MALAYSIA	REUSING OF WATER FROM AQUACULTURE HAVE MANY BENEFITS INCLUDING NEW CULTURE SYSTEM FOR URBAN AQUACULTURE THAT USES INTEGRATED MULTI-TROPHIC. RECYCLE WATER FROM CATFISH FARMING FOR CULTIVATION OF SELECTED VEGETABLE CROPS	NON-QUANTIFIED	
INDIA	ENHANCE WATER USE EFFICIENCY (WUE) BY 20%	QUANTIFIED	20% WUE

## LAND RESOURCES

Ninety-two percent of countries with an adaptation component include land resource use and management amongst adaptation options. The majority of countries promote forest land and coastal zone management (67 and 63 percent of countries with adaptation in ecosystems, respectively), followed by nutrient and on-farm soil management (42 percent), land/soil conservation, restoration and rehabilitation (38 percent), cropland management (33 percent) and grassland management (21 percent), amongst others. Figure 47 illustrates the share of countries, at the regional and sub-regional level, with one or more (to avoid bias of representation) land-related adaptation measure across all ecosystems out of countries with adaptation measures in ecosystems, by resources use and management option.

FIGURE 47.

## LAND-RELATED ADAPTATION MEASURES IN THE NDCs OF ASIAN COUNTRIES, BY TYPE



Source: NDCs.

TABLE 26.

## EXAMPLES OF LAND-RELATED ADAPTATION MEASURES

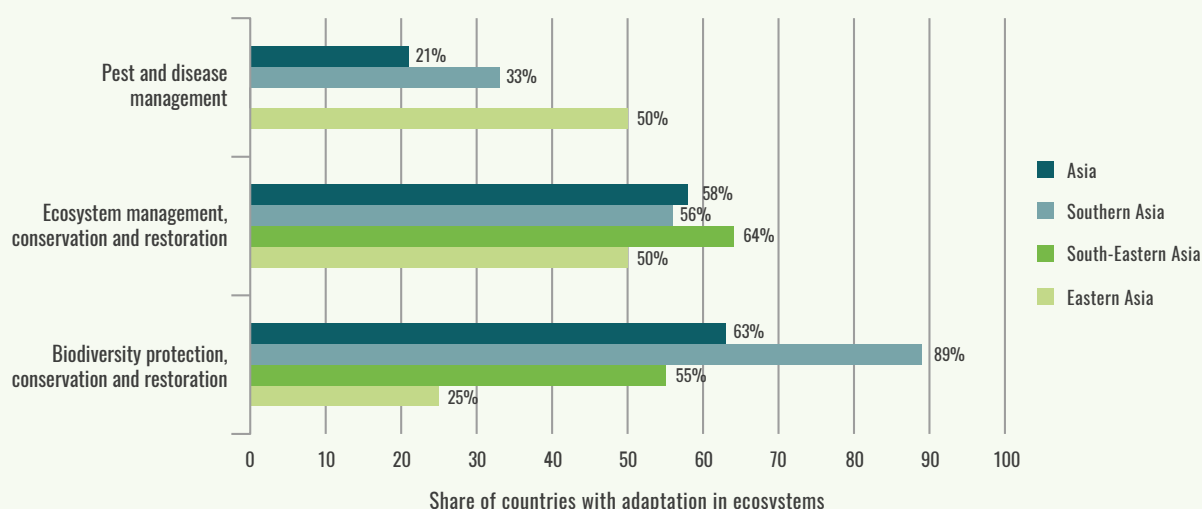
COUNTRY	MANAGEMENT ACTIVITY	METRIC	2030 TARGET
VIETNAM	PREVENT SOIL EROSION, IMPLEMENT SOIL PROTECTION, PRESERVE SOIL MOISTURE AND FERTILITY LEVELS, PLANT TREES AND FORM TERRACED FIELDS ON STEEP SLOPES TO INCREASE VEGETATION COVER	NON-QUANTIFIED	
BRUNEI DARUSSALAM	RESTORATION OF FORESTS AND GRASSLANDS THAT HAVE ALREADY BEEN LOST OR DAMAGED AND THAT HAVE BEEN SENDING EROSION INTO BRUNEI DARUSSALAM WATERS	NON-QUANTIFIED	

## ECOSYSTEM AND GENETIC RESOURCES

Eighty-three percent of countries with an adaptation component include ecosystem and genetic resource use and management amongst adaptation options. The majority of those countries aim to protect, conserve and restore biodiversity and ecosystems in general (63 percent of countries with adaptation in ecosystems, respectively), followed by pest and disease management (58 percent) and payment for ecosystem services (21 percent), amongst others. Figure 48 illustrates the share of countries, at the regional and sub-regional level, with one or more (to avoid bias of representation) ecosystem and genetic resource-related adaptation measure across all ecosystems out of countries with adaptation measures in ecosystems, by resources use and management option.

FIGURE 48.

## ECOSYSTEM AND GENETIC RESOURCES-RELATED ADAPTATION MEASURES IN THE NDCs OF ASIAN COUNTRIES, BY TYPE



Source: NDCs.

TABLE 27.

## EXAMPLES OF ECOSYSTEM AND BIODIVERSITY-RELATED ADAPTATION MEASURES

COUNTRY	MANAGEMENT ACTIVITY	METRIC	2030 TARGET
AFGHANISTAN	AT LEAST 10% OF LAND AREA AND THE HABITAT OF SELECTED SPECIES UNDER A SYSTEM OF CONSERVATION	QUANTIFIED	10% LAND AREA
BANGLADESH	PROTECT CORRIDORS TO ALLOW THE MIGRATION OF PLANTS AND ANIMALS FOLLOWING POLE-WARD SHIFTS IN HABITAT DISTRIBUTIONS DUE TO CHANGES IN TEMPERATURE AND PRECIPITATION	NON-QUANTIFIED	
NEPAL	EX-SITU CONSERVATION OF THREATENED SPECIES IN FORESTS	NON-QUANTIFIED	
REPUBLIC OF KOREA	REDUCE INFECTIOUS DISEASES ON FISHERIES AND DAMAGE FROM ACIDIFICATION	NON-QUANTIFIED	
DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA	CONTROL OF FOREST PESTS OUTBREAKS BY CLIMATE CHANGE AND INTEGRATED FOREST PEST MANAGEMENT	NON-QUANTIFIED	

## Adaptation measures in social systems

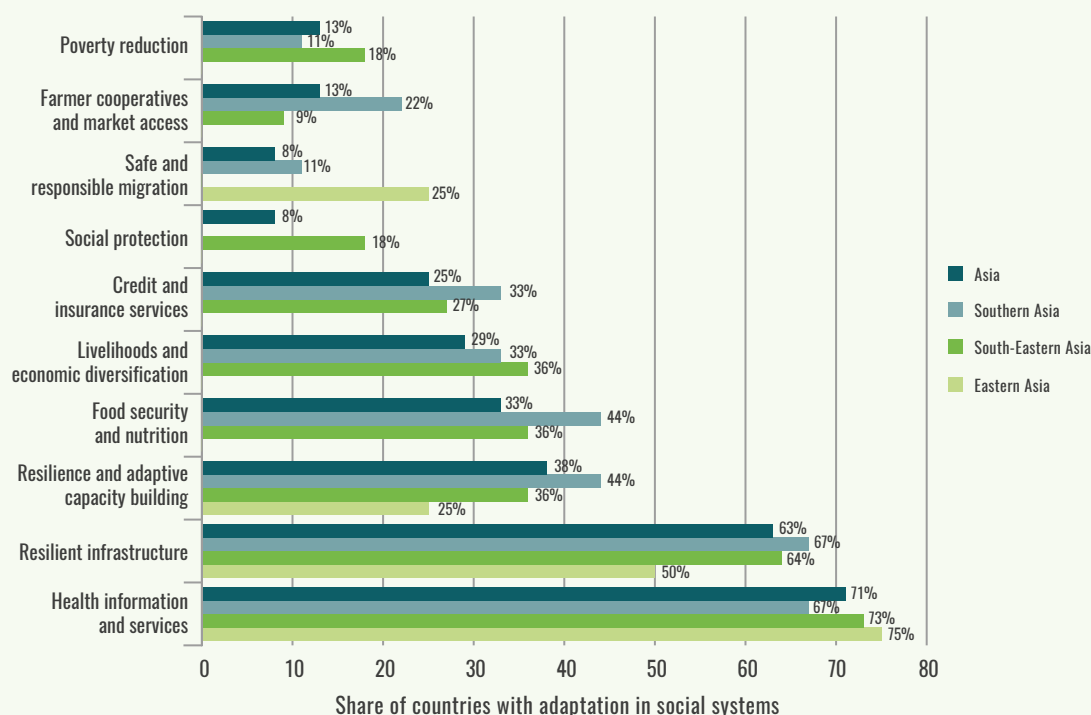
For the sake of this analysis, adaptation measures in social systems are differentiated along three main pillars: socio-economics and well-being; knowledge and capacity; and institutions and governance. Social systems refer to the interaction between agricultural and food systems and rural livelihoods, and the institutions, governments and economies influencing individual adaptive capacity and exposure to climate change. The measures contained, therefore, in this section are not exclusive to agriculture.

All countries with an adaptation component in Asia identify at least one adaptation measure in social systems, primarily around the institutions and governance and socio-economics and well-being pillars (92 percent of countries), followed by the knowledge and capacity pillar (83 percent).

## Socio-economics and well-being

Ninety-two percent of countries with an adaptation component include measures related to socio-economics and well-being. The majority of those countries promote health information and services and resilient infrastructure (71 and 63 percent of countries with adaptation in social systems, respectively), followed by resilience and adaptive capacity building (38 percent), food security and nutrition (33 percent), livelihoods and economic diversification (29 percent) and credit and insurance services (25 percent),

amongst others. **Figure 49** illustrates the share of countries, at the regional and sub-regional level, with one or more (to avoid bias of representation) socio-economics and well-being-related adaptation measure out of countries with adaptation measures in social systems, by type.

**FIGURE 49.****SOCIO-ECONOMICS AND WELL-BEING RELATED ADAPTATION MEASURES IN THE NDCs OF ASIAN COUNTRIES, BY TYPE**

Source: NDCs.

**TABLE 28.****EXAMPLES OF SOCIO-ECONOMICS AND WELL-BEING RELATED ADAPTATION MEASURES**

COUNTRY	MANAGEMENT ACTIVITY	METRIC	2030 TARGET
INDIA	COVER 70 MILLION RURAL POOR HOUSEHOLDS, ACROSS 600 000 VILLAGES IN THE COUNTRY THROUGH SELF-MANAGED SELF HELP GROUPS AND FEDERATED INSTITUTIONS TO SUPPORT THE RURAL COMMUNITIES IN STRENGTHENING THEIR LIVELIHOOD	QUANTIFIED	70 MILLION RURAL POOR HOUSEHOLDS
VIETNAM	REVIEW, ADJUST AND DEVELOP LIVELIHOODS AND PRODUCTION PROCESSES THAT ARE APPROPRIATE UNDER CLIMATE CHANGE CONDITIONS AND ARE LINKED TO POVERTY REDUCTION AND SOCIAL JUSTICE	QUANTIFIED	THE AVERAGE NATIONAL POVERTY RATE IS LOWERED BY 2%/YEAR; IN POOR DISTRICTS AND COMMUNES IT IS LOWERED BY 4%/YEAR
MALDIVES	STRENGTHEN FISHERMEN INSURANCE MECHANISM TO ENSURE MINIMUM MONTHLY INCOME FROM FISHING ACTIVITIES FOR LOST FISHING DUE EXTREME EVENTS	NON-QUANTIFIED	
AFGHANISTAN	CREATE MORE OFF-FARM OR CASH EARNING JOB OPPORTUNITIES FOR FARMERS WHO ARE AFFECTED BY CROP LOSS DUE TO CLIMATE CHANGE EFFECTS	NON-QUANTIFIED	
VIETNAM	100% OF THE POPULATION HAS ACCESS TO HEALTH CARE SERVICES	QUANTIFIED	100% OF POPULATION
INDIA	PROVIDING SAFE PIPED/DRINKING WATER IN ALL URBAN AND RURAL AREAS OF THE COUNTRY	NON-QUANTIFIED	
TIMOR-LESTE	ESTABLISH AN INTEGRATED DISEASE SURVEILLANCE, RESPONSE AND EARLY WARNING SYSTEM WITHIN THE HEALTH SYSTEM REACHING TO THE COMMUNITY LEVEL	NON-QUANTIFIED	

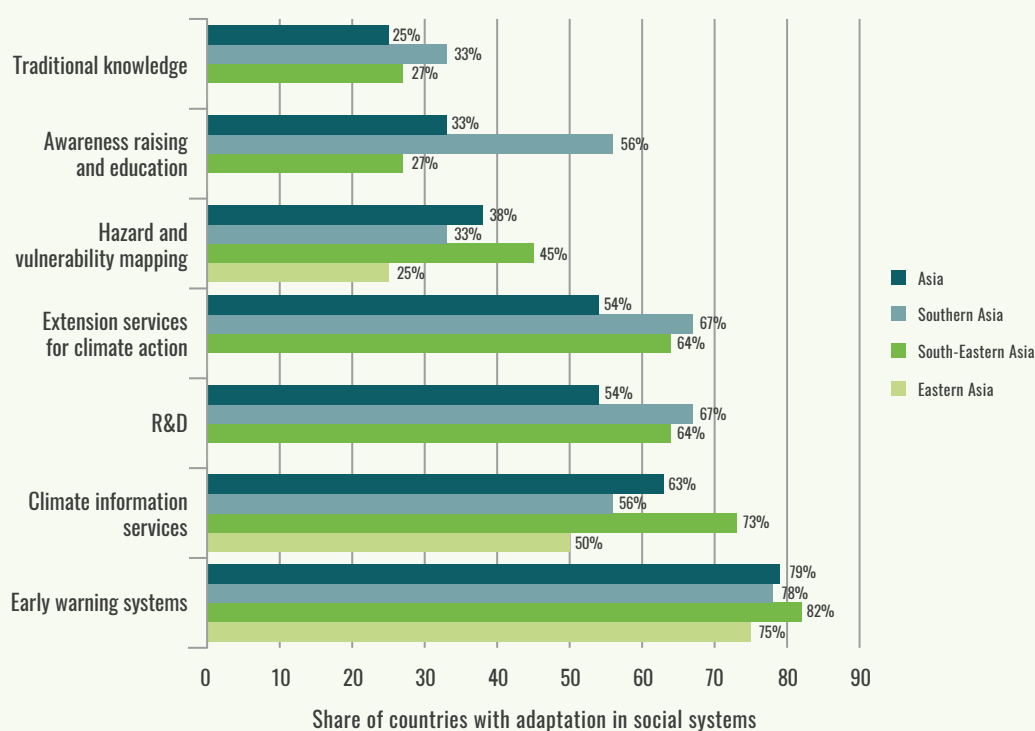
INDIA	STRENGTHENING PROGRAMS SUPPORTIVE OF NUTRITIONALLY VULNERABLE INDIVIDUALS/GROUPS (TARGETED SUBSIDIES, SAFETY NETS, ETC.) FOR HOUSEHOLDS AIMING AT PROMOTING DIRECT ACCESS TO NUTRITIOUS AND SAFE FOODS	NON-QUANTIFIED	
MYANMAR	CREATION OF ALTERNATIVE LIVELIHOOD OPPORTUNITIES FOR FOREST DWELLERS	NON-QUANTIFIED	
BANGLADESH	ENCOURAGE ALTERNATIVE LIVELIHOOD DURING FISH BREEDING	NON-QUANTIFIED	
MYANMAR	ENHANCE RURAL LIVELIHOODS IN DEGRADED WATERSHED AREAS, COASTAL AREAS AND NORTHERN HILLY REGIONS	NON-QUANTIFIED	
LAO PDR	SMALL-SCALE RURAL INFRASTRUCTURE PROTECTED AND DIVERSIFIED AGAINST CLIMATE CHANGE INDUCED RISKS (DROUGHTS, FLOODS, EROSION AND LANDSLIDES) IN 12 DISTRICTS OF SEKONG AND SARAVANE PROVINCES	QUANTIFIED	12 DISTRICTS

## Knowledge and capacity

Eighty-three percent of countries with an adaptation component include measures related to knowledge and capacity. The majority of those countries promote early warning systems and climate information services (79 and 63 percent of countries with adaptation in social systems, respectively), followed by research and development (R&D) and extension services in agriculture for climate action (54 percent, respectively), hazard and vulnerability mapping (38 percent), awareness raising and education (33 percent) and traditional knowledge (25 percent). **Figure 50** illustrates the share of countries, at the regional and sub-regional level, with one or more (to avoid bias of representation) knowledge and capacity-related adaptation measure out of countries with adaptation measures in social systems, by type.

**FIGURE 50.**

### KNOWLEDGE AND CAPACITY RELATED ADAPTATION MEASURES IN THE NDCs OF ASIAN COUNTRIES, BY TYPE



Source: NDCs.

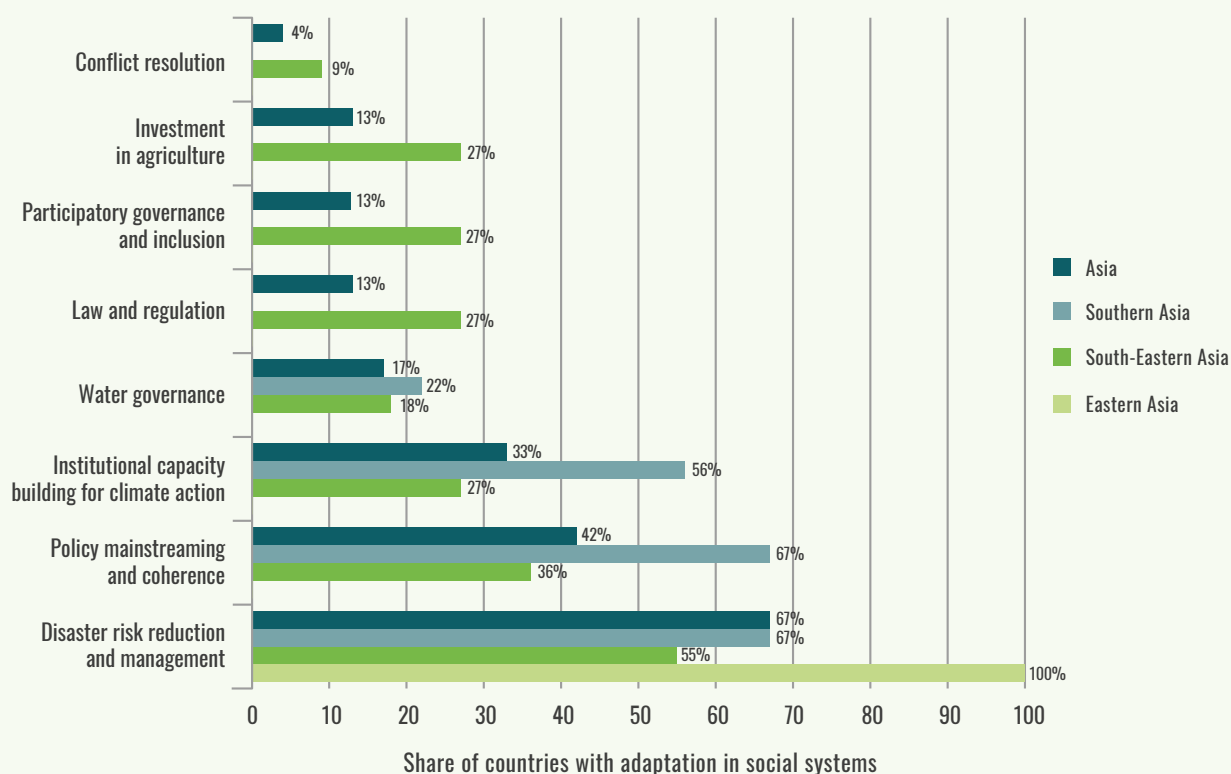
TABLE 29.

## EXAMPLES OF KNOWLEDGE AND CAPACITY RELATED ADAPTATION MEASURES

COUNTRY	MANAGEMENT ACTIVITY	METRIC	2030 TARGET
SRI LANKA	ESTABLISH AN ACCURATE SEA LEVEL RISE FORECASTING SYSTEM	NON-QUANTIFIED	
LAO PDR	DEVELOP FLOOD AND DROUGHT EARLY WARNING SYSTEMS FOR REDUCING THE VULNERABILITY OF LOCAL COMMUNITIES TO EXTREME WEATHER EVENTS	NON-QUANTIFIED	
BHUTAN	IDENTIFY AND MAP HIGHLY VULNERABLE FARMING COMMUNITIES ACROSS THE COUNTRY	NON-QUANTIFIED	
CAMBODIA	STRENGTHEN TECHNICAL AND INSTITUTIONAL CAPACITY TO CONDUCT CLIMATE CHANGE IMPACT	NON-QUANTIFIED	
BRUNEI DARUSSALAM	ASSESSMENTS, CLIMATE CHANGE PROJECTIONS, AND MAINSTREAMING OF CLIMATE CHANGE INTO SECTOR AND SUB-SECTOR DEVELOPMENT PLANS	NON-QUANTIFIED	
INDIA	PROMOTING SUSTAINABLE TECHNOLOGY SUCH AS ALTERNATE WETTING AND DRYING (AWD) TO THE FARMERS THROUGH THE FARMERS FIELD SCHOOL	QUANTIFIED	400 MILLION PEOPLE
LAO PDR	TARGET TO PROVIDE SKILL TRAINING IN VARIOUS SECTORS INCLUDING SUSTAINABLE DEVELOPMENT TO ABOUT 400 MILLION PEOPLE BY 2022	NON-QUANTIFIED	
SRI LANKA	USE OF INDIGENOUS CLIMATE RESILIENT KNOWLEDGE FOR CLIMATE RESILIENT AGRICULTURE		

## Institutions and governance

Ninety-two percent of countries with an adaptation component include measures related to institutions and governance. The majority of those countries promote DRR/M (67 percent of countries with adaptation in social systems), followed by policy mainstreaming and coherence (42 percent), institutional capacity building for climate action (33 percent) and water governance, law and regulation reform and participatory governance and inclusion to a comparable extent (13 to 17 percent), amongst others. **Figure 51** illustrates the share of countries, at the regional and sub-regional level, with one or more (to avoid bias of representation) institutions and governance-related adaptation measure out of countries with adaptation measures in social systems, by intervention option.

**FIGURE 51.****INSTITUTIONS AND GOVERNANCE-ADAPTATION MEASURES IN THE NDCs OF ASIAN COUNTRIES, BY TYPE**

Source: NDCs.

**TABLE 30.****EXAMPLES OF INSTITUTIONS AND GOVERNANCE-RELATED ADAPTATION MEASURES**

COUNTRY	MANAGEMENT ACTIVITY	METRIC	2030 TARGET
AFGHANISTAN	DISASTER MANAGEMENT STRATEGY-PLANNING FOR FOOD SECURITY AND EMERGENCY SUPPLIES FOR VULNERABLE COMMUNITIES	NON-QUANTIFIED	
PHILIPPINES	TRANSFER OF PROPERTY/RIGHTS TO THE POOR	NON-QUANTIFIED	
INDONESIA	DEVELOPMENT OF COMMUNITY CAPACITY AND PARTICIPATION IN LOCAL PLANNING PROCESSES, TO SECURE ACCESS TO KEY NATURAL RESOURCES	NON-QUANTIFIED	
PAKISTAN	DEVELOP A NATIONAL ADAPTATION PLAN THAT WILL CREATE A FRAMEWORK FOR GUIDING THE MAINSTREAMING OF MEDIUM- AND LONG-TERM CLIMATE CHANGE CONCERNS INTO NATIONAL SECTORAL POLICIES, STRATEGIES AND PROGRAMMES	NON-QUANTIFIED	



## 3.3 BARRIERS AND SUPPORT NEEDS

Article 9, 10 and 11 of the Paris Agreement reiterate the obligations of developed countries to support developing country efforts to build clean, climate-resilient futures through the provision of finance, technology and capacity-building support for climate change mitigation and adaptation. This section discusses the different types of support needs communicated by developing countries in Asia, as well as the barriers facing these nations to effectively put in place technologies and policies to achieve their climate goals and targets. Information from the NDCs was supplemented by a comprehensive review of country NCs and the TNAs to understand all support needs and potential barriers to implementation.

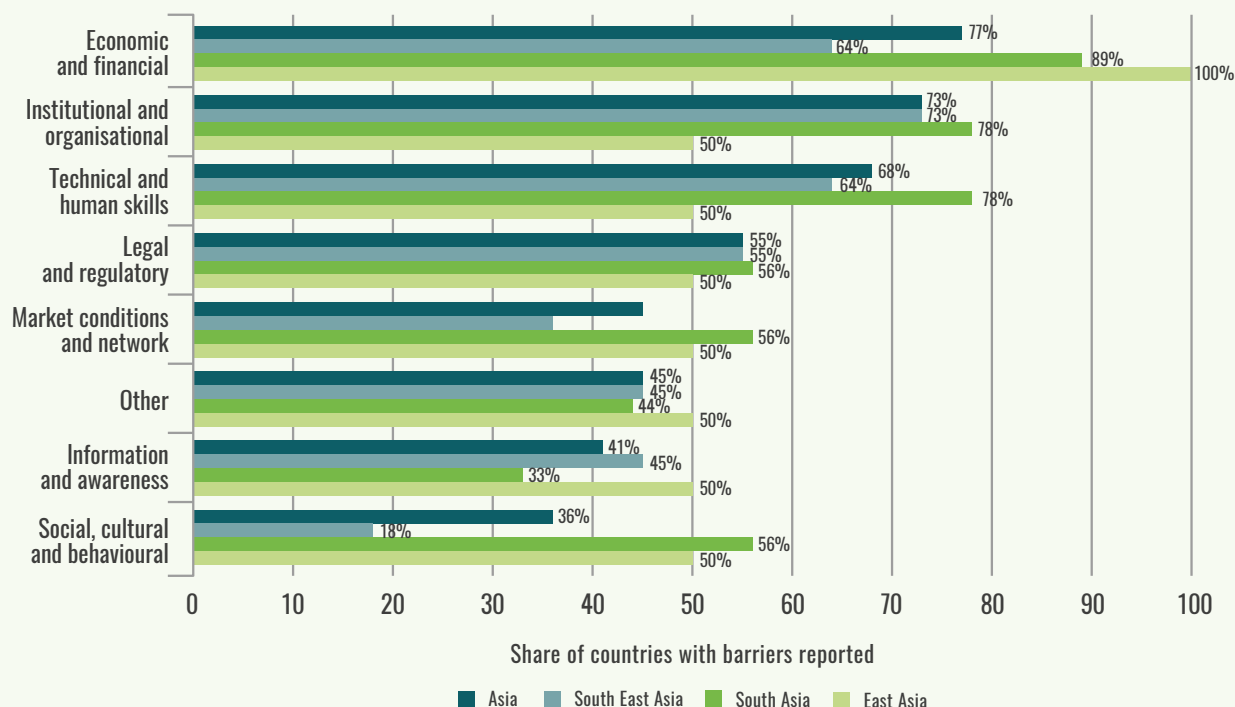
### 3.3.1 Barriers to implementation

Countries report several barriers that can potentially hinder implementation and progress on climate change mitigation and adaptation in the agriculture and land use sectors.

Overall, the majority of Asian countries identify a lack of economic and financial resources, weak institutional and organizational arrangements and low technical and human skill as the main barriers to NDC implementation in the region. In Eastern and Southern Asia, economic and financial resources constitute the main barrier, while weak institutional and organizational capacity is most frequently cited in South-eastern Asia. Figure 52 illustrates the share of countries in Asia, at the regional and sub-regional level, with barriers to NDC implementation identified out of countries with barriers reported, by type.

FIGURE 52.

#### BARRIERS TO CLIMATE ACTION IN THE AGRICULTURE AND LAND USE SECTORS REPORTED IN ASIA, BY BARRIER TYPE



Source: TNAs, NDCs, and NCs.

In Eastern Asia, both China and Mongolia indicate economic and financial constraints as being an important barrier. Further, Mongolia references the poor coordination between key actors in the livestock sector, including national and provincial veterinary and animal breeding organizations, research institutions, private enterprises and international and national projects and programs. Challenges exist in accessing long term soft loans for importers of drip irrigation equipment, facilities and greenhouse and mulch materials as well as vegetable growers which doesn't help in overcoming the high incremental costs associated with introducing new technologies.

In South-eastern Asia, 64 percent of countries identify economic and financial constraints, lack of proper institutions and organizations and lack of legal and regulatory bodies/actions to be the main barriers to NDC implementation. In terms of economic constraints, there is a general consensus across the sub region that high costs are associated with the uptake of and at the later stage, maintenance of the newer technologies. Indonesia mentions that both at national level and within specific sectors (e.g. water) coordination among government institutions like the central and autonomous governments is still weak. In Lao PDR, there is still insufficient legal and regulatory framework on climate resilient technology/infrastructure, including mainstreaming and deployment of climate resilient agricultural infrastructures. Myanmar indicates that lack of clear institutions makes it difficult to access climate related data. In Thailand, the lack of supportive policy/legislative frameworks for research, risk assessment and commercialization hinders effective decision making process and technology uptake and dissemination.

Sixty-four percent of countries in South-eastern Asia also identify lack of technical capacities and human skills as barriers to NDC implementation. Brunei Darussalam, for example, highlights that the lack of national GHG inventory as a common source of data is a significant technical barrier. In Lao PDR, technology transfer is required to develop human skills and enhance technical capacities to undertake R&D and extension of optimal and sustainable plantation including legal, organizational, financial and economic, social and environmental responsibility, carbon trading etc. Around one-third of countries identify lack of information and awareness as a barrier. For its forestry sector, Lao PDR aims to introduce capacity building activities for better management and understanding of sustainable plantations but this is slowed down by unavailability of adequate resource materials. Myanmar stresses the need for generalized support to build capacities to formulate and implement adaptive solutions in key sectors such as forestry, agriculture and early warning systems.

In Southern Asia, 89 percent of countries state that high costs associated with uptake and maintenance of new technologies slow down progress in addressing gaps and needs through technology transfer and dissemination. Afghanistan indicates that while capacity building is required for the country's climate policy expert, the country may not be able to bear the high costs associated with such activities. Bangladesh states in its NC that "high investment, operational and management fund will be required for the development of robust monitoring system of sea-level rise, tidal fluctuation, salinity intrusion, sedimentation coastal erosion" at the national level.

This is closely followed by lack of technical capacities and institutional arrangements, as expressed by 78 percent of countries in the sub-region. Bhutan mentions in its NC that "though the country has a relatively well-defined institutional structure in place looking at its seeds sector, amongst these institutions there is limited institutional and human resources capacity to carry out adequate research and development and more importantly extension activities. In addition, synergies amongst institutions are much desired". There is also a general lack of coordination and communication between the Department of Agriculture/Ministry of Agriculture and Forests and the Dzongkhag Administration (local administrations) in Bhutan (similar to Nepal). Further, the Maldives draws upon the fact that researches are usually carried by external agencies and research institutes in a fragmented manner, and lacks coordination between the different bodies, with limited local engagement which thereby makes is challenging to regulate and disseminate information and knowledge. India highlights that understanding the technicalities associated with understanding the linkages between impacts of climate change and adaptation and mitigation is still limited, which then calls for more research to be undertaken to better understand climate change challenges and identify cost-effective solutions at the local levels. Over half of the countries also identified social and cultural barriers, lack of human skills and lack of legalities and regulations (each) as other barriers.

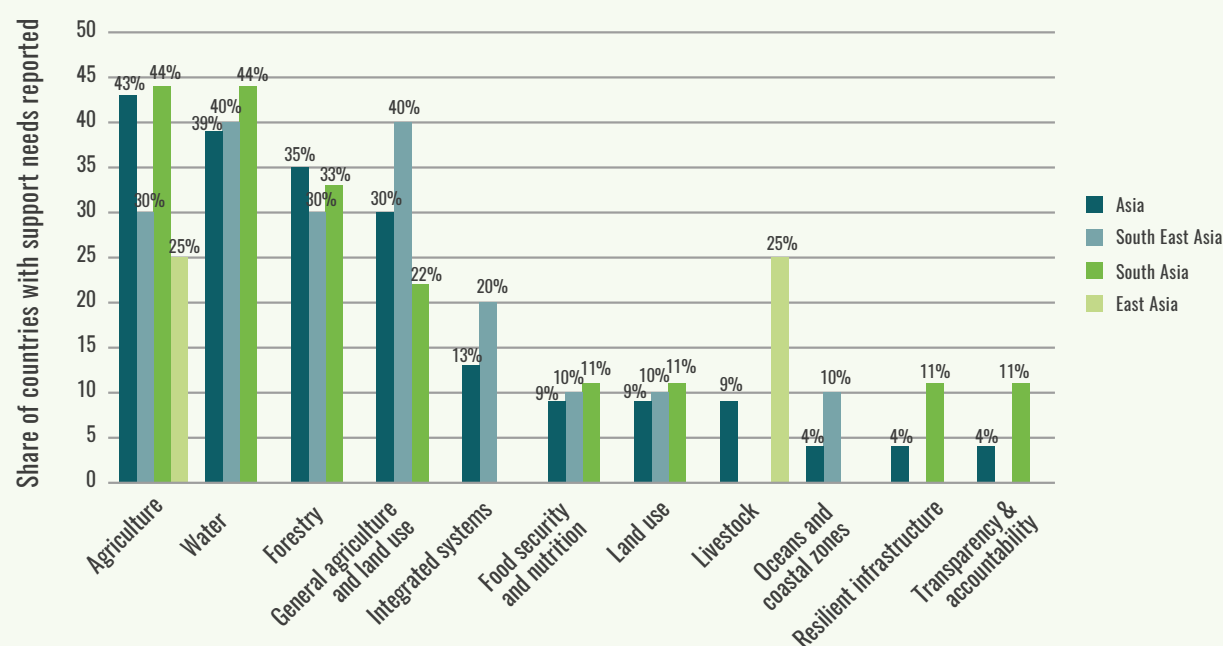
### 3.3.2 Capacity building, technology transfer and finance needs

In Asia, all developing countries with the exception of one<sup>59</sup> report at least one priority support need for implementing climate action in the agriculture and land use sectors, with around 60 percent related to adaptation rather than mitigation (40 percent).

The majority of those countries report support needs related to agriculture, water and forestry (43, 39 and 35 percent of countries with needs reported, respectively), amongst others. Figure 53 illustrates the share of countries, at the regional and sub-regional levels with priority support needs, by sector, out of countries with needs reported.

**FIGURE 53.**

#### PRIORITY SUPPORT NEEDS FOR IMPLEMENTATION OF CLIMATE CHANGE ADAPTATION AND MITIGATION IN ASIA, BY SECTOR



Source: TNAs, NDCs, and NCs.

In Eastern Asia, the priority sectors for support are the livestock sub-sector and agriculture in general, as identified by Mongolia and China respectively.

In South-eastern Asia, after agriculture and land use in general, water resources represent a major priority area for support (36 percent). Cambodia, for example, mentions putting in place small reservoirs, dams and micro catchment areas for better and integrated watershed management. Vietnam identifies technology needs for transfer and shifting of rice to upland grains and from triple cropping to double cropping along with shrimp, fish and poultry farming. Twenty-seven percent of countries mentions both general agriculture and the forestry sub sectors as priority areas for support. For its forestry sector, Indonesia stresses the need to develop better technologies for carbon management and monitoring.

<sup>59</sup> Singapore.

In Southern Asia, water resources and the agriculture sector in general are also identified as the two most important priority areas for support (44 percent, respectively). Around one-third of countries specify the need for support in terms of technology intervention and capacity building activities for their forestry sector. Countries like Nepal and Maldives refer to general support requirements to contribute towards increasing resilience and reducing emissions. Nepal, for instance, welcomes support to identify and develop drought resistant crop varieties with higher tolerance to different biotic and abiotic stresses. India emphasizes the need to build capacities across different sectors under agriculture and land use to integrate different scientific assessments and studies in order to make more informed decisions and policies. **Table 31** below highlights some other technological and capacity building interventions as identified by different countries across the region for specific priority sub sectors.

**TABLE 31.****TYPES OF TECHNOLOGY AND/OR CAPACITY-BUILDING NEEDS, BY PRIORITY AREA**

SUB REGION	COUNTRY	PRIORITY AREA	TECHNOLOGY OR CAPACITY BUILDING NEED
EASTERN ASIA	MONGOLIA	GENERAL AGRICULTURE	<ul style="list-style-type: none"> <li>• SYSTEM OF WHEAT INTENSIFICATION (SWI)</li> <li>• VEGETABLE PRODUCTION SYSTEM WITH DRIP IRRIGATION AND MULCHES (VPS)</li> <li>• POTATO SEED PRODUCTION SYSTEM (PSPS)</li> </ul>
		LIVESTOCK	<ul style="list-style-type: none"> <li>• SEASONAL PREDICTION AND LIVESTOCK EARLY WARNING SYSTEM (SPLEWS)</li> <li>• HIGH QUALITY LIVESTOCK THROUGH SELECTIVE BREEDING AND ANIMAL DISEASE MANAGEMENT (HQL)</li> <li>• SUSTAINABLE PASTURE MANAGEMENT (SPM)</li> </ul>
SOUTH-EASTERN ASIA	INDONESIA	FORESTRY	<ul style="list-style-type: none"> <li>• CARBON MANAGEMENT AND MONITORING FOR GHG INVENTORY AND MRV SYSTEMS</li> </ul>
		WATER	<ul style="list-style-type: none"> <li>• RAIN HARVESTING TECHNOLOGY</li> <li>• WATER RESOURCES PROJECTION TECHNOLOGY</li> </ul>
		FOOD SECURITY AND NUTRITION	<ul style="list-style-type: none"> <li>• FARMING TECHNOLOGY OF DROUGHT AND INUNDATED RESISTANT RICE VARIETIES</li> <li>• MILK FISH CULTIVATION IN FLOATING NET CAGE</li> <li>• TECHNOLOGY ENGINEERING APPLICATION OF BEEF CATTLE</li> <li>• IMPROVED FEED QUALITY AMONG SMALLHOLDERS</li> <li>• CROPPING CALENDAR</li> </ul>
	LAO PDR	GENERAL AGRICULTURE	<ul style="list-style-type: none"> <li>• ORGANIC FARMING TO PROMOTE SUSTAINABLE AGRICULTURE APPROACH AND PRACTICES</li> <li>• BIOENERGY PRODUCTION AND USE THROUGH BIOGAS DIGESTERS AND CONVERSION OF AGRICULTURAL RESIDUES TO ENERGY</li> <li>• AGRICULTURAL DEVELOPMENT SUBSIDY MECHANISM</li> <li>• CLIMATE RESILIENT RURAL INFRASTRUCTURE</li> <li>• CROP DIVERSIFICATION AND BREEDING</li> </ul>
		WATER	<ul style="list-style-type: none"> <li>• CLIMATE INFORMATION AND EARLY WARNING SYSTEMS</li> <li>• DISASTER IMPACT REDUCTION FUND</li> </ul>
	THAILAND	GENERAL AGRICULTURE FORESTRY	<ul style="list-style-type: none"> <li>• CLIMATE INFORMATION AND EARLY WARNING SYSTEMS</li> <li>• CROP IMPROVEMENT TECHNOLOGIES</li> <li>• PRECISION FARMING TECHNOLOGIES FOR SOIL AND NUTRIENT MANAGEMENT</li> </ul>
SOUTHERN ASIA	AFGHANISTAN	WATER	<ul style="list-style-type: none"> <li>• INCREASING IRRIGATED AGRICULTURAL LAND TO 3.14 M-HA, THROUGH RESTORATION AND DEVELOPMENT OF AFGHANISTAN'S IRRIGATION SYSTEMS</li> </ul>
		GENERAL AGRICULTURE	<ul style="list-style-type: none"> <li>• IMPROVED NATIONAL DATASET ON AGRICULTURE, FOOD SECURITY DATA</li> </ul>
	BANGLADESH	WATER	<ul style="list-style-type: none"> <li>• COMPREHENSIVE DISASTER MANAGEMENT INCORPORATING EARLY WARNING SYSTEMS AND INVOLVING COMMUNITY</li> </ul>
		GENERAL AGRICULTURE	<ul style="list-style-type: none"> <li>• MARKET MAPPING AND ANALYSIS FOR TRAINING ON IMPROVED FARMING PRACTICES FOR CROPS, IRRIGATION AND WATER MANAGEMENT, SOIL FERTILITY MANAGEMENT (CONSERVATION AND RESTORATION OF SOIL QUALITY) ETC</li> </ul>
	PAKISTAN	GENERAL AGRICULTURE	<ul style="list-style-type: none"> <li>• HIGH EFFICIENCY IRRIGATION SYSTEMS (DRIP AND SPRINKLER)</li> </ul>

### BOX 3: THAILAND'S TECHNOLOGY NEEDS ASSESSMENT

Thailand is one of the few countries that has put together a Technology Needs Assessment (TNA) for its agriculture sector along with its water sector, for the purpose of identifying technologies to enhance capacities to better adapt to the changing climate and to embark on a sustainable and low emissions pathway. It also emphasizes the need to develop models for the purpose of development and management of national data to address the needs of the agriculture and water sectors. The TNA has also been referred to and integrated in its NDC.

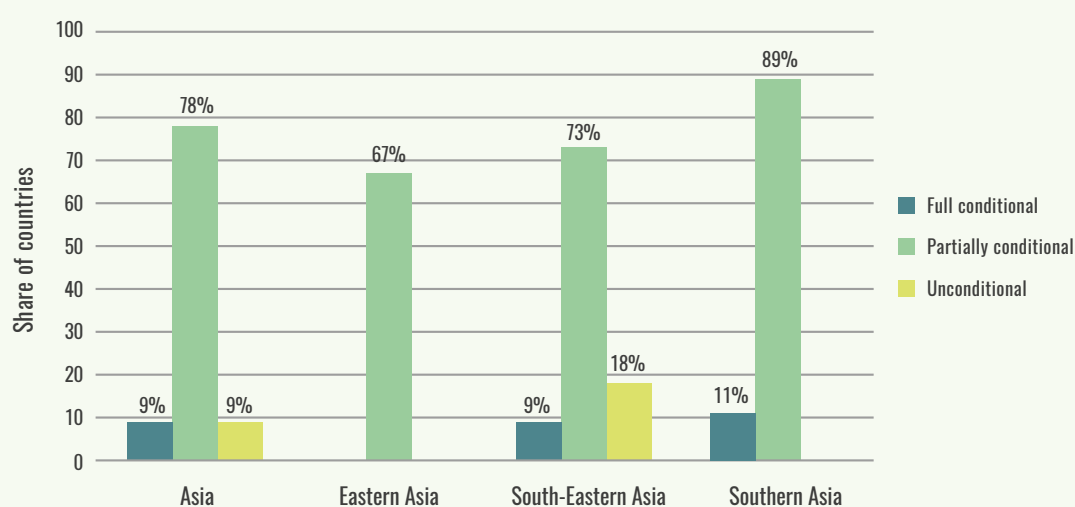
Examples of priority areas and technology needs highlighted in the country's TNA report are:

- **Agriculture sector** - forecasting and early warning system technologies, crop improvement technologies, and precision farming technologies;
- **Water Sector** - networking (via pipes and canals) and management of infrastructures (including zoning), seasonal climate prediction, and sensor web using observation and/or modeling data; and
- **Modelling** - integrated national data center, national data transfer/management process and the advanced research, weather research and forecasting (WRF - ARW) model, and an integrated model to address the need of agricultural sector and water resource management sector.

Countries highlight that access to additional financial resources is a prerequisite for achieving the climate goals and targets in country NDCs. All developing countries, with the exception of one,<sup>60</sup> indicate whether they require full, partial or no financial support for NDC implementation, but not all quantify the respective conditional and unconditional share. Eighty percent of countries in Asia communicate that NDC implementation is partly conditional to international financial support, two countries<sup>61</sup> make their NDCs totally conditional and two country<sup>62</sup> make their NDC unconditional to the provision of external finance. Not all requiring financial support however, quantify financial needs disaggregated by conditional and unconditional shares. Only 16 percent of countries specify the conditional and unconditional share. Overall, NDC implementation in Asia is associated with a reported 1.6 billion USD. This however represents the financial needs expressed by only one-third of the countries in the region. **Figure 54** illustrates the share of countries with NDCs that are fully, partially or not conditional to the provision of external finance.

**FIGURE 54.**

#### FINANCIAL CONDITIONALITY OF NDC IMPLEMENTATION IN ASIAN DEVELOPING COUNTRIES, BY TYPE



Source: NDCs.

<sup>60</sup> Democratic People's Republic of Korea did not indicate any conditionality of financial support in its NDC.

<sup>61</sup> Philippines and Afghanistan.

<sup>62</sup> Brunei-Darussalam and Singapore.

# CHAPTER 4



# GAPS AND OPPORTUNITIES FOR ENHANCING AMBITION IN THE AGRICULTURE AND LAND USE SECTORS

This section aims to assess the degree to which the mitigation policies and measures in the agriculture and land use sectors address the major sources of sectoral GHG emissions, and the extent to which adaptation measures in ecosystems and social systems respond to the major observed and/or projected climate-related hazards, slow onset risks, impacts and vulnerabilities reported. The results of the “gap” analysis can inform the review and revision of NDCs in 2020 and future revision cycles by highlighting the “opportunities” to realign mitigation and adaptation priorities in the agriculture and land use sectors.

## 4.1 MITIGATION ANALYSIS

This section first projects the counterfactual scenario – or net emissions in the absence of mitigation – and compares it to the mitigation scenario set out in country NDCs. Information from the NDCs is supplemented by information from the NCs. The “GHG hotspots” in the agriculture and land use sectors are also identified and serve as the reference against which the mitigation policies or measures presented in the NDCs are assessed in order to identify gaps and opportunities for enhancing mitigation ambition.

### 4.1.1 Counterfactual and mitigation scenarios

Based on national data reported to the UNFCCC by all 25 countries in the region between 1994 and 2016, the counterfactual and mitigation scenarios are estimated at the country and sub-regional levels and then aggregated at the regional level. The counterfactual scenario, at the country-level, is based on the projected level of net emissions in 2030 that is either reported by the country, or projected by using the average change in sub-regional net emissions estimated by other countries in the sub-region as a



proxy. The counterfactual scenarios for each country are then aggregated at the sub-regional level. The mitigation scenario, at the country level, is based on the estimated level of net emissions in 2030 that would result from the GHG reduction target reported by each country in either their NDC or NC. The mitigation scenarios for each country are then aggregated at the sub-regional level. The counterfactual and mitigation scenarios at the sub-regional level can then be further aggregated at the regional level.

Once the counterfactual and mitigation scenarios are established, they can be compared against each other at the aggregate level to quantify the impact of NDC implementation in terms of the percentage of reduction in regional net emissions compared to either a scenario without NDC implementation (i.e. the counterfactual level of emissions in 2030) or the starting point (i.e. the historical level of emissions in 2015).

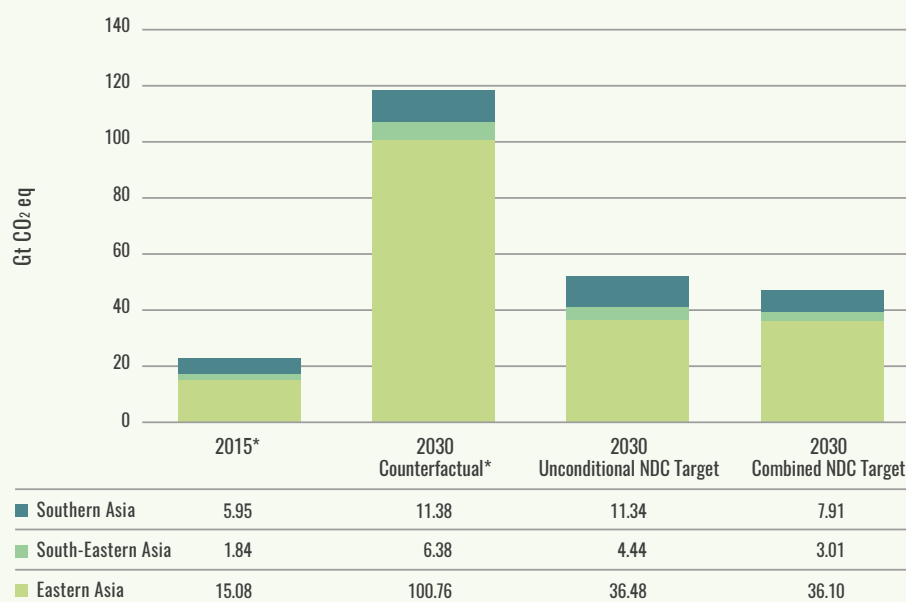
**Without implementation of the NDCs, total economy-wide net emissions in 2030 are expected to quadruple those reported in 2015**, rising from around 22.8 Gt CO<sub>2</sub> eq. in 2015 to 118.5 Gt CO<sub>2</sub> eq. in 2030. Given the large weight of China in terms of emissions, when excluded, net emissions in the region are expected to double those reported in 2015, rising from 9.8 Gt CO<sub>2</sub> eq. in 2015 to 20.1 Gt CO<sub>2</sub> eq. in 2030. All but six countries in Asia,<sup>63</sup> representing 98 percent of economy-wide net emissions in the region, set a general GHG target, covering the 2016–2030 period.

**Under the mitigation scenario, total net emissions in the region are expected to fall by roughly 60 percent compared to the 2030 counterfactual scenario**, or from 118.5 Gt CO<sub>2</sub> eq. to 47 Gt CO<sub>2</sub> eq. in 2030, which equates to a cumulated net reduction of –633 Gt CO<sub>2</sub> eq. over the implementation period.<sup>64</sup> Excluding China, the mitigation scenario entails a 38 percent reduction in net emissions, or from 20.1 Gt CO<sub>2</sub> eq. to 12.6 Gt CO<sub>2</sub> eq. in 2030, equating to a cumulated net reduction in the order of –43.2 Gt CO<sub>2</sub> eq. over the implementation period, of which 70 percent is conditional to international support.

**When compared against the historical 2015 level, however, net emissions at the regional level are nevertheless projected to double by 2030 even under NDC implementation.** Excluding China, net emissions in the region are projected to increase by one-third compared to historical levels under NDC implementation. **Figure 55** compares the historical net emissions in 2015 to net emission levels in the 2030 counterfactual and 2030 unconditional and combined (unconditional and conditional) mitigation scenarios in Asia.

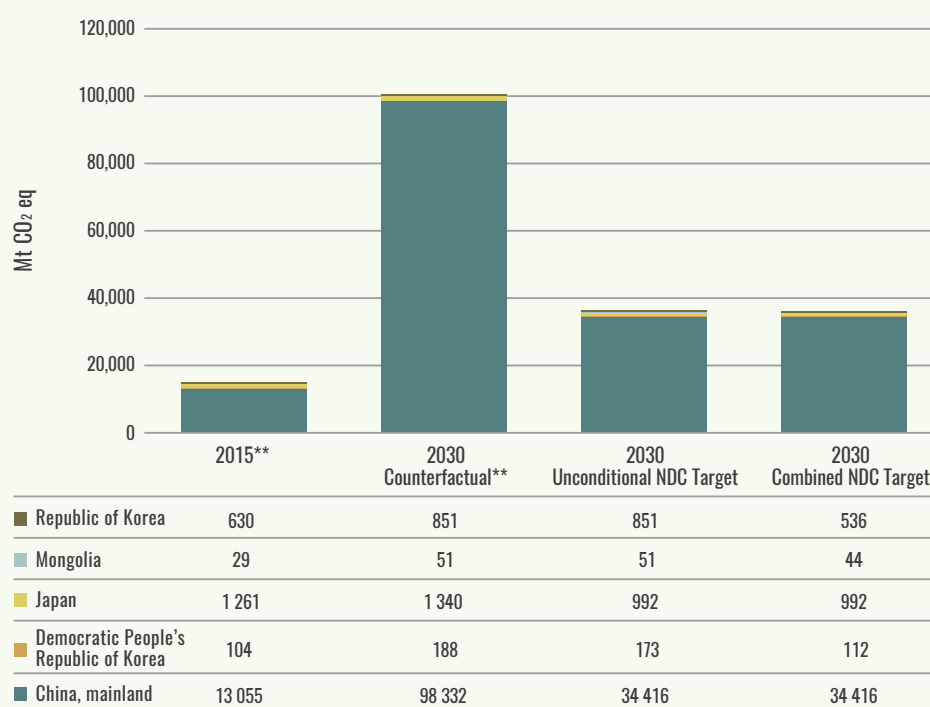
<sup>63</sup> Brunei Darussalam, Lao PDR, Myanmar, Timor-Leste, Bhutan and Nepal.

<sup>64</sup> It should be noted that the high cumulated net reduction value for the region is largely associated with the type of GHG target (GDP intensity) and baseline (2005 base year) communicated by China, in which the GDP growth recorded for the period 2006–2015 (513 percent) combined with that estimated for the period 2016–2030 (at 6.9 percent per year based on 2015 data), would result in a 2030 baseline estimated to be 1 395 percent larger than its 2005 level, assuming no gain in GDP efficiency. As a result, the 65 percent reduction target generates a substantive cumulated net reduction over the implementation period – though 2030 net emissions would nevertheless be higher than those historically.

**FIGURE 55.****HISTORICAL (2015), COUNTERFACTUAL (2030) AND UNCONDITIONAL AND COMBINED NDC MITIGATION SCENARIOS (2030) IN ASIA**

\* Estimated based on national data, when available, and linearly interpolated, extrapolated or projected data.  
Source: FAO elaboration based on NGHGI and NDCs.

Figures 56–58 illustrate the various emission scenarios at the sub-regional level.

**FIGURE 56.****HISTORICAL (2015), COUNTERFACTUAL (2030) AND UNCONDITIONAL AND COMBINED NDC MITIGATION SCENARIOS (2030) FOR ALL COUNTRIES IN EASTERN ASIA**

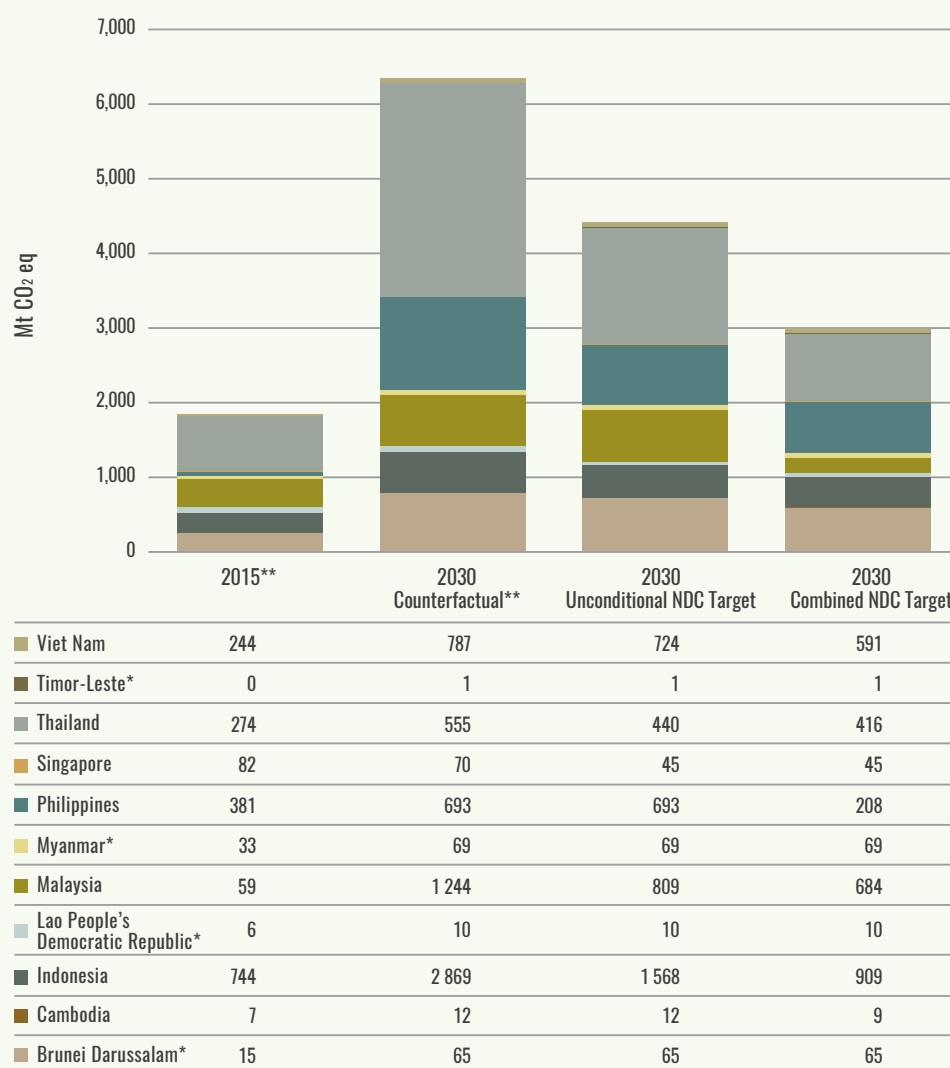
\*\* Estimated based on national data, when available, and linearly interpolated, extrapolated or projected data.

Note: If a country does not set an unconditional and/or combined target, the counterfactual scenario emission level is used, assuming the absence of mitigation.

Source: FAO elaboration based on NGHGI and NDCs.

**FIGURE 57.**

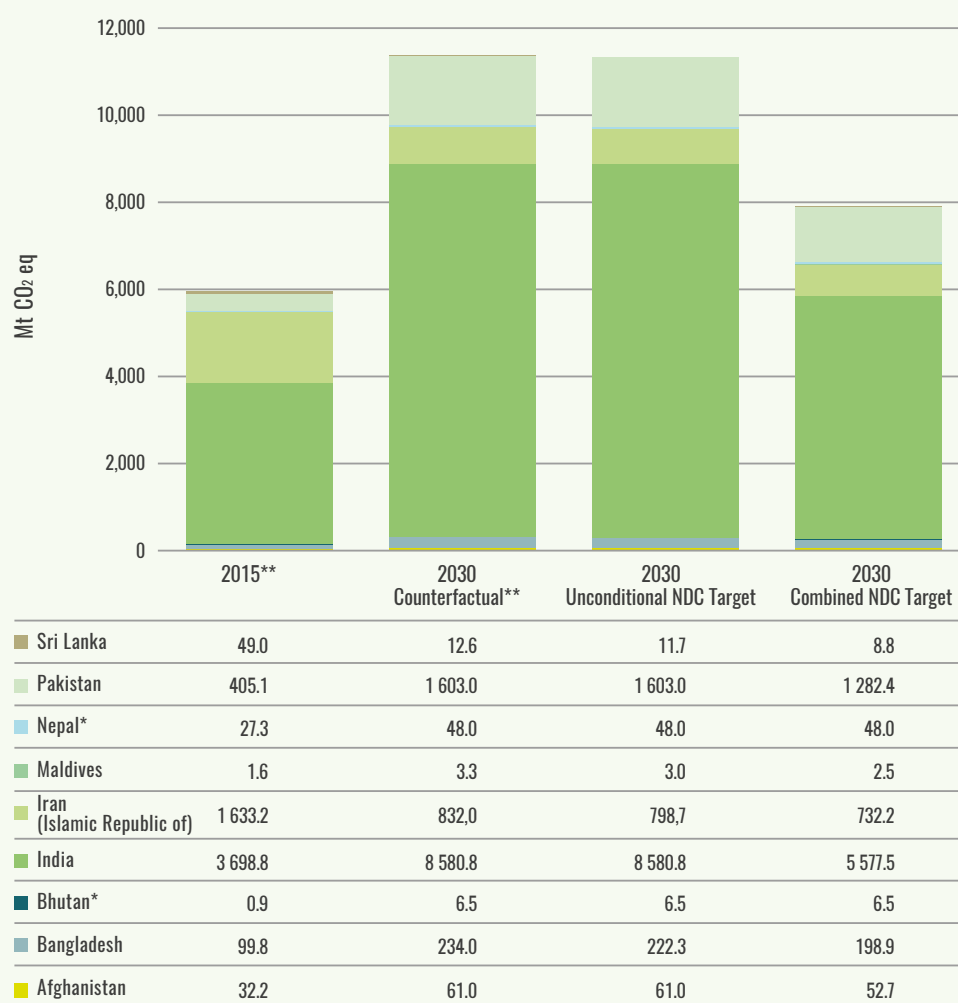
**HISTORICAL (2015), COUNTERFACTUAL (2030) AND UNCONDITIONAL AND COMBINED NDC MITIGATION SCENARIOS (2030) FOR ALL COUNTRIES IN SOUTH-EAST ASIA**



\*Country without a GHG target where the 2030 counterfactual scenario is projected based on sub-regional emission trends and used under the 2030 mitigation scenarios, assuming the absence of mitigation.

\*\*Estimated based on national data, when available, and linearly interpolated, extrapolated or projected data. Note: If a country does not set an unconditional target, the counterfactual scenario emission level is used, assuming the absence of mitigation.

Source: FAO elaboration based on NGHGI and NDCs.

**FIGURE 58.****HISTORICAL (2015), COUNTERFACTUAL (2030) AND UNCONDITIONAL AND COMBINED NDC MITIGATION SCENARIOS (2030) FOR ALL COUNTRIES IN SOUTHERN ASIA**

\*Country without a GHG target where the 2030 counterfactual scenario is projected based on sub-regional emission trends and used under the 2030 mitigation scenarios, assuming the absence of mitigation.

\*\*Estimated based on national data, when available, and linearly interpolated, extrapolated or projected data.

Note: If a country does not set an unconditional target, the counterfactual scenario emission level is used, assuming the absence of mitigation.

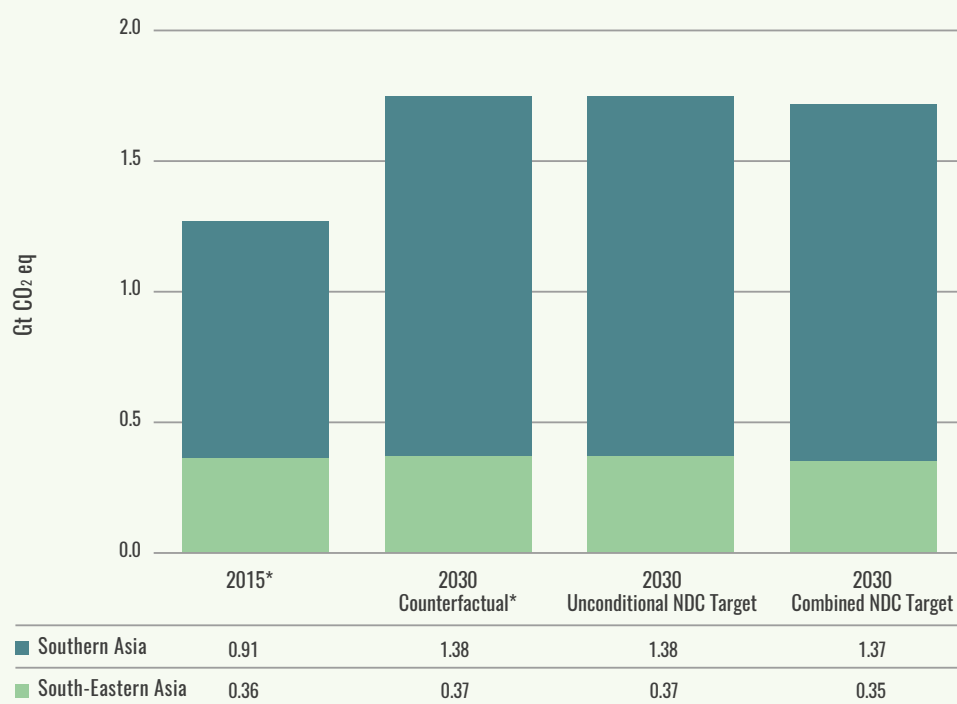
Source: FAO elaboration based on NGHGI and NDCs.

In the agriculture sector, the counterfactual and mitigation scenarios were estimated for South-eastern and Southern Asia only, as none of the countries in Eastern Asia reported a GHG target nor projected emission levels in 2030 without mitigation from which the two scenarios could be constructed.

By 2030, total emissions from the agriculture sector in South-eastern and Southern Asia are expected to increase by around 40 percent compared to historical levels, rising from around 1.3 Gt CO<sub>2</sub> eq. in 2015 to almost 1.8 Gt CO<sub>2</sub> eq. in 2030. Out of 25 countries in the region, only four,<sup>65</sup> representing 30 percent of total agricultural emissions, communicated a sectoral GHG target, which would reduce emissions by only ten percent in those countries, compared to the counterfactual in 2030, of which 84 percent is conditional to international support. This equates to a cumulated net reduction of -1.39 Gt CO<sub>2</sub> eq. by 2030 over the implementation period. The impact of that reduction on the regional<sup>66</sup> emissions in the agriculture sector is a reduction of only 2 percent compared to the 2030 counterfactual. Compared to historical 2015 levels, agricultural emissions in the region<sup>67</sup> would nevertheless increase by 36 percent in 2030 even under NDC implementation. Figure 59 compares the historical net emissions in 2015 to net emission levels in the 2030 counterfactual and 2030 unconditional and combined (unconditional and conditional) mitigation scenarios for the agriculture sector in Southern and South-eastern Asia.

**FIGURE 59.**

**HISTORICAL (2015), COUNTERFACTUAL (2030) AND UNCONDITIONAL AND COMBINED NDC MITIGATION SCENARIOS (2030) IN THE AGRICULTURE SECTOR FOR SOUTH-EASTERN ASIA**



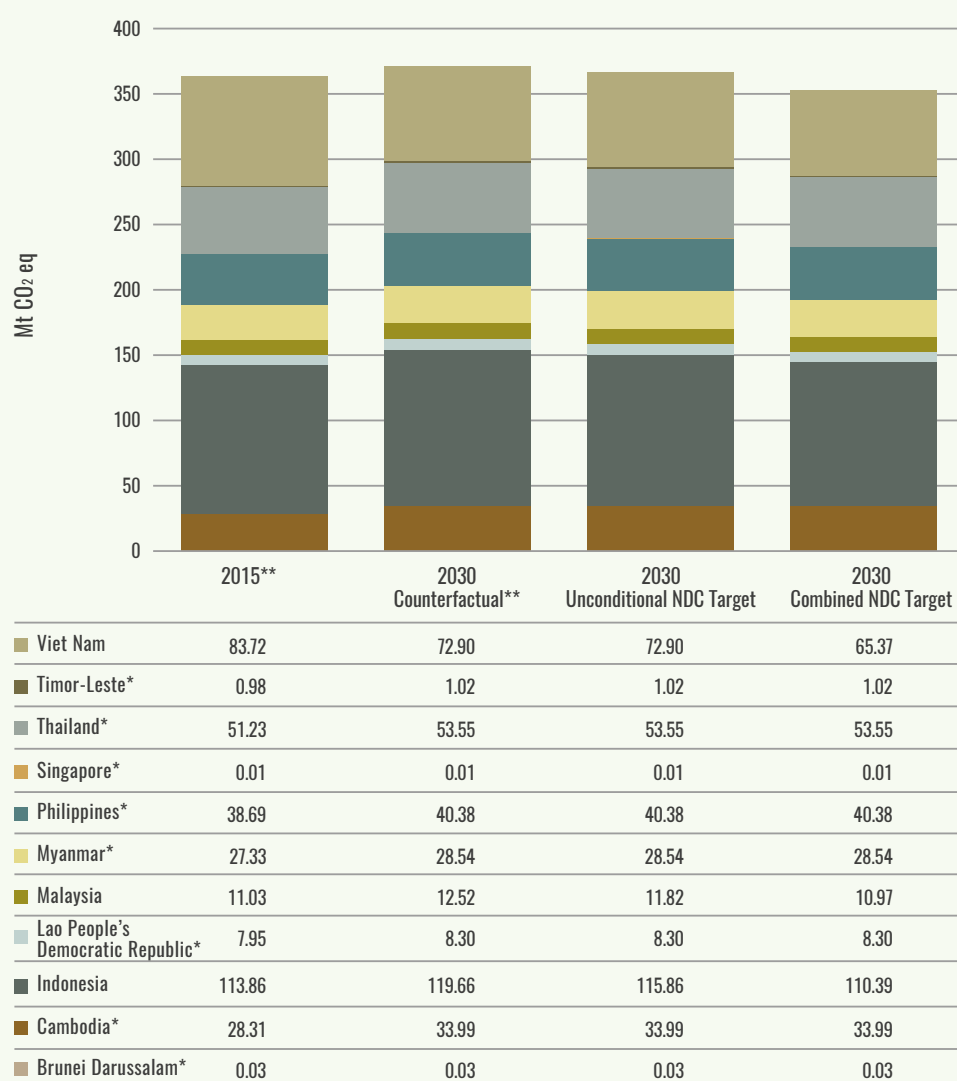
\* Estimated based on national data, when available, and linearly interpolated, extrapolated or projected data.  
Source: FAO elaboration based on NGHGI and NDCs.

Figures 60–61 illustrate the various agricultural emission scenarios at the sub-regional level.

<sup>65</sup> Malaysia, Vietnam, Indonesia and Iran (Islamic Republic of).

<sup>66</sup> Excluding Eastern Asia due to lack of data.

<sup>67</sup> Excluding Eastern Asia due to lack of data.

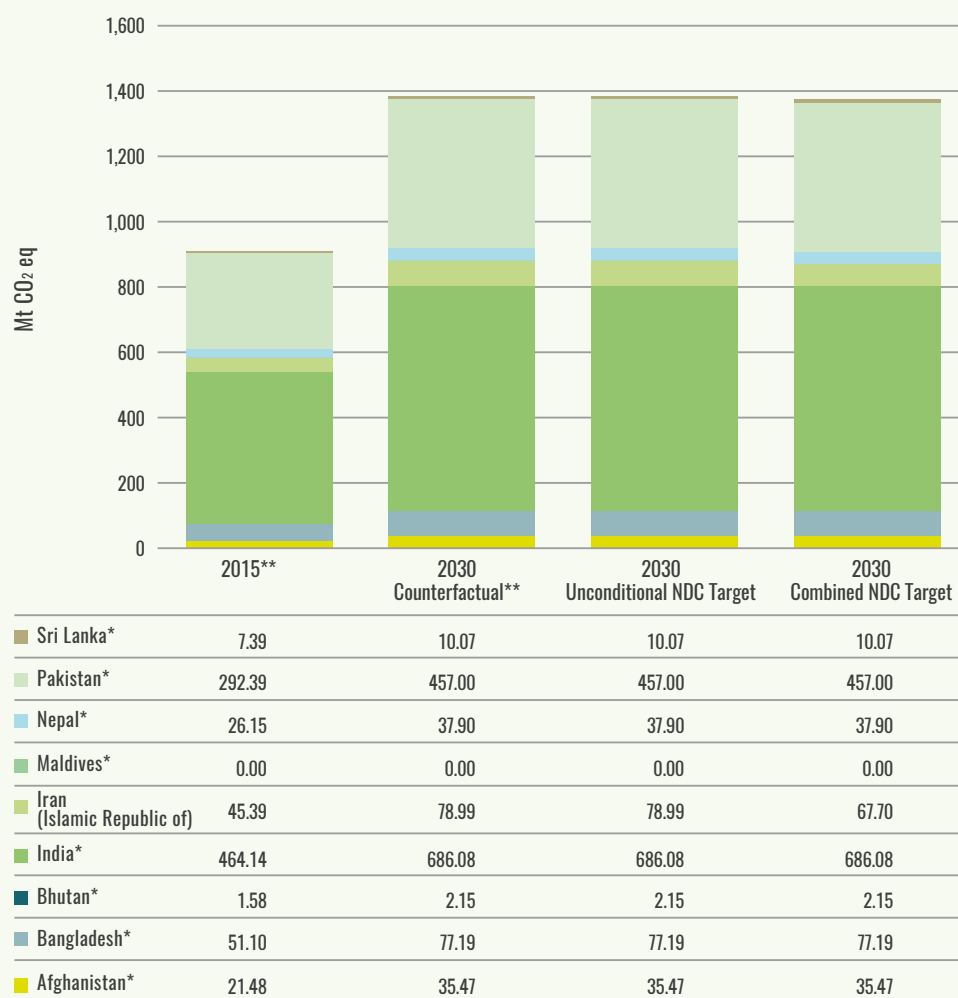
**FIGURE 60.****HISTORICAL (2015), COUNTERFACTUAL (2030) AND UNCONDITIONAL AND COMBINED NDC MITIGATION SCENARIOS (2030) IN THE AGRICULTURE SECTOR FOR SOUTH-EASTERN ASIA**

\* Country without a GHG target where the 2030 counterfactual scenario is projected based on sub-regional emission trends and used under the 2030 mitigation scenarios, assuming the absence of mitigation.

\*\* Estimated based on national data, when available, and linearly interpolated, extrapolated or projected data.

Note: If a country does not set an unconditional target, the counterfactual scenario emission level is used, assuming the absence of mitigation.

Source: FAO elaboration based on NGHGI and NDCs.

**FIGURE 61.****HISTORICAL (2015), COUNTERFACTUAL (2030) AND UNCONDITIONAL AND COMBINED NDC MITIGATION SCENARIOS (2030) FOR SOUTHERN ASIA**

\* Country without a GHG target where the 2030 counterfactual scenario is projected based on sub-regional emission trends and used under the 2030 mitigation scenarios, assuming the absence of mitigation.

\*\* Estimated based on national data, when available, and linearly interpolated, extrapolated or projected data.

Note: If a country does not set an unconditional target, the counterfactual scenario emission level is used, assuming the absence of mitigation. Source: FAO elaboration based on NGHGI and NDCs.

**The LULUCF sector constitutes a net sink in Asia and removals are expected to increase by 25 percent in 2030,**<sup>68</sup> compared to those reported in 2015, or from -0.69 Gt CO<sub>2</sub> eq. to -0.86 Gt CO<sub>2</sub> eq. in 2030. Out of 25 countries in the region, eight,<sup>69</sup> representing 92 percent of net LULUCF emissions, communicated a sectoral GHG target, which would increase removals by seven-fold in those countries under NDC implementation, compared to the 2030 counterfactual, equating to a cumulated net reduction of -10.8 Gt CO<sub>2</sub> eq, of which roughly 75 percent is conditional to international support. The impact of that reduction on regional net emissions in the LULUCF sector is a 160 percent increase in the sink compared to the 2030 counterfactual, or from -0.86 Gt CO<sub>2</sub> eq. to -2.2 Gt CO<sub>2</sub> eq. in 2030. Compared to historic levels, net removals in the LULUCF sector would increase by 225 percent at the regional level under NDC mitigation.

<sup>68</sup> It should be noted that such extrapolation is almost fully determined by the projected increasing sink reported by Cambodia, Indonesia and Malaysia, affecting the sub-regional counterfactual trend.

<sup>69</sup> Japan, Cambodia, Indonesia, Lao PDR, Malaysia, Vietnam, India and Iran (Islamic Republic of).

**Figure 62** compares the historical net emissions in 2015 to net emission levels in the 2030 counterfactual and 2030 unconditional and combined (unconditional and conditional) mitigation scenarios in Asia.

**FIGURE 62.**

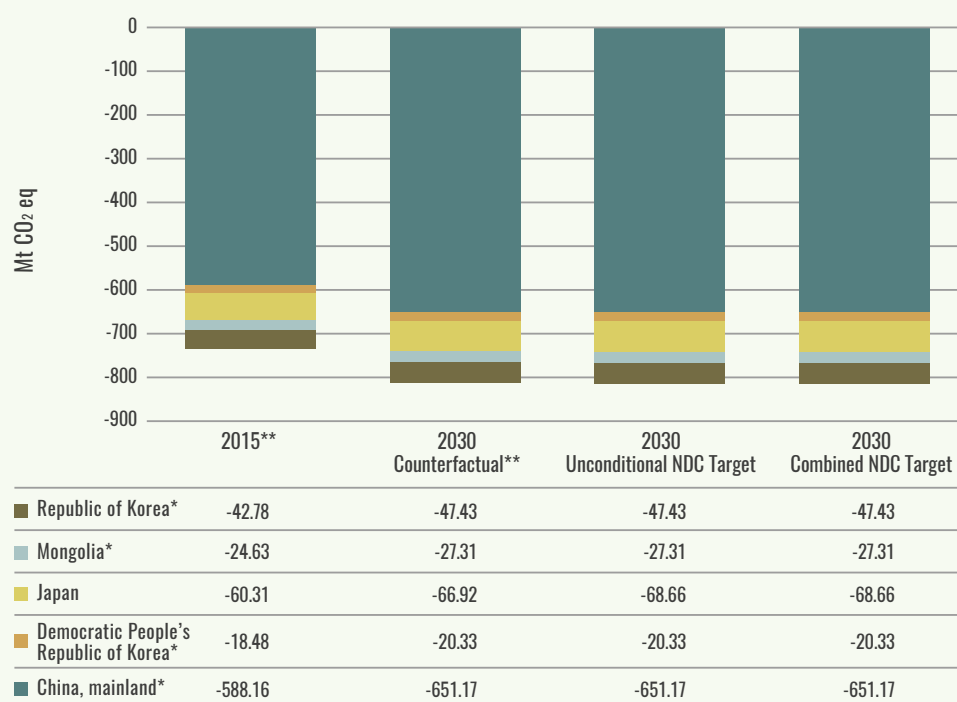
**HISTORICAL (2015), COUNTERFACTUAL (2030) AND UNCONDITIONAL AND COMBINED NDC MITIGATION SCENARIOS (2030) FOR THE LULUCF SECTOR IN ASIA**



\* Estimated based on national data, when available, and linearly interpolated, extrapolated or projected data.  
Source: FAO elaboration based on NGHGI and NDCs.

**Figures 63–65** illustrate the various LULUCF emission scenarios at the sub-regional level.



**FIGURE 63.****HISTORICAL (2015), COUNTERFACTUAL (2030) AND UNCONDITIONAL AND COMBINED NDC MITIGATION SCENARIOS (2030) FOR THE LULUCF SECTOR IN EASTERN ASIA**

\* Country without a GHG target where the 2030 counterfactual scenario is projected based on sub-regional emission trends and used under the 2030 mitigation scenarios, assuming the absence of mitigation.

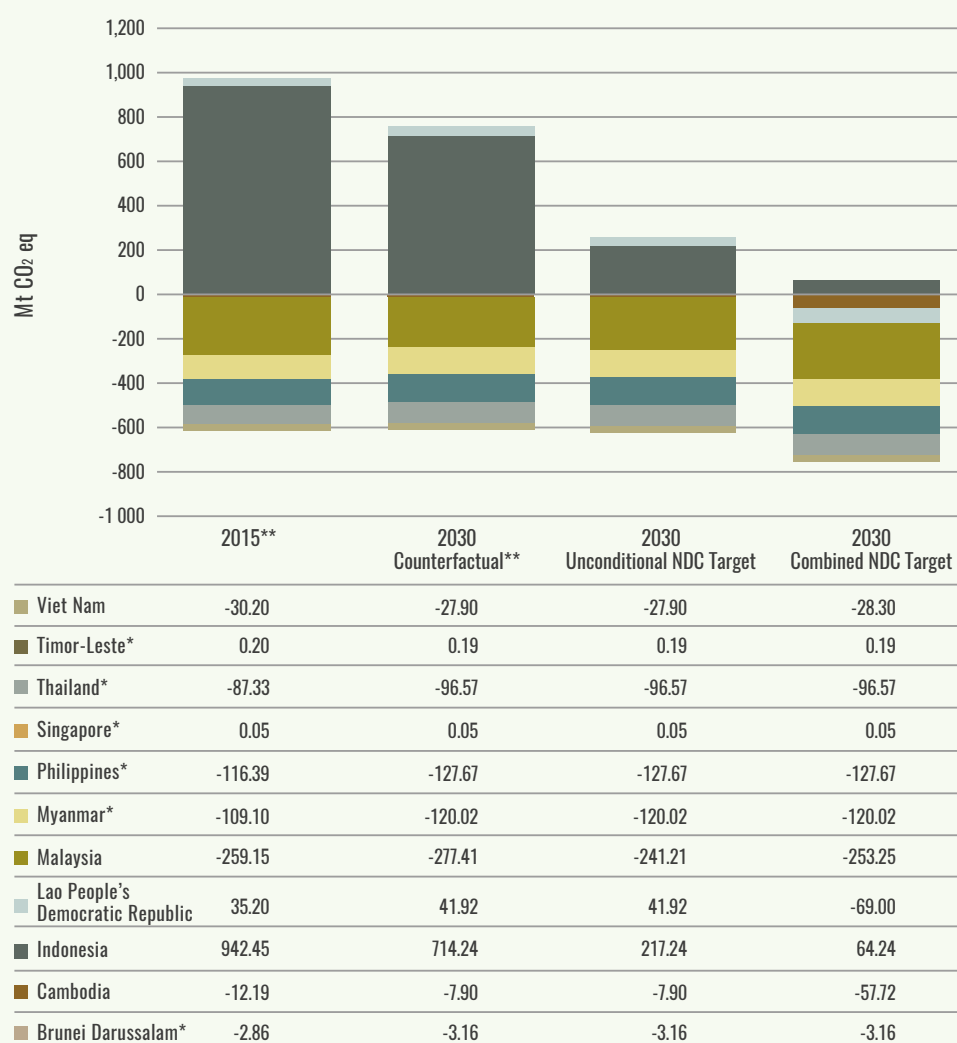
\*\* Estimated based on national data, when available, and linearly interpolated, extrapolated or projected data.

Note: If a country does not set an unconditional target, the counterfactual scenario emission level is used, assuming the absence of mitigation.

Source: FAO elaboration based on NGHGI and NDCs.

**FIGURE 64.**

**HISTORICAL (2015), COUNTERFACTUAL (2030) AND UNCONDITIONAL AND COMBINED NDC MITIGATION SCENARIOS (2030) FOR THE LULUCF SECTOR IN SOUTH-EASTERN ASIA**



\* Country without a GHG target where the 2030 counterfactual scenario is projected based on sub-regional emission trends and used under the 2030 mitigation scenarios, assuming the absence of mitigation.

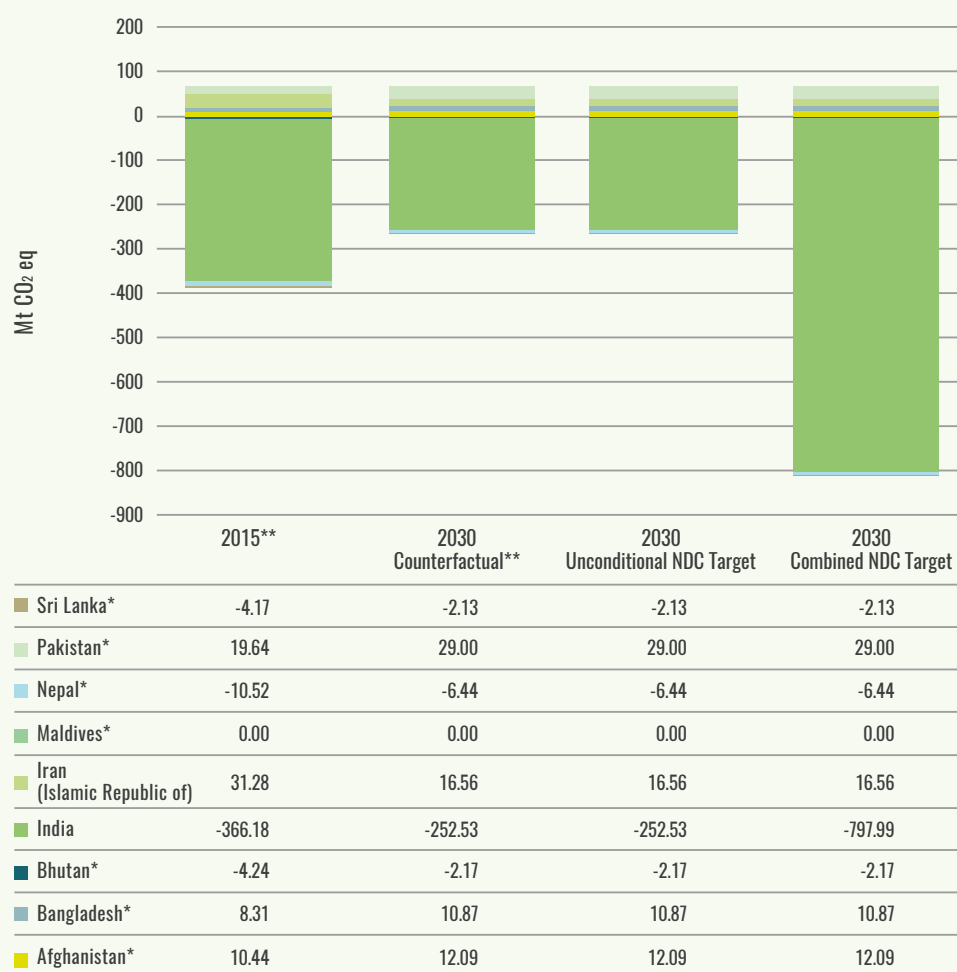
\*\* Estimated based on national data, when available, and linearly interpolated, extrapolated or projected data.

Note: If a country does not set an unconditional target, the counterfactual scenario emission level is used, assuming the absence of mitigation.

Source: FAO elaboration based on NGHGI and NDCs.

FIGURE 65.

**HISTORICAL (2015), COUNTERFACTUAL (2030) AND UNCONDITIONAL AND COMBINED NDC MITIGATION SCENARIOS (2030) FOR THE LULUCF SECTOR IN SOUTHERN ASIA**



\* Country without a GHG target where the 2030 counterfactual scenario is projected based on sub-regional emission trends and used under the 2030 mitigation scenarios, assuming the absence of mitigation.

\*\* Estimated based on national data, when available, and linearly interpolated, extrapolated or projected data.

Note: If a country does not set an unconditional target, the counterfactual scenario emission level is used, assuming the absence of mitigation.

Source: FAO elaboration based on NGHGI and NDCs.

### 4.1.2 Greenhouse gas hotspots

The contribution of the agriculture and LULUCF sector to regional emissions is significant, at around 16 percent. Achieving the 60 percent reduction in the region's economy-wide net emissions, as set forth in country NDCs (representing 98 percent of the region's current emissions), will depend upon the identification of major source categories and opportunities for cost-effective mitigation. With 92 percent of countries in the region committed to mitigation in the agriculture and/or LULUCF sectors, this section identifies the major emission sources, against which the policies or measures set forth in the NDCs are compared, to inform the gap and opportunity analysis in the section that follows.

For each country, the first and second<sup>70</sup> largest sources of sectoral emissions, or "GHG hotspots," are identified based on data reported in the NGHGI. The country-level GHG hotspots are then aggregated at sub-regional and regional levels to identify trends amongst emissions sources, and account for differences, across sub-regional economies and land covers.

<sup>70</sup> Above a 10 percent share.

In the agriculture sector, the largest GHG hotspots in the region are emissions from managed soils (33 percent of total agriculture emissions), mostly generated in Eastern Asia, and enteric fermentation (32 percent), predominantly from Southern and Eastern Asia, followed by rice management (23 percent), mostly generated in South-eastern Asia. **Figure 66** illustrates the GHG hotspots in the agriculture sector, at the sub-regional level, where the size of the bubble corresponds to the amount of Mt CO<sub>2</sub> eq.

**FIGURE 66.**

**GHG HOTSPOTS IN THE AGRICULTURE SECTOR, BY SUB-REGION AND MAJOR CATEGORY**

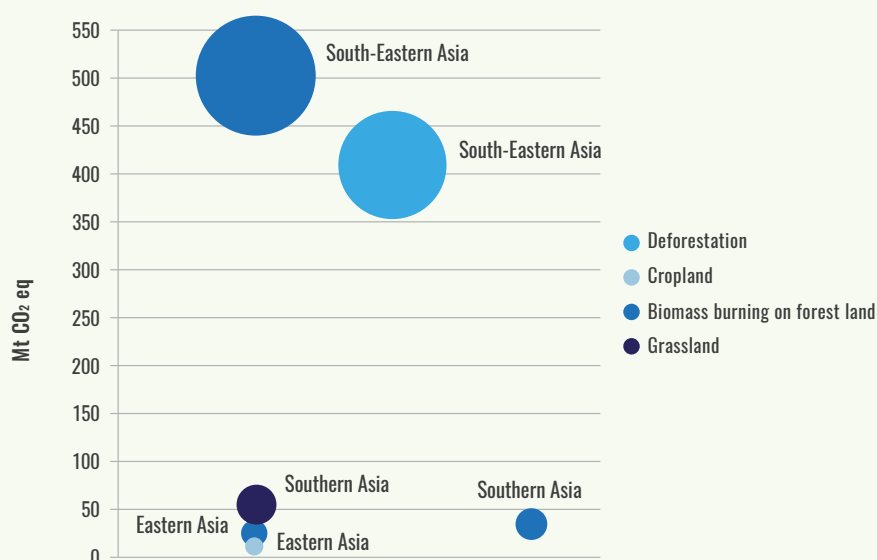


Source: FAO elaboration based on NGHGs.

In the LULUCF sector, the largest GHG hotspots in the region are emissions from biomass burning on forest land and deforestation (37 and 33 percent of total LULUCF emissions, respectively), primarily from South-eastern Asia. **Figure 67** illustrates the GHG hotspots in the LULUCF sector, at the sub-regional level, where the size of the bubble corresponds to the amount of Mt CO<sub>2</sub> eq.

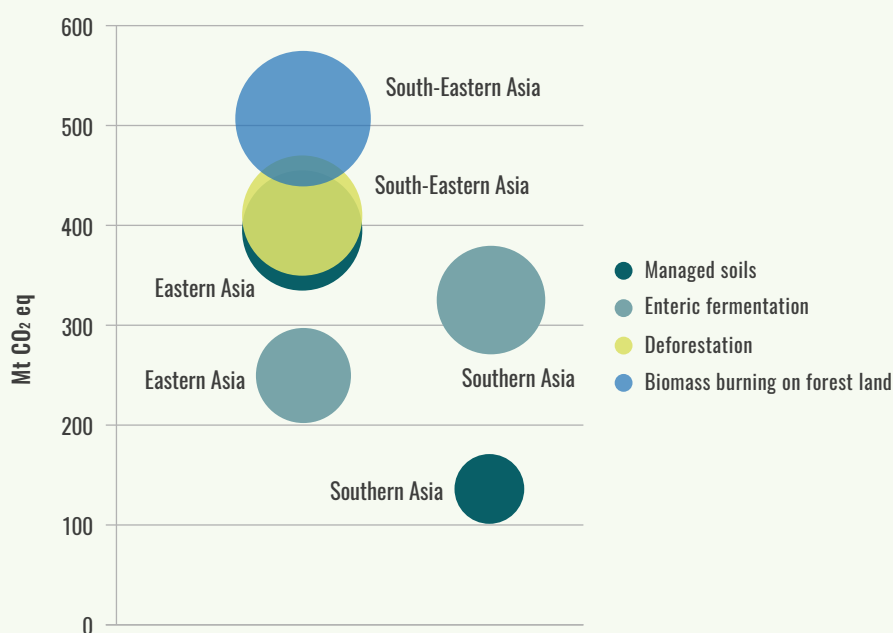
**FIGURE 67.**

**GHG HOTSPOTS IN THE LULUCF SECTOR, BY SUB-REGION AND MAJOR CATEGORY**



Source: FAO elaboration based on NGHGs.

When emissions from the agriculture and LULUCF sector are combined, the largest GHG hotspots in the region are emissions from managed soils, primarily in Eastern Asia, and enteric fermentation, primarily in Southern Asia (19 percent of total AFOLU emissions, respectively), followed by biomass burning on forest land and deforestation (15 and 14 percent each), mostly generated in South-eastern Asia. **Figure 68** illustrates the GHG hotspots in the AFOLU sector, at the sub-regional level, where the size of the bubble corresponds to the amount of Mt CO<sub>2</sub> eq.

**FIGURE 68.****GHG HOTSPOTS IN THE AFOLU SECTOR, BY SUB-REGION AND MAJOR CATEGORY**

Source: FAO elaboration based on NGHGs.

### 4.1.3 Gaps and opportunities for enhancing mitigation

A gap analysis was run to assess the degree to which the mitigation policies and measures in the agriculture and land use sectors set forth in the NDCs address the main sources of sectoral GHG emissions, or GHG hotspots, to illustrate not only current “gaps” but potential “opportunities” for enhancing future NDCs. The analysis is based on the mitigation matrices for the agriculture and LULUCF sectors contained in the methodological framework (FAO, 2019c). “Policy coverage” refers to when at least one mitigation policy or measure in a country’s NDC aims to reduce emissions or enhance sinks from the GHG hotspot identified in its NGHGI. Policy coverage is quantified at the sub-regional level as the share of countries with at least one mitigation policy or measure that is in line with the GHG hotspot identified. A “policy coverage gap” refers to when there is absence of at least one policy or measure in a country’s NDC that targets the GHG hotspot identified. The gap is quantified at the sub-regional level as the share of countries with a policy coverage gap out of the share of countries with a GHG hotspot (**Table 32**). **Annex 4** contain a summary of the country-level gap analysis results per GHG hotspot.

It should be noted that the analysis serves as a broad review of the coverage of mitigation policies or measures mentioned in the NDC and not an assessment of their strength, which should be further assessed in terms of type (e.g. action, policy, project, programme or framework), scale, comprehensiveness and timeframe. The analysis, therefore, serves as an initial stocktaking of policy coverage and does not necessarily indicate policy effectiveness.

TABLE 32.

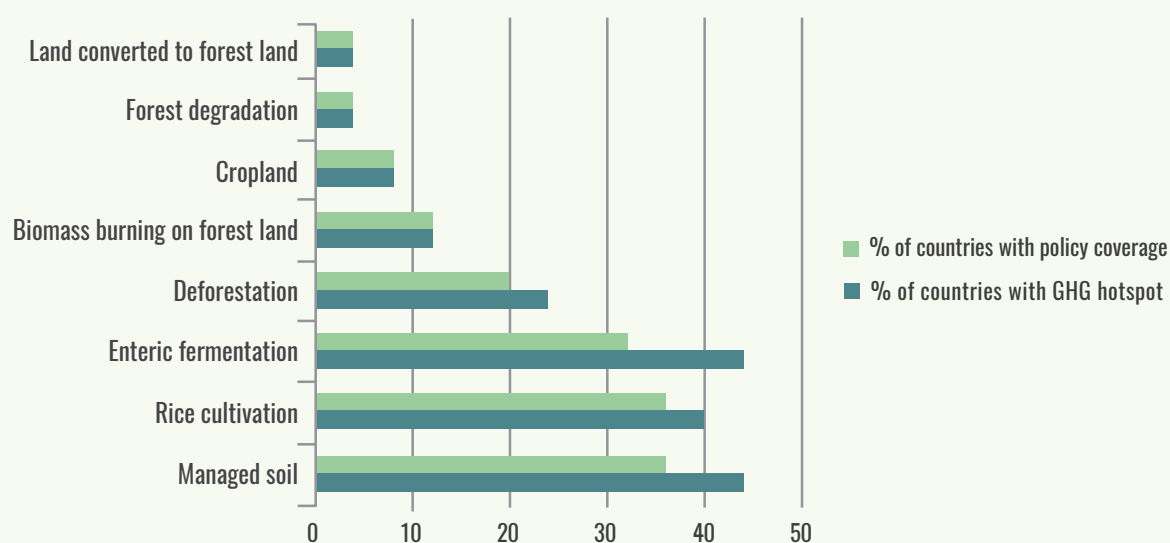
## RANGE OF POLICY COVERAGE GAPS IN THE NDC

SCORE	RANGE OF POLICY COVERAGE GAP
VERY HIGH	61 TO 100 PERCENT
HIGH	31 TO 60 PERCENT
MODERATE	10 TO 30 PERCENT
LOW	0 TO 9 PERCENT

In Asia, moderate policy coverage gaps are observed in relation to emissions from enteric fermentation, deforestation, managed soils and rice cultivation. Figure 69 presents the results of the mitigation policy gap and opportunity analysis by which the percent of countries with each type of GHG hotspot is compared against the share of countries with mitigation policy coverage in the NDCs, ordered from highest to lowest policy coverage gap.

FIGURE 69.

MITIGATION GAP AND OPPORTUNITY ANALYSIS RESULTS FOR ASIA, PER GHG HOTSPOT (SHARE OF COUNTRIES WITH GHG HOTSPOTS COMPARED AGAINST SHARE OF COUNTRIES WITH MITIGATION POLICY COVERAGE IN NDCs)




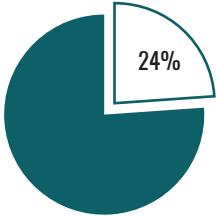
Source: FAO elaboration based on NGHGs and NDCs.

The sub-regional results are presented below:

## Eastern Asia

In Eastern Asia, a very high policy coverage gap is found in relation to emissions from enteric fermentation. Emissions from this source represent a hotspot for 60 percent of countries in the region and constitutes 24 percent of AFOLU emissions in the region.


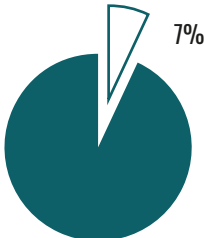
## ENTERIC FERMENTATION

NUMBER OF COUNTRIES WITH HOTSPOT	HOTSPOT SHARE OF AFOLU EMISSIONS	POLICY COVERAGE GAP
		<b>VERY HIGH</b>
<b>60%</b>		


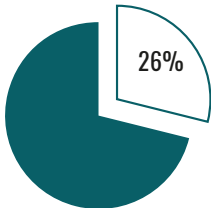
## South-eastern Asia

In South-eastern Asia, moderate policy coverage gaps are found in relation to emissions from managed soils, deforestation and rice cultivation. Emissions from deforestation represent the greatest share of AFOLU emissions in the region (26 percent of AFOLU emissions) and this hotspot is shared by 45 percent of countries in South-eastern Asia.


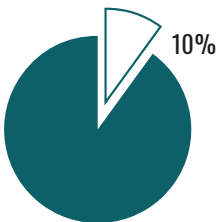
## MANAGED SOILS

NUMBER OF COUNTRIES WITH HOTSPOT	HOTSPOT SHARE OF AFOLU EMISSIONS	POLICY COVERAGE GAP
		<b>MODERATE</b>
<b>36%</b>		

## DEFORESTATION

NUMBER OF COUNTRIES WITH HOTSPOT	HOTSPOT SHARE OF AFOLU EMISSIONS	POLICY COVERAGE GAP
		<b>MODERATE</b>
<b>45%</b>		


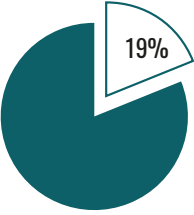
## RICE CULTIVATION

NUMBER OF COUNTRIES WITH HOTSPOT	HOTSPOT SHARE OF AFOLU EMISSIONS	POLICY COVERAGE GAP
		<b>MODERATE</b>
<b>45%</b>		


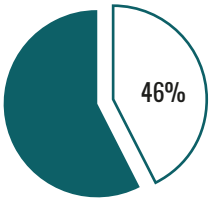
## Southern Asia

In Southern Asia, moderate policy coverage gaps are found in relation to emissions from managed soils, which represent 19 percent of AFOLU emissions held by 44 percent of countries in the region, and enteric fermentation, which constitutes the largest source of emissions in the region (46 percent) held by 78 percent of countries.

### MANAGED SOILS

NUMBER OF COUNTRIES WITH HOTSPOT	HOTSPOT SHARE OF AFOLU EMISSIONS	POLICY COVERAGE GAP
		<b>MODERATE</b>
<b>44%</b>		

### ENTERIC FERMENTATION

NUMBER OF COUNTRIES WITH HOTSPOT	HOTSPOT SHARE OF AFOLU EMISSIONS	POLICY COVERAGE GAP
		<b>MODERATE</b>
<b>78%</b>		

## 4.2 ADAPTATION ANALYSIS

This section presents the results of a gap analysis that compares the observed and/or projected climate-related hazards, impacts, vulnerabilities and risks in ecosystems and social systems reported, or “vulnerability hotspots”, against the relevant adaptation measures set forth in the NDCs in order to identify gaps and opportunities for strengthening next round NDCs. Information from the NDCs are supplemented with information from NCs. The analysis is based on the adaptation matrices for ecosystems and social systems contained in the methodological framework (FAO, 2019c).

### 4.2.1 Gaps and opportunities for enhancing adaptation

For each country, the observed and/or projected climate-related hazards, risks and vulnerabilities reported in ecosystems or social systems, or “vulnerability hotspots,” are compared against the set of adaptation priorities or measures set forth in the NDCs at either the ecosystem service level (for ecosystems) or social dimension (for social systems). “Policy coverage” refers to when at least one adaptation measure in a country’s NDC aims to reduce vulnerability and/or increase adaptive capacity in relation to a given vulnerability hotspot. Policy coverage is quantified at the sub-regional level as the share of countries with at least one adaptation measure that addresses a given hotspot. A “policy coverage gap” refers to when there is misalignment between the adaptation priorities or measures presented in a country’s NDCs and a given vulnerability hotspot. A policy coverage gap is the difference between the share of countries with a vulnerability hotspot and the share of countries with policy coverage. The gap is quantified at the sub-regional level as the share of countries with a policy coverage gap out of the share of countries with a vulnerability hotspot (**Table 33**). **Annex 6–7** contains the country-level gap analysis results per vulnerability hotspot for each country.



It should be noted that the analysis serves as a broad review of the coverage of adaptation priority sectors and measures mentioned in the NDC and not an assessment of their strength, which should be further assessed in terms of type (e.g. action, policy, project, programme or framework), scale, comprehensiveness and timeframe. The analysis, therefore, serves as an initial stocktaking of policy coverage and does not necessarily indicate policy effectiveness.

**TABLE 33.****RANGE OF POLICY COVERAGE GAPS IN THE NDC**

SCORE	POLICY COVERAGE GAP RANGE
VERY HIGH	61 TO 100 PERCENT
HIGH	31 TO 60 PERCENT
MODERATE	10 TO 30 PERCENT
LOW	0 TO 9 PERCENT


## Gaps and opportunities in ecosystems


In Asia, all countries with the exception of one<sup>71</sup> reported climate-related hazards, impacts and vulnerabilities in ecosystems. For this reason, the gap and opportunity analysis is only relevant to those reporting countries.

**At the regional level, moderate to high adaptation policy coverage gaps in ecosystems are found in relation to fisheries, forestry and crops sub-sectors,** as well as climate-related soil erosion, coastal erosion and the invasion of pests and non-native species. The sub-regional results are presented below by climate-related vulnerability hotspot.

### EASTERN ASIA

In Eastern Asia, moderate adaptation policy coverage gaps are found relation to coastal erosion and sea-level rise.


CLIMATE-RELATED VULNERABILITY HOTSPOT	NUMBER OF COUNTRIES WITH HOTSPOT	POLICY COVERAGE GAP
<b>COASTAL EROSION</b>		<b>MODERATE</b>
	<b>50%</b>	


CLIMATE-RELATED VULNERABILITY HOTSPOT	NUMBER OF COUNTRIES WITH HOTSPOT	POLICY COVERAGE GAP
<b>SEA-LEVEL RISE</b>		<b>MODERATE</b>
	<b>50%</b>	


<sup>71</sup> Japan.


## SOUTH-EASTERN ASIA


In South-eastern Asia, moderate to high adaptation policy coverage gaps are found in relation to the forestry and fisheries sub-sectors, climate-related sea level rise and invasion by pests and non-native species in agriculture.

CLIMATE-RELATED VULNERABILITY HOTSPOT	NUMBER OF COUNTRIES WITH HOTSPOT	POLICY COVERAGE GAP
<b>SEA-LEVEL RISE</b>		<b>HIGH</b>
	<b>18%</b>	

CLIMATE-RELATED VULNERABILITY HOTSPOT	NUMBER OF COUNTRIES WITH HOTSPOT	POLICY COVERAGE GAP
<b>INCREASED INVASION BY PESTS AND NON-NATIVE SPECIES IN AGRICULTURE</b>		<b>MODERATE</b>
	<b>36%</b>	


CLIMATE-RELATED VULNERABILITY HOTSPOT	NUMBER OF COUNTRIES WITH HOTSPOT	POLICY COVERAGE GAP
<b>FISHERIES</b>		<b>HIGH</b>
	<b>45%</b>	


CLIMATE-RELATED VULNERABILITY HOTSPOT	NUMBER OF COUNTRIES WITH HOTSPOT	POLICY COVERAGE GAP
<b>CROPS</b>		<b>MODERATE</b>
	<b>36%</b>	


CLIMATE-RELATED VULNERABILITY HOTSPOT	NUMBER OF COUNTRIES WITH HOTSPOT	POLICY COVERAGE GAP
<b>FORESTRY</b>		<b>MODERATE</b>
	<b>45%</b>	


## SOUTHERN ASIA


In Southern Asia, a high adaptation moderate adaptation policy coverage gaps are found in relation to the forestry and crops sub-sectors, land and soil resources, sea level rise and soil erosion.

CLIMATE-RELATED VULNERABILITY HOTSPOT	NUMBER OF COUNTRIES WITH HOTSPOT	POLICY COVERAGE GAP
SEA-LEVEL RISE		HIGH
	56%	

CLIMATE-RELATED VULNERABILITY HOTSPOT	NUMBER OF COUNTRIES WITH HOTSPOT	POLICY COVERAGE GAP
CROPS		MODERATE
	67%	

CLIMATE-RELATED VULNERABILITY HOTSPOT	NUMBER OF COUNTRIES WITH HOTSPOT	POLICY COVERAGE GAP
FORESTRY		MODERATE
	67%	

CLIMATE-RELATED VULNERABILITY HOTSPOT	NUMBER OF COUNTRIES WITH HOTSPOT	POLICY COVERAGE GAP
LAND AND SOIL RESOURCES		MODERATE
	67%	

CLIMATE-RELATED VULNERABILITY HOTSPOT	NUMBER OF COUNTRIES WITH HOTSPOT	POLICY COVERAGE GAP
EROSION CONTROL		HIGH
	33%	


## Gaps and opportunities in social systems


In Asia, all countries with the exception of one<sup>72</sup> reported climate-related hazards, impacts and vulnerabilities in social systems. For this reason, the gap and opportunity analysis is only relevant to those reporting countries.


**At the regional level, moderate adaptation policy coverage gaps are found around climate-related risks reported, including rural livelihoods and income loss and gender and youth inequality.** The sub-regional results are presented below.

### EASTERN ASIA

In Eastern Asia, low adaptation policy coverage gaps are found around climate-related risks reported, including loss of productive infrastructure and assets, limited knowledge and capacity, and weak institutions and governance.

CLIMATE-RELATED VULNERABILITY HOTSPOT	NUMBER OF COUNTRIES WITH HOTSPOT	POLICY COVERAGE GAP
<b>LOSS OF PRODUCTIVE INFRASTRUCTURE AND ASSETS</b>		<b>LOW</b>
	<b>25%</b>	


CLIMATE-RELATED VULNERABILITY HOTSPOT	NUMBER OF COUNTRIES WITH HOTSPOT	POLICY COVERAGE GAP
<b>LIMITED KNOWLEDGE AND CAPACITY</b>		<b>LOW</b>
	<b>25%</b>	


CLIMATE-RELATED VULNERABILITY HOTSPOT	NUMBER OF COUNTRIES WITH HOTSPOT	POLICY COVERAGE GAP
<b>WEAK INSTITUTIONS AND GOVERNANCE</b>		<b>LOW</b>
	<b>25%</b>	

<sup>72</sup> Japan.

## SOUTH-EASTERN ASIA


In the South-eastern Asia, a moderate to high adaptation policy coverage gaps are found in relation to climate-related risks reported, including gender and youth inequality and rural livelihoods and income loss.

CLIMATE-RELATED VULNERABILITY HOTSPOT	NUMBER OF COUNTRIES WITH HOTSPOT	POLICY COVERAGE GAP
<b>GENDER AND YOUTH INEQUALITY</b>		<b>HIGH</b>
	<b>18%</b>	

CLIMATE-RELATED VULNERABILITY HOTSPOT	NUMBER OF COUNTRIES WITH HOTSPOT	POLICY COVERAGE GAP
<b>RURAL LIVELIHOODS AND INCOME LOSS</b>		<b>MODERATE</b>
	<b>64%</b>	

## SOUTHERN ASIA

In the Southern Asia, a moderate adaptation policy coverage gap is found in relation to climate-related rural livelihoods and income loss.

CLIMATE-RELATED VULNERABILITY HOTSPOT	NUMBER OF COUNTRIES WITH HOTSPOT	POLICY COVERAGE GAP
<b>RURAL LIVELIHOODS AND INCOME LOSS</b>		<b>MODERATE</b>
	<b>64%</b>	

# CHAPTER 5



# OPPORTUNITIES FOR LEVERAGING SYNERGIES WITH SUSTAINABLE DEVELOPMENT

**The world faces a double challenge of eradicating hunger by 2030 and addressing global climate change at the same time.** In 2015, with the adoption of the 2030 Agenda for Sustainable Development and the Paris Agreement, developed and developing countries alike pledged to take ambitious action to end all forms of poverty, fight inequalities, and tackle climate change, ensuring that no one is left behind.

**The Paris Agreement rests upon 167 (I)NDCs that reflect the national climate targets, policies and measures of 194 countries,<sup>73</sup> while the SDGs are defined by 17 goals and 169 targets,** which need to be translated into national and subnational plans.

**The SDGs and NDCs are interlinked** (GIZ and WRI, 2018). Both the 2030 Agenda and the preamble of the Paris Agreement acknowledge the intrinsic relationship between climate change, sustainable development and food security. The 2030 Agenda integrates addressing climate change in its 17 goals and refers to the UNFCCC as the primary international forum for negotiating the global response to climate change. Similarly, the Paris Agreement requires parties to embed climate action “in the context of sustainable development” and acknowledges the “fundamental priority of safeguarding food security and ending hunger, and the particular vulnerabilities of food production systems to the adverse impacts of climate change.”<sup>74</sup>

**The challenge is to strike a balance between emission reductions, adaptation and sustainable development priorities by finding policies that co-deliver.** Climate change response pathways in developing countries should address the dual need for mitigation and adaptation together, leveraging synergies and reconciling tradeoffs amongst varying objectives. Capturing the co-benefits of mitigation and adaptation in the agriculture sector can also support progress in achieving the objectives of other international agreements, including the Sendai Framework for Disaster Risk Reduction, the United Nations Convention to Combat Desertification and the Convention on Biological Diversity.

<sup>73</sup> As of March 1, 2019.

<sup>74</sup> Article 2.1 of Paris Agreement.



Transforming the approach to NDC and SDG implementation from silos to synergies presents an **unprecedented opportunity** for national governments to leverage progress across both agendas and optimize resources in the path towards low-emissions and climate resilient development.

The Sendai Framework charts the global course over the next 15 years, with seven targets and four priorities for action, to reducing risk. It recognizes the opportunity to enhance coherence and mutual reinforcement across international agreements, to link mechanisms for monitoring and reporting and to promote cooperation in implementation.

This section aims to assess the opportunities for capturing mitigation and adaptation co-benefits within the NDCs, as well as leveraging synergies between climate actions and the sustainable development agenda. It first presents the types of co-benefits explicitly referenced by countries in their NDCs and then looks beyond to the potential co-benefits and synergies that may be generated from climate actions that are not explicitly recognized in the NDCs. It also assesses the links between climate actions in the agriculture and land use sectors and the 2030 Agenda, the Sendai Framework and the Koronivia Joint Work on Agriculture.

## 5.1 MITIGATION AND ADAPTION CO-BENEFITS

Mitigation and adaptation in agriculture are closely interlinked through a web of feedbacks, synergies, and tradeoffs. Sustainable food and agriculture systems carry the greatest potential for generating synergies across climate change mitigation and adaptation efforts, as well as significant socio-economic and environmental co-benefits (FAO, 2016d).

Overall, over 60 percent of countries in Asia explicitly recognize synergies and/or co-benefits between mitigation and adaptation in the agriculture and land use sectors within their NDCs. Figure 70 illustrates the share of countries, per sub-region, with explicit reference to synergies and/or co-benefits in the agriculture and land use sectors.

FIGURE 70.

SHARE OF COUNTRIES WITH EXPLICIT REFERENCE TO SYNERGIES AND/OR CO-BENEFITS BETWEEN MITIGATION AND ADAPTATION IN THE AGRICULTURE AND LAND USE SECTORS IN THE NDCs



Source: NDC.

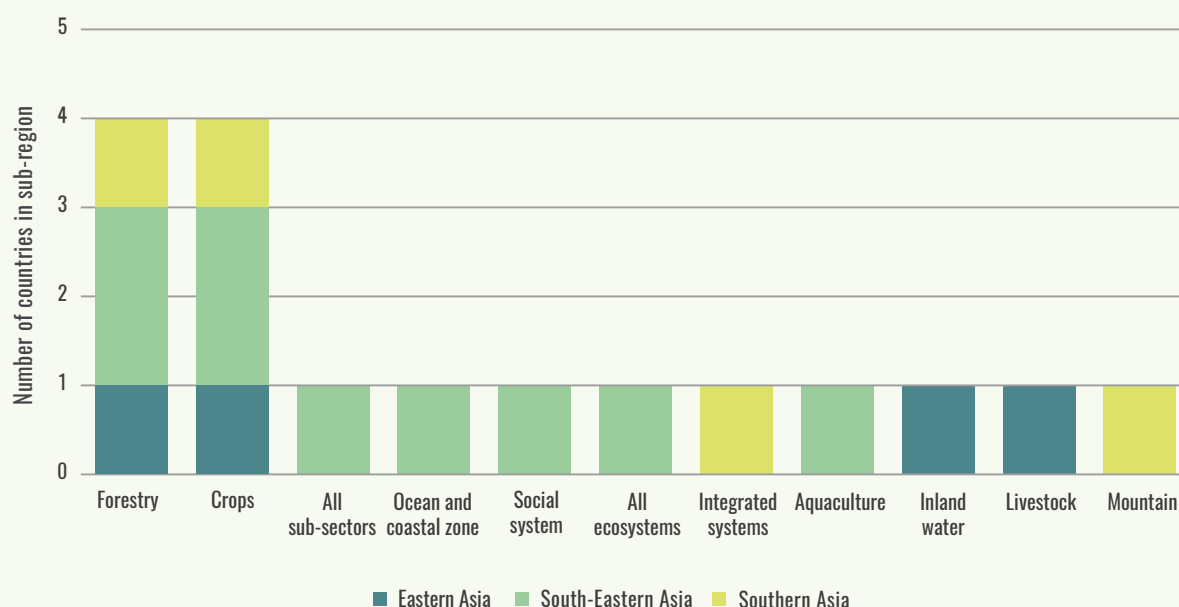
The identification of co-benefits can be critical for driving progress across mitigation and adaptation agendas and informing investment options in the agriculture and land use sectors. In order to assess the potential for adaptation and mitigation synergies amongst climate actions that are not explicitly referenced in country NDCs, the channels by which mitigation and adaptation co-benefits in the agriculture and land use sectors may be generated, as well as potential tradeoffs, are assessed in the mitigation and adaptation measures set forth in country NDCs. A mitigation and adaptation co-benefit matrix was developed (FAO, 2019c) to codify the links between the basket of mitigation and adaptation policies or measures identified, from which approximately 300 potential mitigation and adaptation co-benefits and 30 tradeoffs were generated in the agriculture and land use sectors. The degree of convergence refers to the frequency of adaptation or mitigation co-benefits per mitigation or adaptation measure (and does not reflect how much the measure contribute in absolute terms to achieving a particular outcome). The number of policies or measures with mitigation or adaptation co-benefits is quantified at the country-level and results are aggregated at sub-regional and regional levels.

### 5.1.1 Mitigation co-benefits of adaptation

In Asia, adaptation measures in forestry are expected to generate the most mitigation co-benefits amongst adaptation measures in the agriculture and land use sectors, particularly in South-eastern Asia, followed by the crops sub-sector. Out of those adaptation measures in forestry, reducing deforestation and promoting SFM generates the majority of mitigation co-benefits in Asia. Figure 71 illustrates the number of countries, per sub-region, with at least one adaptation measure with mitigation co-benefits explicitly referenced, by land use/sub-sector.

FIGURE 71.

NUMBER OF COUNTRIES WITH EXPLICIT REFERENCE TO THE MITIGATION CO-BENEFITS OF ADAPTATION BY LAND USE/ SUB-SECTOR IN THE NDCs



Source: NDC.

TABLE 34.

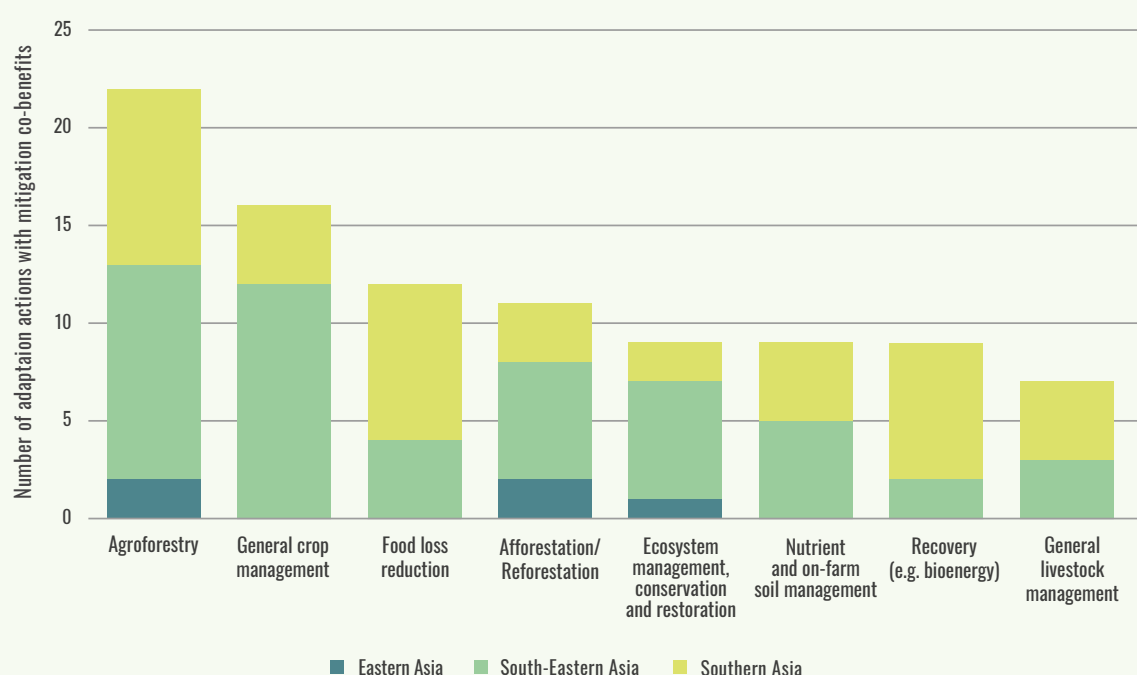
## EXAMPLE OF MITIGATION CO-BENEFITS OF ADAPTATION REPORTED

COUNTRY	ADAPTATION MEASURE	MITIGATION CO-BENEFIT
INDIA	ENHANCE, MAINTAIN, AND CONSERVE SOIL AND PLANT CARBON POOLS ON HIGHLY VULNERABLE MOUNTAIN SLOPES	SOIL CARBON SEQUESTRATION
MONGOLIA	IMPROVE PASTURE MANAGEMENT	WILL INCREASE THE CARBON SINK OF CO <sub>2</sub> EQUIVALENT TO 29 MILLION TONS PER YEAR, WHICH IS EQUAL TO 1/3 OF EMISSION REDUCTION IN ENERGY SECTOR
BRUNEI DARUSSALAM	IMPLEMENT RESTRICTIONS AND REDUCED-SCALE ON LOGGING ACTIVITIES, INCLUDING SETTING A MINIMUM DISTANCE FROM A RIVER WHERE TREES CAN BE FELLED (WHICH PROVIDES PROTECTION AGAINST FLOODING DUE TO PRESERVING SOIL QUALITY AROUND THE RIVERS)	WHEN THIS IS COUPLED WITH REFORESTATION OR AFFORESTATION TO EXPAND THE FORESTS RESERVES AREA, THERE COULD BE ENHANCED MITIGATION BENEFITS TOO
INDIA	EXPANDING TREE PLANTATION IN COMPLEMENTARITY AND INTEGRATED MANNER WITH CROPS AND LIVESTOCK. IT WILL HELP PROTECT AND STABILIZE ECOSYSTEMS, AND PROMOTE RESILIENT CROPPING AND FARMING SYSTEMS TO MINIMIZE THE RISK DURING EXTREME CLIMATIC EVENTS	IT WILL ALSO COMPLEMENT ACHIEVING THE MITIGATION TARGET OF INCREASING FOREST/ TREE COVER

Looking beyond explicit references, the adaptation measure in the NDCs associated with the greatest number of potential mitigation co-benefits is agroforestry, followed by crop management, food loss reduction and afforestation/reforestation, amongst others. For instance, adaptation measures promoting integrated systems, such as agroforestry, may diversify income-generating options and conserve biodiversity, while at the same time increasing above- and below-ground biomass stocks that capture atmospheric carbon, and fixing nitrogen in the soil which would enhance fertility and lower nitrous oxide emissions from fertilizer application. At the same time, crop residues can serve as inputs to livestock production, offsetting emissions related to feed production. Figure 72 presents the distribution of adaptation measures in Asia with potential mitigation co-benefits across sub-regions.

FIGURE 72.

## NUMBER OF ADAPTATION MEASURES IN THE NDCs WITH POTENTIAL MITIGATION CO-BENEFITS



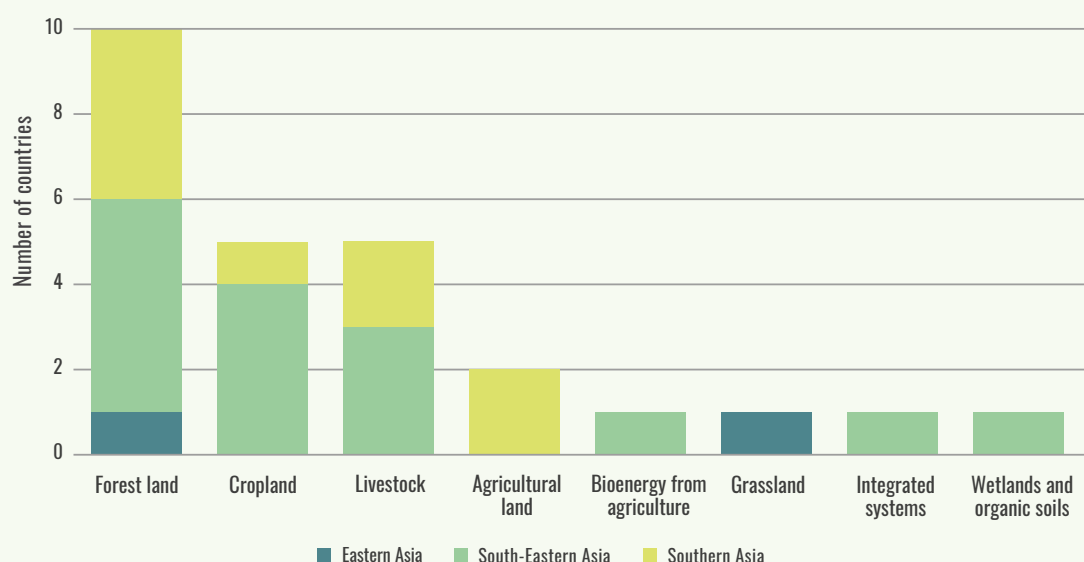
Source: FAO elaboration.

### 5.1.2 Adaptation co-benefits of mitigation

In Asia, mitigation measures on forest land are expected to generate the most adaptation co-benefits amongst mitigation measures in the agriculture and land use sectors, particularly in South-eastern and Southern Asia, followed by mitigation on cropland and in the livestock sub-sector. Out of those mitigation measures on forest land, reducing deforestation and promoting SFM generate the majority of adaptation co-benefits in Asia. Out of the mitigation measures on cropland, improved rice management generates the majority of adaptation co-benefits in Asia. Out of those mitigation measures in the livestock sub-sector, improved feeding practices and manure management generate the majority of adaptation co-benefits in Asia. **Figure 73** illustrates the number of countries, per sub-region, with at least one mitigation measure with adaptation co-benefits explicitly referenced, by land use/sub-sector.

**FIGURE 73.**

**NUMBER OF COUNTRIES WITH EXPLICIT REFERENCE TO THE ADAPTATION CO-BENEFITS OF MITIGATION IN THE NDCs, BY LAND USE/SUB-SECTOR**



Source: NDCs.

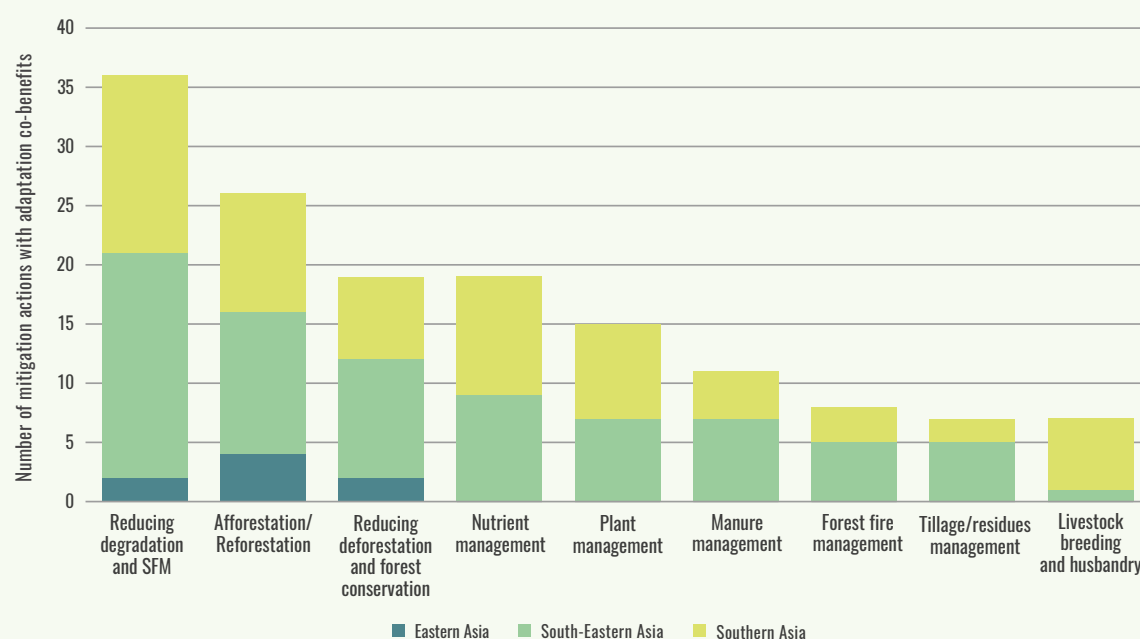
**TABLE 35.**

**EXAMPLE OF ADAPTATION AND SUSTAINABLE DEVELOPMENT CO-BENEFITS OF MITIGATION MEASURES REPORTED**

COUNTRY	MITIGATION MEASURE	ADAPTATION AND SUSTAINABLE DEVELOPMENT CO-BENEFITS
MYANMAR	INCREASE RESERVED FOREST (RF) AND PROTECTED PUBLIC FOREST TO 30% OF NATIONAL LAND AREA	POVERTY REDUCTION
THAILAND	ALTERNATIVE WETTING AND DRYING (AWD)	AWD IS A WIN-WIN OPTION FOR MITIGATING CH <sub>4</sub> EMISSION, SAVING WATER, AND POTENTIALLY INCREASING CROP YIELDS IN PADDY RICE FIELDS
LAO PDR	INCREASE FOREST COVER TO 70% OF LAND AREA (I.E. TO 16.58 MILLION HECTARES) BY 2020 WITH -90 T CO <sub>2</sub> EQ PER HA	PREVENTION OF FLOODING, SOIL EROSION AND LANDSLIDES, AND PROTECTION OF BIODIVERSITY AND ECOSYSTEM SERVICES
BRUNEI DARUSSALAM	SUSTAINABLE FOREST MANAGEMENT THROUGH COMMUNITY FORESTS, LEASEHOLD FORESTS, COLLABORATIVE FORESTS AND PROTECTED AREAS FOLLOWING A LANDSCAPE APPROACH TO RESOURCE CONSERVATION AND MANAGEMENT	THE BENEFITS OF FORESTS ARE PROJECTED TO USE IN FOREST-ENTERPRISE DEVELOPMENT, ADAPTATION TO CLIMATE CHANGE AND CONTRIBUTION TO LOCAL AND NATIONAL ECONOMY WHILE SUSTAINABLY CONSERVING WATERSHED AND BIODIVERSITY

INDONESIA	SOCIAL FORESTRY	THERE ARE AT LEAST FIVE ASPECTS OF THE CO-BENEFITS OF LAND-BASED MITIGATION ACTION ACTIVITIES: 1. BIODIVERSITY CONSERVATION 2. PROVISION OF NON-CARBON ENVIRONMENTAL SERVICES 3. IMPROVED GOVERNANCE 4. CERTAINTY OF COMMUNITY RIGHTS 5. INCREASE IN THE INCOME OF COMMUNITY SURROUNDING FOREST
THAILAND	AGROFORESTRY	THE AGROFORESTRY SYSTEM IS ANOTHER ALTERNATIVE TO EXTENUATE AFFORESTATION/REFORESTATION DISADVANTAGES. AGROFORESTRY PROVIDES ECONOMIC, SOCIAL AND ENVIRONMENT BENEFITS TO LOCAL COMMUNITIES. PLANTED TREES CAN STORE CARBON WHILE FARMERS CAN BENEFIT FROM INTERCROPS

Looking beyond explicit references, the mitigation measure found in the NDCs associated with the greatest number of potential adaptation co-benefits is reducing forest degradation and SFM, followed by afforestation/reforestation and reducing deforestation and forest conservation, amongst others. For instance, sustainable forest management measures that aim to prevent or reduce emissions from forest fires also protect, conserve and restore the biodiversity of forest ecosystems and improve local air quality. **Figure 74** presents the distribution of mitigation measures in Asia with potential adaptation co-benefits across sub-regions.

**FIGURE 74.****NUMBER OF MITIGATION POLICIES OR MEASURES IN THE NDCs WITH POTENTIAL ADAPTATION CO-BENEFITS**

Source: FAO elaboration.

### 5.13 Mitigation and adaptation tradeoffs

Reconciling tradeoffs amongst mitigation and adaptation measures is critical to a sustainable transition towards a low-emissions and climate resilient future. A cross-sectoral and long-term approach is necessary for planning climate change responses that support – and do not limit – multiple objectives.

In Asia, the greatest potential adaptation tradeoffs arising from mitigation policies or measures are found between liquid biofuel production and biodiversity protection, nutrient and on-farm soil management and reducing deforestation and forest conservation, particularly in South-eastern and Southern Asia. On the other hand, the greatest potential mitigation tradeoffs arising from adaptation measures are found around the intensification of agricultural production, particularly in Eastern Asia.

## 5.2 LINKS TO THE SUSTAINABLE DEVELOPMENT GOALS

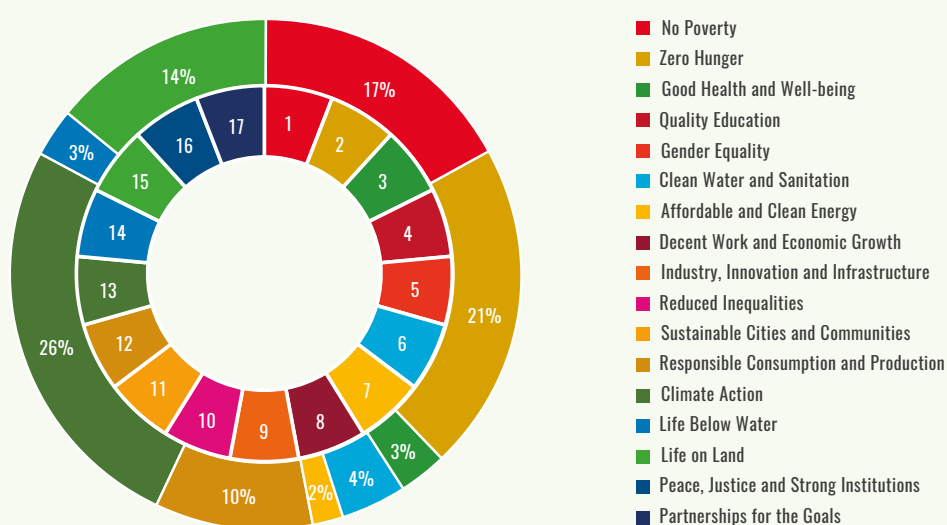
The high degree of convergence between the climate and sustainable development agendas<sup>75</sup> suggests that aligning their implementation provides a great opportunity to national and sub-national governments to accelerate progress across both agendas. Aligning planning and budgetary processes would not only maximize scarce resources, enhance capacities and multiply information and technology sharing opportunities but, most importantly, deliver on countries' adaptation and mitigation commitments in a way that advances development and includes the most vulnerable.

To understand the degree of convergence between “climate actions” in the agriculture and land use sectors communicated by countries in their NDCs and the 17 goals and 169 targets of the 2030 Agenda for Sustainable Development, the sectoral climate actions in the NDCs were mapped against the SDG targets. The variety of mitigation targets, policies or measures and adaptation priorities and measures in the agriculture and land use sectors (collectively referred to as “climate actions”) serve as the data points for the analysis. Overall, around 300 potential data points were derived.

A NDC-SDG matrix was developed to map the alignment between each climate action in the agriculture and land use sectors with one or more SDG targets (FAO, 2019c). A total of 1,500 potential climate action-sustainable development synergies and around 50 potential tradeoffs were generated in the agriculture and land use sectors. The degree of convergence between NDC climate actions in the agriculture and land use sectors and SDG targets was assessed at the country level. The degree of convergence refers to the frequency of climate actions per SDG target (and does not reflect how much the climate action contributes in absolute terms to achieving a particular SDG target). The results were aggregated at sub-regional and regional levels. Figure 75 illustrates the area of convergence between climate actions in the agriculture and land use sectors and the SDGs.

FIGURE 75.

DEGREE OF CONVERGENCE BETWEEN CLIMATE ACTIONS IN THE AGRICULTURE AND LAND USE SECTORS IN THE NDCs AND SDGs IN ASIA



Source: FAO elaboration based on NDCs.

<sup>75</sup> Northrop *et al.* (2016) find that climate actions are aligned with 154 of the 169 SDG targets, particularly around energy, forest, land use and agriculture. Conversely, GIZ-WRI (2018) finds that 49 targets across 13 SDGs contribute to climate mitigation and adaptation, with greatest potential to generate climate action synergies in agriculture, water, food waste and marine and forest ecosystems, amongst others.

In Asia, the greatest areas of convergence<sup>76</sup> between climate actions in the agriculture and land use sectors and the SDGs are found around, in descending order:

- ▶ SDG 13 Climate action, primarily target 13.2 “Integrate climate measures in policy making”;
- ▶ SDG 2 Zero Hunger, primarily targets 2.3 “Assure agricultural productivity for marginalized” and 2.4 “Ensure sustainable agriculture systems for climate change”;
- ▶ SDG 1 No Poverty, primarily targets 1.5 “Resilience of poor to climate events” and 1.4 “Equal access of vulnerable to all type of resources”;
- ▶ SDG 15 Life on Land, primarily targets 15.1 “Conserve and restore inland ecosystems” and 15.3 “Restore degraded land and combat desertification”;
- ▶ SDG 12 Responsible consumption and production, primarily target 12.2 “Efficient use of natural resources”;
- ▶ SDG 6 Clean water and sanitation, primarily target 6.3 “Improve water quality and reduce pollution”; and
- ▶ SDG 14 Life below water, primarily target 14.7 “Increase economic benefits of SIDS from fisheries and tourism”.

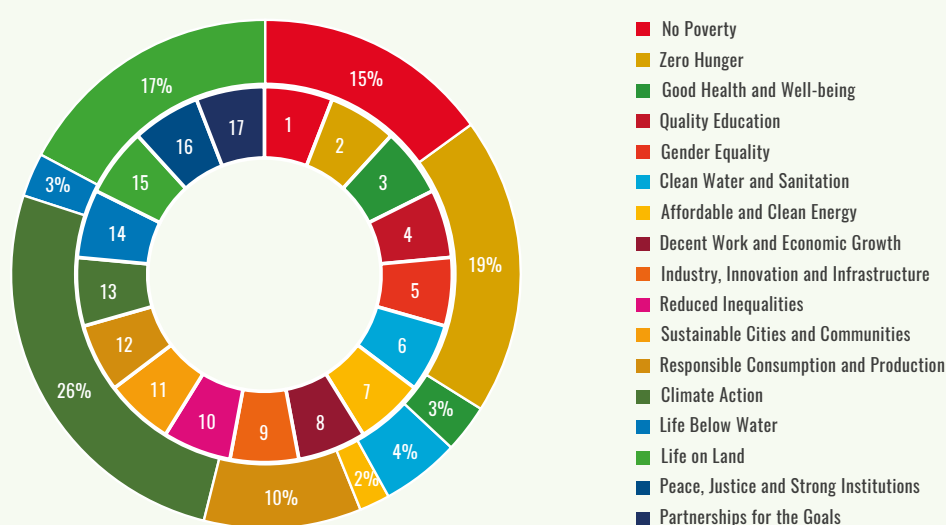
The distribution of major SDG convergence areas is similar across sub-regions, with varying distributions of marine, water, and energy resource-related priorities.

In Eastern Asia, the greatest areas of convergence<sup>77</sup> between climate actions in the agriculture and land use sectors and the SDGs are found around, in descending order:

- ▶ SDG 13 Climate action, primarily target 13.2 “Integrate climate measures in policy making”;
- ▶ SDG 2 Zero Hunger, primarily target 2.3 “Assure agricultural productivity for marginalized”;
- ▶ SDG 15 Life on Land, primarily target 15.1 “Conserve and restore inland ecosystems”;
- ▶ SDG 1 No Poverty, primarily target 1.5 “Resilience of poor to climate events”;
- ▶ SDG 12 Responsible consumption and production, primarily target 12.2 “Efficient use of natural resources”;
- ▶ SDG 6 Clean water and sanitation, primarily target 6.3 “Improve water water quality and reduce pollution”; and
- ▶ SDG 14 Life below water, primarily target 14.5 “Conserve coastal and marine areas”.

**FIGURE 76.**

**DEGREE OF CONVERGENCE BETWEEN CLIMATE ACTIONS IN THE AGRICULTURE AND LAND USE SECTORS IN THE NDCs AND THE SDGs IN EASTERN ASIA**



Source: FAO elaboration based on NDCs.

<sup>76</sup> Only convergence above or equal to a 3 percent share of climate action-sustainable development pathways are reported in list.

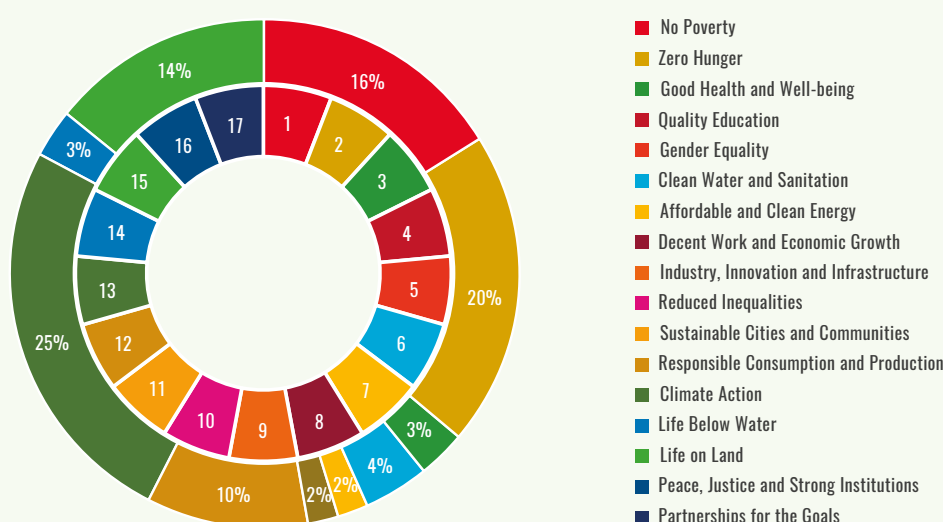
<sup>77</sup> Only convergence above or equal to a 3 percent share of climate action-sustainable development pathways are reported in list.

In South-eastern Asia, the greatest areas of convergence<sup>78</sup> between climate actions in the agriculture and land use sectors and the SDGs are found around, in descending order:

- SDG 13 Climate action, primarily target 13.2 “Integrate climate measures in policy making”;
- SDG 2 Zero Hunger, primarily target 2.3 “Assure agricultural productivity for marginalized”;
- SDG 1 No Poverty, primarily target 1.5 “Resilience of poor to climate events”;
- SDG 15 Life on Land, primarily target 15.1 “Conserve and restore inland ecosystems”;
- SDG 12 Responsible consumption and production, primarily target 12.2 “Efficient use of natural resources”;
- SDG 6 Clean water and sanitation, primarily target 6.3 “Improve water quality and reduce pollution”; and
- SDG 3 Good health and well-being, primarily target 3.3 “End epidemics and diseases”.

**FIGURE 77.**

**DEGREE OF CONVERGENCE BETWEEN CLIMATE ACTIONS IN THE AGRICULTURE AND LAND USE SECTORS IN THE NDCs AND THE SDGs IN SOUTH-EASTERN ASIA**



Source: FAO elaboration based on NDCs.

In Southern Asia, the greatest areas of convergence<sup>79</sup> between climate actions in the agriculture and land use sectors and the SDGs are found around, in descending order:

- SDG 13 Climate action, primarily target 13.2 “Integrate climate measures in policy making”;
- SDG 2 Zero Hunger, primarily target 2.3 “Assure agricultural productivity for marginalized”;
- SDG 1 No Poverty, primarily target 1.5 “Resilience of poor to climate events”;
- SDG 15 Life on Land, primarily target 15.1 “Conserve and restore inland ecosystems”;
- SDG 12 Responsible consumption and production, primarily target 12.2 “Efficient use of natural resources”;
- SDG 6 Clean water and sanitation, primarily target 6.3 “Improve water quality and reduce pollution”; and
- SDG 14 Life below water, primarily target 14.7 “Increase economic benefits of SIDS from fisheries and tourism”.

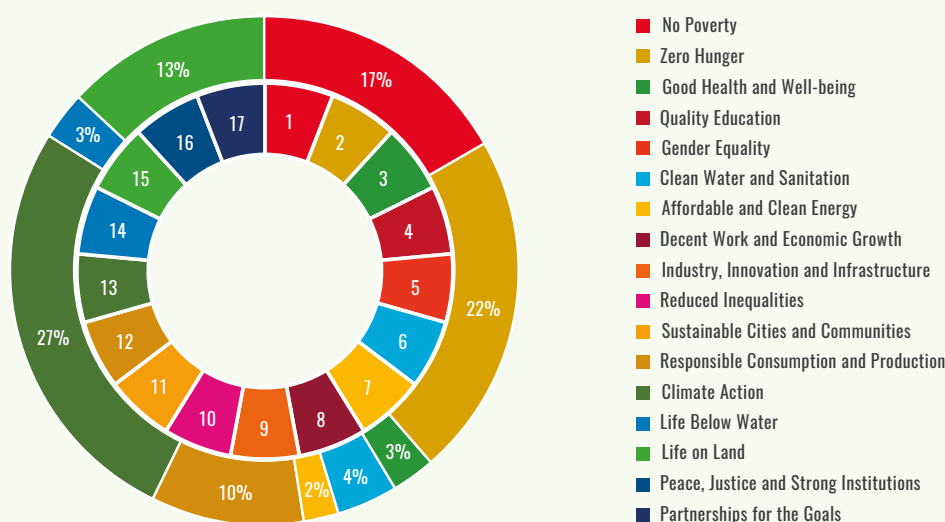
<sup>78</sup> Only convergence above or equal to a 3 percent share of climate action-sustainable development pathways are reported in list.

<sup>79</sup> Only convergence above or equal to a 3 percent share of climate action-sustainable development pathways are reported in list.



FIGURE 78.

DEGREE OF CONVERGENCE BETWEEN CLIMATE ACTIONS IN THE AGRICULTURE AND LAND USE SECTORS IN THE NDCs AND THE SDGs IN SOUTHERN ASIA



Source: FAO elaboration based on NDCs.

## 5.3 LINKS TO THE SENDAI FRAMEWORK FOR DISASTER RISK REDUCTION

Climate change adaptation relies on the reduction and management of climate-related disaster risks, as countries are increasingly affected by both incremental climate change and more frequent and severe climate-related disasters. In agriculture, the two streams are strongly interrelated and mutually complementary. The overlaying nature of disaster and climate change impacts on agriculture calls for an integrated approach and working methods that enhance farmers' resilience to shocks and climate change. Convergence between DRR and climate change adaptation action can bring significant benefits to adaptation, disaster risk reduction and sustainable development.

**The Sendai Framework for Disaster Risk Reduction (SFDRR) presents an opportunity to enhance coherence across climate and development agendas and promote cooperation, as appropriate, for linked implementation, monitoring and reporting processes.** The Sendai Framework is a 15-year long, country driven and non-binding agreement that recognizes the importance of integrating systematic efforts and strategies at different levels to prevent new and reduce existing disaster risk, by reducing hazard exposure and vulnerability to disaster, increasing preparedness for response and recovery and thus strengthening resilience. The framework is built upon four priorities for action, which are:

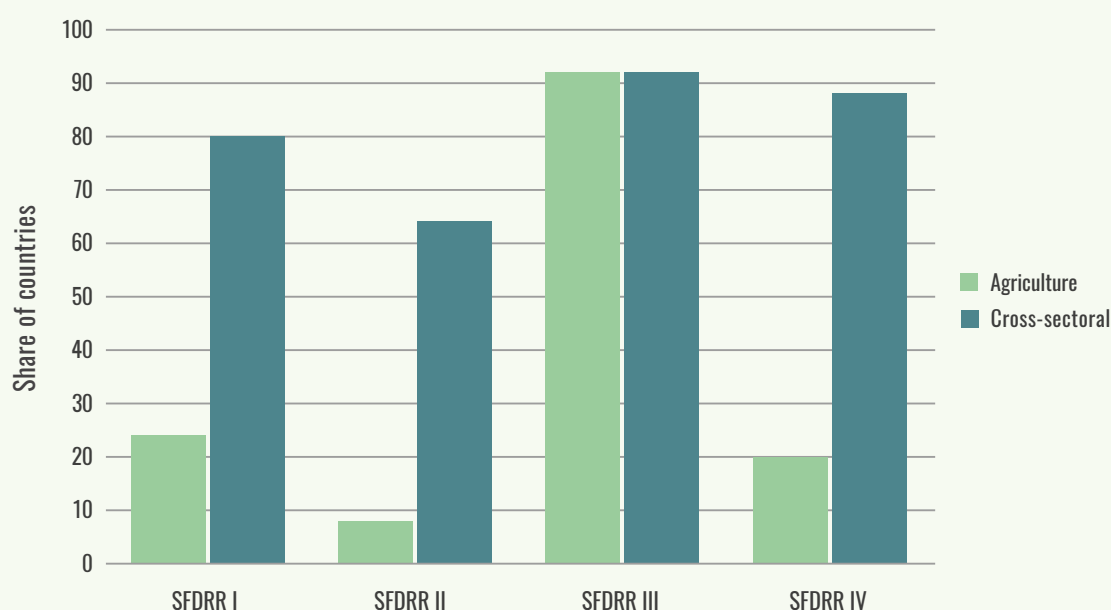
- 1 Priority for action I: understanding disaster risk
- 2 Priority for action II: strengthening disaster risk governance to manage disaster risk
- 3 Priority for action III: investing in disaster risk reduction for resilience
- 4 Priority for action IV: enhancing disaster preparedness for effective response and to "Build Back Better" in recovery, rehabilitation and reconstruction.

This section analyzes the degree of alignment between adaptation priorities set forth in country NDCs and the Sendai Framework, as per its four priorities for actions, to provide a better understanding of how climate change adaptation in the agriculture and land use sector and DRR/M are mutually reinforcing to promote policy coherence.

Almost all countries in the region promote climate change adaptation measures in the agriculture and land use sectors that contribute to the Sendai Framework. All countries in South-eastern and Southern Asia and 80 percent of Eastern Asian countries included one or more adaptation measure in their NDCs in line with one or more of the SFDRR priorities for action. While in most NDCs, DRR/M measures are incorporated as a cross cutting theme across different sectors, actions for increasing the resilience of the agriculture sector also feature prominently, especially under SFDRR priority III, where 92 percent of the countries have included targeted actions and measures in the agriculture sector. Around one-fourth of countries include actions to better understand climate-related risks to agriculture and food security, in line with SFDRR priority I. Conversely, integration of measures promoting better institutions and governance for climate related activities in agriculture (related to SFDRR priority II) received the least priority amongst countries. Figure 79 illustrates the share of countries with cross sectoral and/or agriculture-related adaptation priorities contributing to the SFDRR, per SFDRR priority for action.

**FIGURE 79.**

**SHARE OF COUNTRIES WITH CROSS-SECTORAL AND/OR AGRICULTURE-RELATED ADAPTATION PRIORITIES IN THE NDCs CONTRIBUTING TO THE SENDAI FRAMEWORK, PER SFDRR PRIORITY FOR ACTION**



Source: FAO elaboration based on NDCs.

### 5.3.1 SFDRR priority for action I: understanding disaster risk

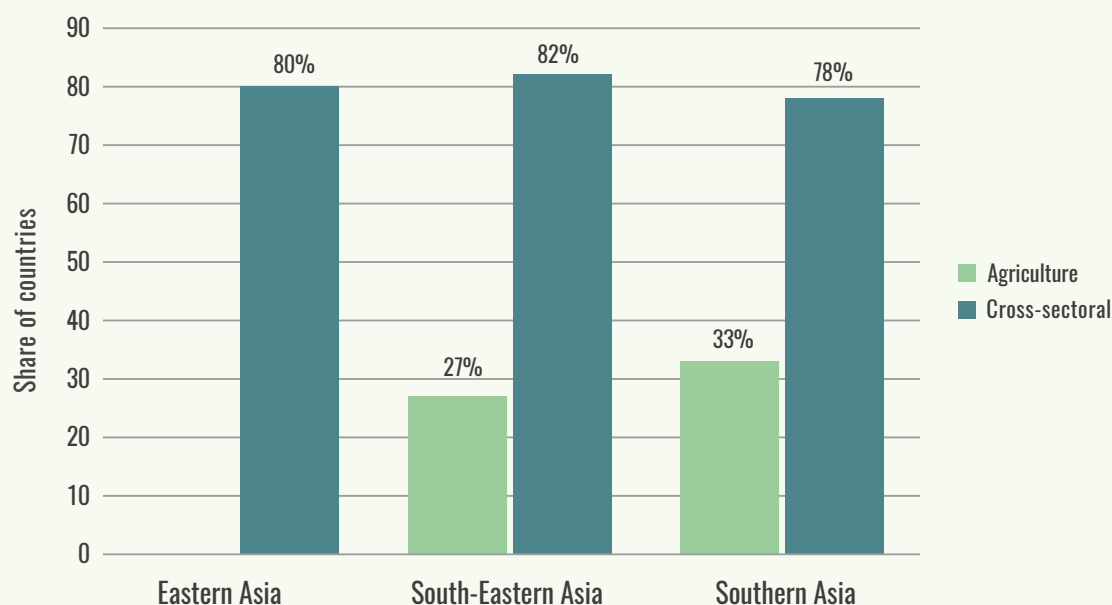
In order to be able to reduce climate-related risks, a sound understanding of these risks in all their dimensions is necessary. DRR/M and climate change adaptation policies and actions need to be based on a healthy combination of scientific evidence and indigenous knowledge. Eighty percent of countries in Asia refer to measures and actions to understand climate related risks as cross cutting through different sectors with only 20 percent of the countries identifying measures specific to the agriculture sector.

At sub-regional level, in South-eastern Asia, 82 percent of countries included DRR/M measures to understand climate risks in general and 27 percent included measures for understanding the risks in the agriculture sector. Similarly, in Southern Asia, 77 percent of the countries referred to DRR/M measures

and strategies for better understanding of risks across different sectors while the share was about 33 percent for the agriculture sector. No countries from Eastern Asia has integrated DRR/M measures in the agriculture sector under priority I but 80 percent have included actions across different sectors. **Figure 80** illustrates the share of countries that have identified measures contributing to SFDRR I, by sub-region.

**FIGURE 80.**

**SHARE OF COUNTRIES WITH CROSS-SECTORAL AND/OR AGRICULTURE-RELATED ADAPTATION PRIORITIES IN THE NDCs CONTRIBUTING TO SFDRR PRIORITY FOR ACTION I, BY SUB-REGION**



Source: FAO elaboration based on NDCs.

## Vulnerability and climate risk assessments

A preamble to better designing policies or measures to reduce risks is to better understand the type of risks and hazards that a community faces in the present and are expected in the future, by undertaking comprehensive context-specific vulnerability and risk assessments. In its NDC, the Philippines for example, outlines its plans to undertake science-based vulnerability and risk assessments in order to mainstream DRR/M actions and measures across different sectors. It also intends to strengthen research and development on climate change for a better understanding of risks and hazards. Pakistan's NDC emphasizes the country's work on developing DRR/M and relief management systems which are based on assessments of risks, across different sectors. Similarly, countries in Eastern Asia, like China and Republic of Korea refer to their efforts to develop tools to conduct research on understanding climate change impacts and to undertake more comprehensive vulnerability and risk assessments. Sri Lanka has also outlined detailed measures to assess vulnerabilities in the livestock sector which will include identifying detrimental impacts on the animal production systems, identifying agro climate areas, farming communities, production systems and lastly, vulnerabilities in the processing pathways.

## Data collection, analysis and management

**Building stronger databases through improved methodologies for collection, analysis and management feature prominently** in the NDCs of several of the countries in the region. Among South-Eastern Asian countries, Singapore, for example, has developed capacities with Meteorological Service Singapore by establishing the Centre for Climate Research Singapore, which works on research related to improving understanding and make better predictions on convective thunderstorms and monsoons in South-eastern Asia. Vietnam and Myanmar highlighted the need for better weather forecasting.

In Southern Asia, Afghanistan outlines the need to develop climate science technology to monitor and assess vulnerabilities to a changing climate. It further aims to strengthen meteorological and hydrological monitoring networks and services, including developing national databases to store data and information. Similarly, Bhutan also aims to improve its hydro meteorological network and weather and flood forecasting systems. It further envisions to institutionalize surveillance of crop pests and diseases to contribute towards achieving food and nutritional security. Maldives identified critical gaps in its understanding of climate risks and aims to strengthen its climate related data collection, management and forecasting in order to make more informed decisions at national and community levels.

## Knowledge building, sharing and awareness raising

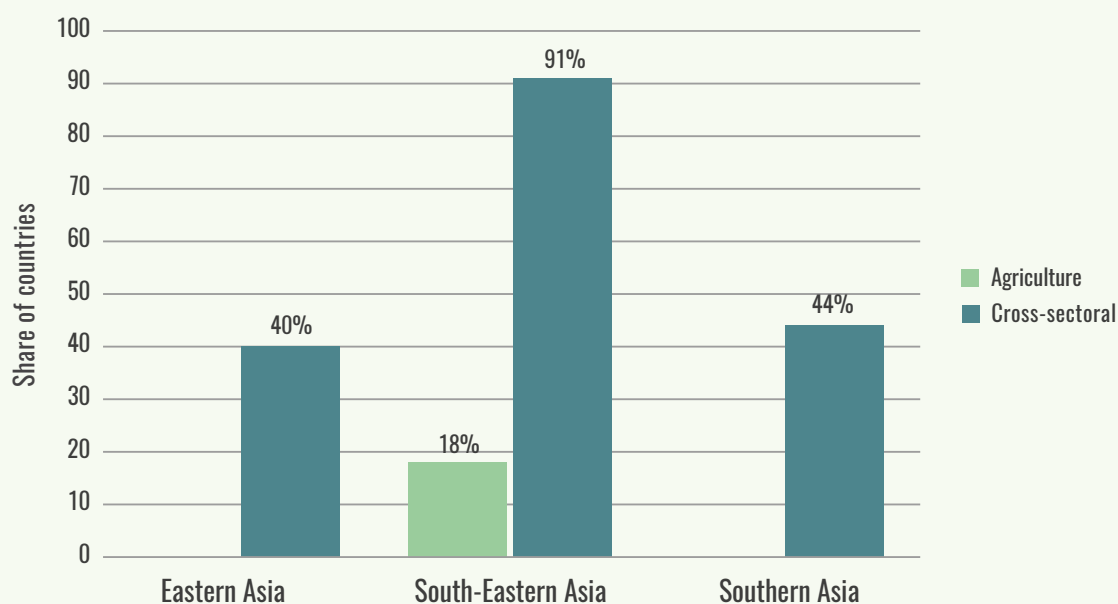
**The availability of data facilitates the process of undertaking research related to climate, which can then help to improve knowledge and understanding** of different stakeholders and help build the resilience of the broader communities. In Nepal, multiple stakeholders, including both government and non-government organizations, community driven organizations, academic and research institutions, are working towards building and disseminating knowledge and information on climate change. The country's NDC emphasizes the establishment of a Climate Change Knowledge Management Centre. As one of its adaptation commitments, the Ministry of Education in Myanmar is mainstreaming DRR/M and climate change concepts in school curricula and learning materials in order to build knowledge and awareness. Countries like Sri Lanka and India are recognizing in their NDCs the need to build on traditional knowledge and to support them with sound scientific information in order to design localized actions and strategies related to DRR/M.

### 5.3.2 SFDRR priority for action II: strengthening disaster risk governance to manage disaster risk

**Governance is crucial for the implementation of DRR/M and climate change adaptation activities in the agriculture and land use sectors.** Strengthening disaster management structures, policies and development plans and the institutional capacity to implement them are a prerequisite for reducing climate-related risk on the national level. Sixty percent of the countries have indicated the need to strengthen risk governance and institutions in the context of climate change with only two countries explicitly mention this need for stronger DRR governance mechanisms in the agricultural sector. In Eastern and Southern Asia, 40 percent and 44 percent of the countries (respectively) have outlined measures to strengthen institutions and governance in the field of climate change but as a cross cutting measure across different sectors. In South-eastern Asia, across different sectors, 91 percent of the countries aim to have stronger governance and institutions to better handle the risks from a changing climate. **Figure 81** illustrates the share of countries that have identified measures contributing to SFDRR Priority II, by sub-region.

FIGURE 81.

SHARE OF COUNTRIES WITH CROSS-SECTORAL AND/OR AGRICULTURE-RELATED ADAPTATION PRIORITIES IN THE NDCs CONTRIBUTING TO SFDRR PRIORITY FOR ACTION II, BY SUB-REGION



Source: FAO elaboration based on NDCs.

## National plans, strategies and laws

Several countries have already incorporated DRR/M measures for climate change adaptation in their national climate change and development related strategies and laws or are in the process of **integrating them** (e.g. Cambodia). For example, Bangladesh, like most other countries, built its NDC on the basis of several climate change related strategies and actions plans, the National Disaster Management Plan and the Disaster Management Act being two of them. In its NDC Brunei Darussalam refers to its Natural Disaster Management Centre which has developed the Strategic National Action Plan for Disaster Risk Reduction through a multi sectoral involvement and participatory process that included both government and non-governmental stakeholders. Myanmar also refers to its recently developed Action Plan on DRR (2017 – 2020), which includes DRR/M measures that contribute to adaptation.

## Strengthen capacity and coordination

**Strengthening capacities and improving the coordination between different entities has been identified as integral to developing effective and efficient policies** and for further implementation of these strategies at different levels, by many countries. In its NDC, the government of Pakistan has outlined its goal to strengthen institutional capacities and put in place legal systems for better disaster management and preparation through the implementation of actions under the National Disaster Management Plan. Sri Lanka highlights in its NDC the importance of infrastructural development and human resource capacities to better adapt to the impacts of the changing climate. Countries have also focused on developing capacities for addressing impacts on different sectors, including the agriculture sector, like Indonesia, that has outlined its plans to build local capacities and develop integrated policies to better adapt to climate change and reduce disaster risks to this vulnerable sector by 2030.

### 5.3.3 SFDRR priority for action III: investing in disaster risk reduction for resilience

The negative impact of climate-related disasters on livelihoods and food security can be effectively reduced through investments in DRR/M and climate change adaptation. Approximately 90 percent of all the countries in Asia have highlighted the need to invest in DRR/M and climate change adaptation measures for building climate resilient agricultural sectors. At the sub regional level, the share stands at 60 percent for Eastern Asian countries and at 100 percent for countries in Southern and South-eastern Asia. The need to better design agricultural technologies and good agricultural practices in different sectors feature prominently across the NDCs of many of the countries. **Figure 82** illustrates the percentage of parties that have identified measures contributing to SFDRR Priority III, by sub-region.

**FIGURE 82.**

**SHARE OF COUNTRIES WITH CROSS-SECTORAL AND/OR AGRICULTURE-RELATED ADAPTATION PRIORITIES IN THE NDCs CONTRIBUTING TO SFDRR PRIORITY FOR ACTION III, BY SUB-REGION**



Source: FAO elaboration based on NDCs.

Specific DRR/M and climate change adaptation strategies have also been identified for different sub sectors under the agriculture and land use sector. The different strategies and measures have been discussed in detail in **Chapter 3**.

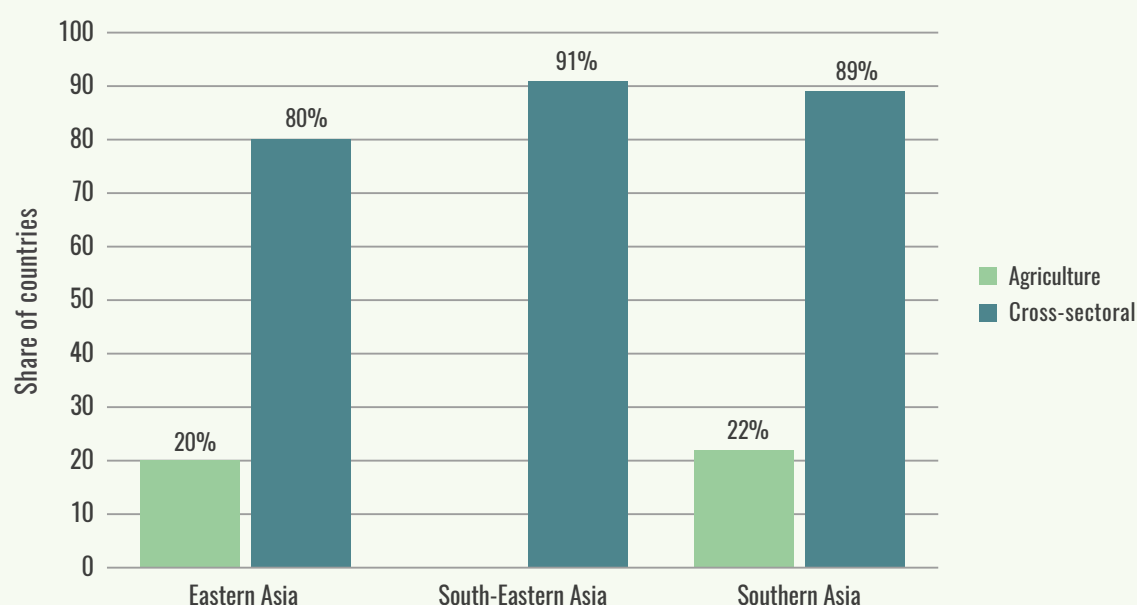
**Many countries have also integrated the need for risk transfer and insurance mechanisms as modalities to reduce risks from disasters, as either a coping mechanism with or adaptation strategy.** For example, Bhutan refers to its plans to improve crop insurance programs as an adaptation priority for the country. The Maldives, outlines measures to strengthen existing climate risk insurance mechanism to protect farmers and reduce the income losses from extreme weather events. One of Pakistan's adaptation priorities outlined is the strengthening of the risk management system for the agriculture sector, which includes the development of institutions that can provide agricultural insurance facilities and using Farmers' Fields School to build awareness of agriculture insurance options. Countries such as Sri Lanka and Vietnam, also envision on introducing possible insurance mechanisms to recover from loss and damage and to develop policies and actions to strengthen insurance systems.

### 5.3.4 SFDRR priority for action IV: enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation and reconstruction

Capacities in climate risk preparedness to improve the response to and recovery from climate-related disasters are essential to ensure climate-resilient livelihoods. More than 85 percent of countries in Asia have highlighted the need to enhance climate risk preparedness for effective response and recovery, with 20 percent of the countries recognizing this need in the agricultural sector only. The share is almost similar across the different sub regions. In Southern and Eastern Asia, approximately 80 percent of countries want to build the risk preparedness for better response across different sectors and 20 percent want it specifically for the agriculture sector. Countries in South-eastern Asia have highlighted this need to be cross cutting through different sectors for which the share of countries is about 85 percent. **Figure 83** illustrates the percentage of parties that have identified measures contributing to SFDRR IV, by sub-region.

**FIGURE 83.**

**SHARE OF COUNTRIES WITH CROSS-SECTORAL AND/OR AGRICULTURE-RELATED ADAPTATION PRIORITIES IN THE NDCs CONTRIBUTING TO SFDRR IV, BY SUB-REGION**



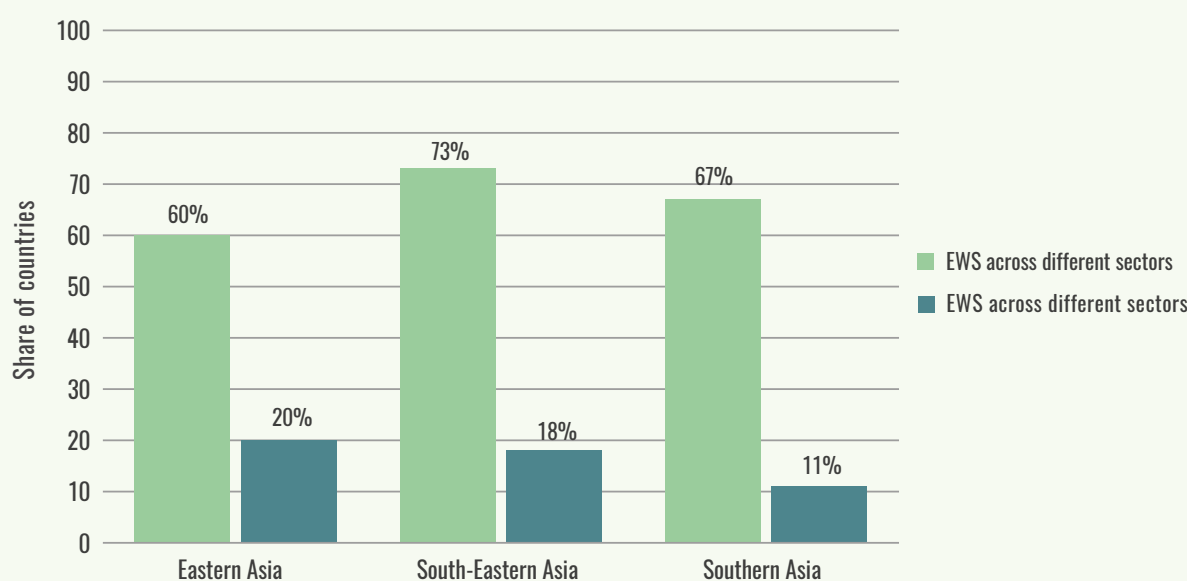
Source: FAO elaboration based on NDCs.

### Development of Early Warning Systems

Strengthening of EWS has been a key strategy that has been identified by several countries in the region either cross cutting through different sectors or for the agriculture sector alone, for improving climate risk preparedness and to respond more efficiently to hazards, as illustrated in **Figure 84**. Countries are in different stages of development and implementation of the EWS, by sub-region.

**FIGURE 84.**

**SHARE OF COUNTRIES BY DIFFERENT SUB REGIONS THAT INDICATED THE PLANS TO DEVELOP EWS FOR DIFFERENT SECTORS AND FOR THE AGRICULTURE AND LAND USE SECTORS**



Source: FAO elaboration based on NDCs.

Some countries have specified the type of hazards that they want to manage through the establishment of the EWS. For example, Mongolia wants to introduce EWS in its livestock sector to reduce diseases and loss of animals. Bangladesh aims to improve EWS for tropical cyclones, floods, flash floods and droughts while Bhutan plans to develop EWS for flash floods and landslides.

### Capacity building for preparedness and response

Apart from building institutional capacities, development of stronger capacities of different stakeholders is also important in order to effectively respond to climate related disasters. India, for example, has taken many stringent steps to develop capacities at district and ground levels. As part of the National Mission on Sustainable Agriculture, India has developed 580 district level contingency plans based on early warning systems and other weather forecasting systems. Furthermore, it has also established a holistic DRR/M and response apparatus at national, state and district levels that includes improved access and evacuation, enhanced capacity and capability of local communities to respond to disaster and strengthening disaster risk mitigation capacity at central, state and local level.

## 5.4 LINKS TO THE KORONIVIA JOINT WORK ON AGRICULTURE

At COP23, Parties reached a historic decision to adopt decision 4/CP.23 on the Koronivia Joint Work on Agriculture (KJWA), which recognizes the fundamental importance of agriculture in responding to climate change, and calls for joint work between the Subsidiary Body for Scientific and Technological Advice (SBSTA) and the Subsidiary Body for Implementation (SBI) on specific topics, including through workshops and expert meetings. Between 2018 and 2020, the UNFCCC Secretariat will organize a series of in-session workshops to discuss six topics on agriculture where Parties and observers are invited to submit their views on the subject ahead of each workshop. In November 2020, SB53 will report on the progress and outcomes of the KJWA work to COP26. The decision identifies the following six elements to start the work:



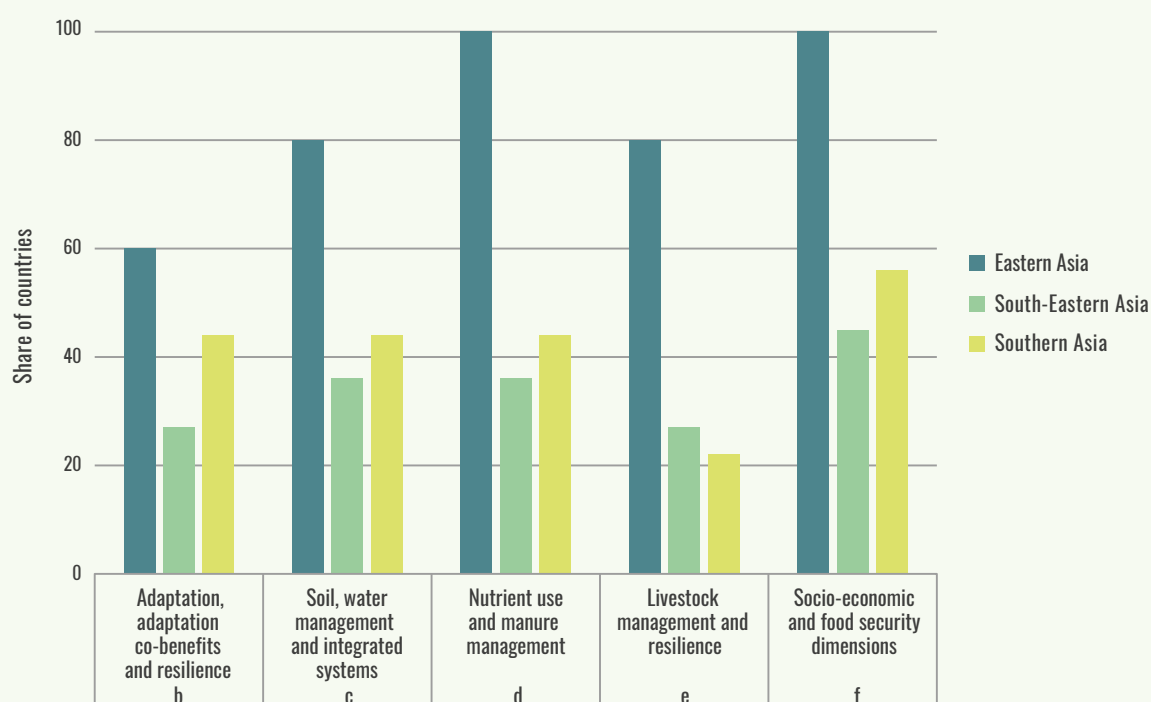
- (a) Modalities for implementation of the outcomes of the five in-session workshops on issues related to agriculture and other future topics that may arise from this work;
- (b) Methods and approaches for assessing adaptation, adaptation co-benefits and resilience;
- (c) Improved soil carbon, soil health and soil fertility under grassland and cropland as well as integrated systems, including water management;
- (d) Improved nutrient use and manure management towards sustainable and resilient agricultural systems;
- (e) Improved livestock management systems;
- (f) Socioeconomic and food security dimensions of climate change in the agricultural sector.

The three-year workplan of the KJWA presents an opportunity for countries to highlight the vulnerabilities of agriculture to climate change and promote responses that reduce sectoral emissions while safeguarding food security (FAO, 2018e). An analysis of the links between NDCs in agriculture and the KJWA points to the extent to which the KJWA presents an opportunity for countries to share views on their mitigation and adaptation priorities already defined in their NDCs. It can also inform the in-session workshops, as well as guide country submissions on the topics. For the sake of this analysis, only topics 2(b) to 2(f) are considered.

Overall, all countries in the region include adaptation and/or mitigation priorities in their NDCs that are aligned with one or more of the topics under the KJWA. Adaptation and/or mitigation priorities were most frequently aligned with Koronivia topics 2(b) “Methods and approaches for assessing adaptation, adaptation co-benefits and resilience” and 2(f) “Socio-economic and food security dimensions of climate change in the agricultural sector” (20 percent of countries, respectively). On the other hand, the Koronivia topic to which adaptation and/or mitigation priorities were least often linked was topic 2(e) “Improved livestock management systems” (12 percent). Overall, seventy percent of the links between agricultural priorities in the NDCs and the KJWA are found in adaptation measures, with mitigation constituting a 30 percent share. **Figure 85** illustrates the share of countries, per sub-region, with links between the NDCs and the KJWA, per topic.

**FIGURE 85.**

**SHARE OF COUNTRIES IN ASIA WITH LINKS BETWEEN THE NDCs AND THE KJWA, BY TOPIC**



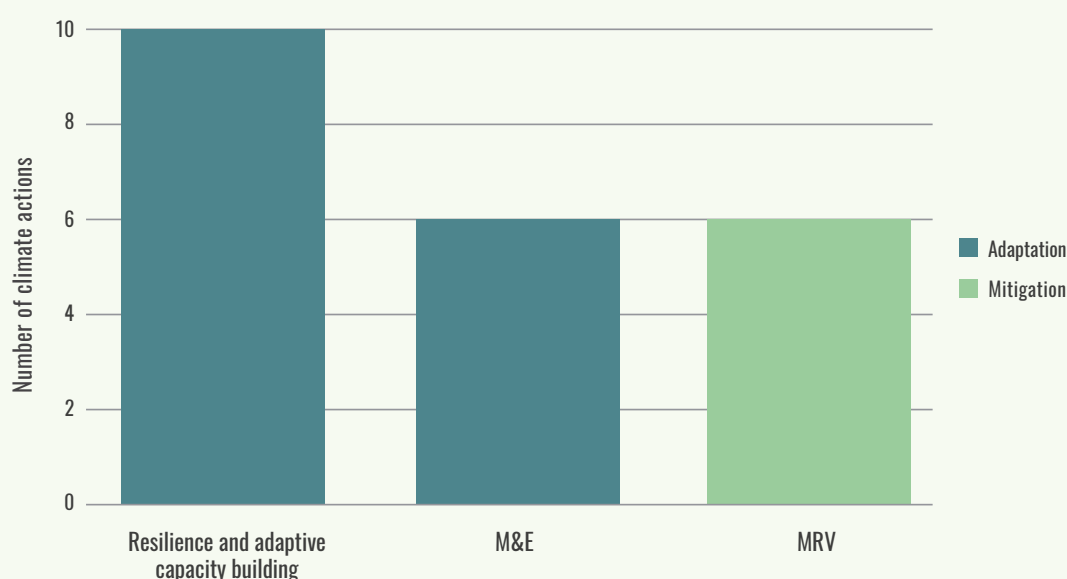
Source: FAO elaboration based on NDCs.

### 5.4.1 Methods and approaches for assessing adaptation, adaptation co-benefits and resilience (2b)

Amongst links between the NDCs in the region and KJWA topic (b), the majority are found in measures promoting resilience and adaptive capacity building, followed by systems for monitoring and evaluating (M&E) adaptation progress and systems for measuring, reporting and verifying (MRV) mitigation progress. Around three-fourths of links between agricultural priorities in the NDCs and KJWA topic (b) are found in adaptation measures, with mitigation constituting the remaining one-fourth. **Figure 86** illustrates the distribution of measures found in the NDCs of the region most closely aligned with KJWA topic (b).

**FIGURE 86.**

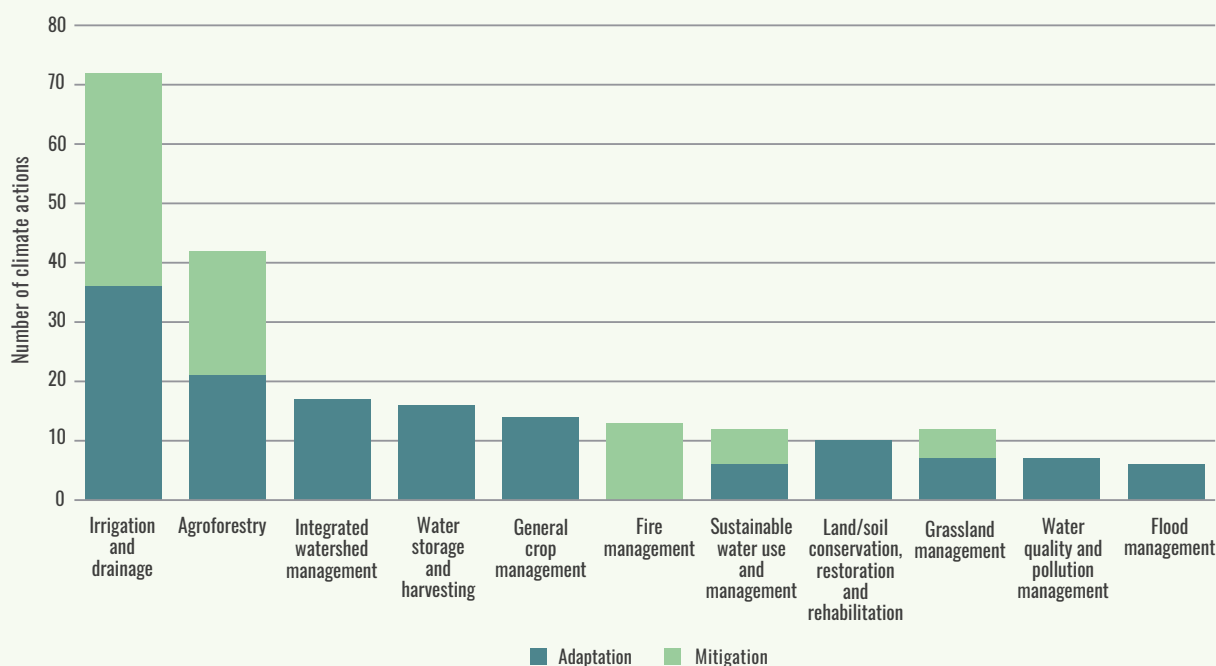
NUMBER OF NDC MEASURES IN ASIA ALIGNED WITH KJWA TOPIC (B)



Source: FAO elaboration based on NDCs.

### 5.4.2 Improved soil carbon, soil health and soil fertility under grassland and cropland as well as integrated systems, including water management (2c)

Amongst links between the NDCs in the region and KJWA topic (c), the majority are found in measures related to irrigation and drainage, followed by agroforestry, integrated watershed management and water storage and harvesting, amongst others. Around 60 percent of links between agricultural priorities in the NDCs and KJWA topic (c) are found in adaptation measures, with mitigation constituting a 40 percent share. **Figure 87** illustrates the distribution of measures found in the NDCs of the region most closely aligned with KJWA topic (c).

**FIGURE 87.****SHARE OF NDC MEASURES IN ASIA ALIGNED WITH KJWA TOPIC (C)**

Source: FAO elaboration based on NDCs.

### 5.4.3 Improved nutrient use and manure management towards sustainable and resilient agricultural ecosystems (2d)

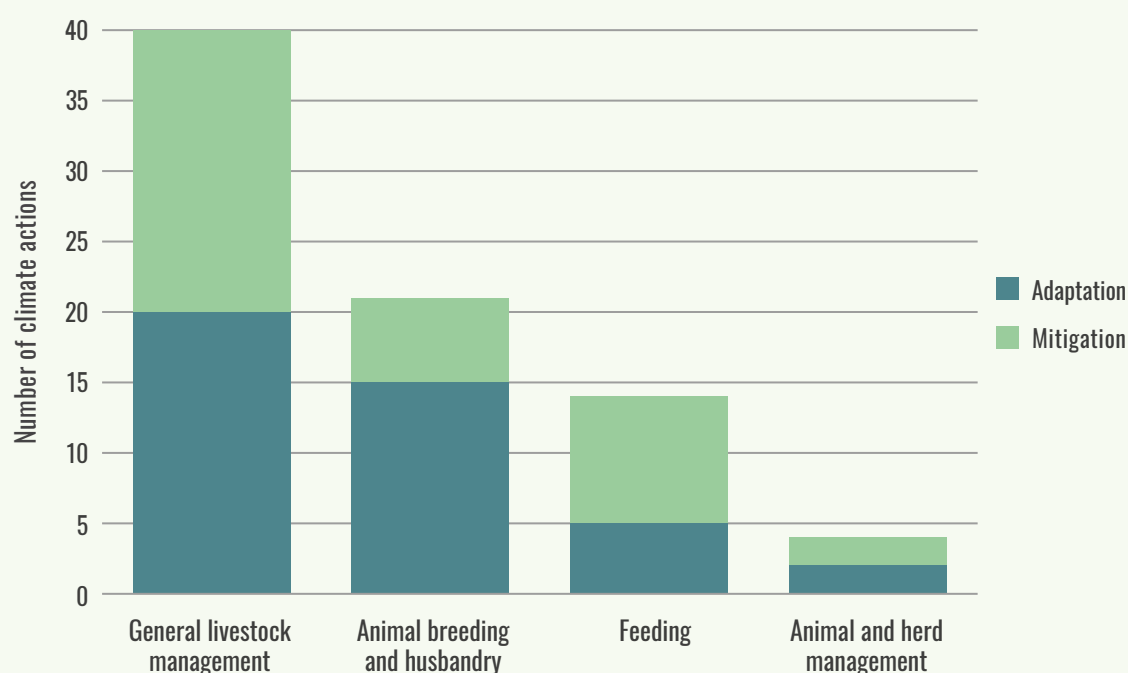
Amongst links between the NDCs in the region and KJWA topic (d), the majority are found in measures promoting improved nutrient and on-farm soil management, followed by manure management and tillage/residues management. Around 60 percent of links between agricultural priorities in the NDCs and KJWA topic (d) are found in mitigation measures, with adaptation constituting a 40 percent share. **Figure 88** illustrates the distribution of measures found in the NDCs of the region most closely aligned with KJWA topic (d).

**FIGURE 88.****NUMBER OF NDC MEASURES IN ASIA ALIGNED WITH KJWA TOPIC (D)**

Source: FAO elaboration based on NDCs.

#### 5.4.4 Improved livestock management systems (2e)

Amongst links between the NDCs in the region and KJWA topic (e), the majority are found in measures promoting livestock management in general, followed by more specific measures, including animal breeding and husbandry, improved feeding and animal and herd management on grassland. The links between agricultural priorities in the NDCs and KJWA topic (e) are equally found across mitigation and adaptation measures. **Figure 89** illustrates the distribution of measures found in the NDCs of the region most closely aligned with KJWA topic (e).

**FIGURE 89.****NUMBER OF NDC MEASURES IN ASIA ALIGNED WITH KJWA TOPIC (E)**

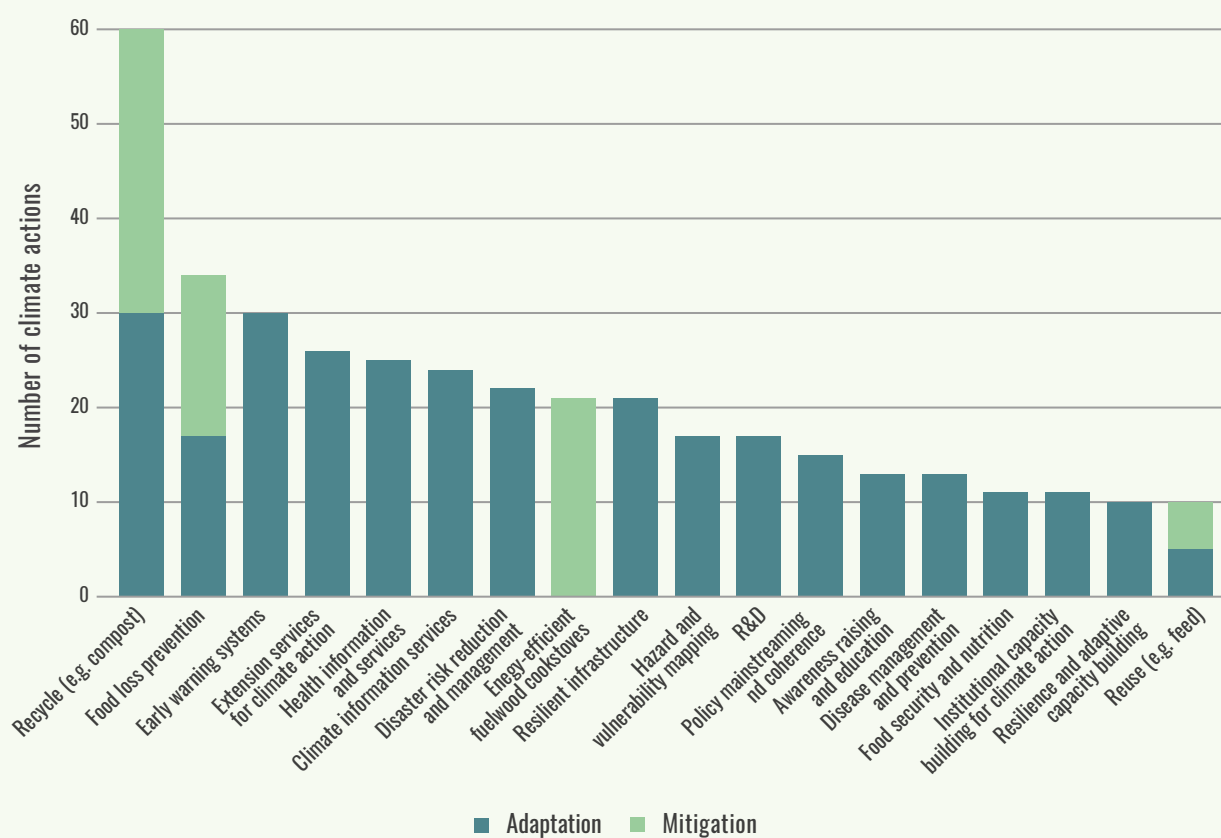
Source: FAO elaboration based on NDCs.

### 5.4.5 Socioeconomic and food security dimensions of climate change in the agricultural sector (2f)

Amongst links between the NDCs in the region and KJWA topic (f), the majority are found in measures **related to food loss reduction** through the recycling of biomass (e.g. compost) and prevention, early warning systems, extension services for climate action and health information and services, amongst others. Around 85 percent of links between agricultural priorities in the NDCs and KJWA topic (d) are found in adaptation measures, with mitigation constituting a 15 percent share. **Figure 90** illustrates the distribution of measures found in the NDCs of the region most closely aligned with KJWA topic (e).

**FIGURE 90.**

**NUMBER OF NDC MEASURES IN ASIA ALIGNED WITH KJWA TOPIC (F)**



Source: FAO elaboration based on NDCs.



# CHAPTER 6





# KEY FINDINGS

**Asia alone contributes to almost 40 percent of global emissions from agriculture and land use**, amounting to 1.4 billion tons of CO<sub>2</sub> eq each year (FAOb, n.d.). The majority of agricultural emissions are generated from managed soils, primarily in Eastern Asia, and enteric fermentation in Southern and Eastern Asia. Emissions from the LULUCF sector, on the other hand, are predominantly associated with the burning on forest biomass and deforestation in South-eastern Asia.

**Without implementation of the NDCs in the region, total net emissions in 2030 are expected to quadruple those reported in 2015.** Agricultural emissions are expected to increase by at least 40 percent by 2030 compared to historical levels.<sup>80</sup> However, removals from the LULUCF sector are expected to increase by around 25 percent on current levels over the same period.

**Under NDC implementation, however, net emissions are expected to fall by roughly 60 percent compared to the 2030 counterfactual scenario.**<sup>81</sup> Only four<sup>82</sup> out of 25 countries in the region, representing one-third of the region's agricultural emissions, communicated a sectoral GHG target, which would reduce emissions in those countries by 10 percent compared to the counterfactual scenario. Eighty-four percent of that reduction is conditional to international support. In the LULUCF sector, eight<sup>83</sup> out of 25 countries, representing over 90 percent of the region's LULUCF net emissions, communicated a sectoral GHG target, which would increase removals by seven-fold in those countries compared to the counterfactual scenario. Seventy-five percent of these additional removals are conditional to international support.

<sup>80</sup> Projection based on data reported from South-eastern and Southern Asia only.

<sup>81</sup> Net emission reduction based on targets from 19 out of 25 countries in the region, representing 98 percent of economy-wide net emissions in 2015.

<sup>82</sup> Malaysia, Vietnam, Indonesia and Iran (Islamic Republic of).

<sup>83</sup> Japan, Cambodia, Indonesia, Lao PDR, Malaysia, Vietnam, India and Iran (Islamic Republic of).

**Ninety-two percent of countries in the region have prioritized mitigation in the agriculture and/or LULUCF sectors, primarily on forest land, cropland or in the livestock sub-sector.** Amongst mitigation policies or measures set forth, the majority of countries promote reduced forest degradation and SFM, improved rice management practices and manure management. Approximately 90 percent of countries in the region promote food loss and waste reduction-related measures, primarily as a mitigation priority.

**Increasing frequency and intensity of floods, drought, storms and invasion by pests and non-native species in agriculture are amongst the most frequent climate-related hazards** observed and/or projected in Asia. Water stress, sea level rise and coastal erosion are the most prominent climate-related slow onset events reported. As a result, water is found most often amongst cross-sectoral priorities for adaptation, followed by oceans and coastal zones.

**Agroecosystems are considered the most vulnerable ecosystem in the region, particularly the forestry, crops and marine fisheries sub-sectors.** Losses in primary production and biodiversity are the ecosystem service impacts most often observed and/or projected.

**All developing countries in the region promote adaptation in agriculture, primarily in the crops and forestry sub-sectors,** acknowledging the sector's unique capacity to reduce or avoid adverse climatic impacts by means of lowering the underlying vulnerability of agricultural and food systems, and strengthening the adaptive capacity and resilience of rural communities to climate-related risks and longer-term climate changes. Over half of countries in the region include livestock-related measures, and around one-third promote measures in marine and/or inland fisheries and aquaculture as part of their adaptation strategy.

**Poverty and low levels of economic development threaten to exacerbate the vulnerability of populations to climate change,** particularly amongst populations dependent on agriculture and food systems for their livelihoods and sustenance. Health is considered the social dimension most at risk under climate change. Consequently, health is presented as the greatest cross-cutting adaptation priority in social systems amongst countries in the region. Around 70 percent of countries promote health information and services, DRR/M and early warning systems as adaptation strategies.

**A review of the mitigation and adaptation measures set forth in country NDCs points to a number of “policy coverage gaps”, or “opportunities” for enhancing ambition in the next round of NDCs and attracting additional, needed support.** Targeting emissions from enteric fermentation, managed soils, deforestation and rice cultivation presents an opportunity for strengthening mitigation ambition. Strengthening adaptation responses to observed and/or projected losses in the provision of fisheries, crops and forestry, coastal erosion, and increased invasion of pest and non-native species presents an opportunity for raising adaptation ambition. Enhancing the response to inequality amongst women and youth, as well as to rural livelihoods and income losses also present important entry-points for strengthening adaptation.

**More can be done to better specify and quantify both mitigation and adaptation contributions in the NDCs.** Of the mitigation policies or measures identified from countries in the region, only around 40 percent have quantified targets, half of which are quantified in terms of GHG emission reductions. The situation for adaptation is even more challenging with only around 5 percent of adaptation measures identified having quantified targets, most likely arising due to the challenges related to measuring adaptation baselines and outcomes at the local and national scale. Working to better develop policies and measures that can be quantified may result in a range of benefits including improved understanding of potential ambition as well as trade-offs implied by NDC contributions and needs for additional financial and technical support.

**Identifying actions that co-deliver on mitigation and adaptation is critical to achieving climate action at scale, while ensuring that “no one is left behind.”** Over 60 percent of countries in Asia explicitly recognize synergies and/or co-benefits between mitigation and adaptation in the agriculture and land use sectors within their NDCs. In particular, reducing forest degradation, SFM and agroforestry are reported as capable of generating the most co-benefits for mitigation and adaptation in agriculture across all sub-regions.

**Aligning the climate and sustainable development agenda presents a unique opportunity for countries to co-deliver.** The greatest area of convergence between agricultural climate actions in the region and the 2030 Agenda for Sustainable Development, after SDG 13 “Climate Action,” are found around targets 2.3 “Assure agricultural productivity for marginalized,” 1.5 “Resilience of poor to climate events,” 15.1 “Conserve and restore inland ecosystems,” 12.2 “Efficient use of natural resources,” 6.3 “Improve water quality and reduce pollution” and 14.7 “Increase economic benefits of SIDS from fisheries and tourism.”

**There is a need to better link NDCs to the Sendai Framework, particularly around measures aiming to strengthen disaster risk governance to manage disaster risk in agriculture** (SFDRR priority for action II). Strengthening disaster management structures, policies and development plans in agriculture and the institutional capacity to implement them are a prerequisite for reducing climate-related risk on the national level. There is also a need to incorporate measures aiming to enhance climate risk preparedness for effective response and recovery in agriculture, such as the development EWSs in agriculture, and to “Build Back Better” in recovery, rehabilitation and reconstruction in agriculture (SFDRR priority for action IV).

**The Koronivia Joint Work Agenda presents a historical opportunity for countries to highlight the vulnerabilities of agriculture to climate change and promote responses that safeguard food security.** Overall, all countries in the region include adaptation and/or mitigation priorities in their NDCs that are aligned with one or more of the topics under the KJWA, particularly around topic 2(b) “Methods and approaches for assessing adaptation, adaptation co-benefits and resilience” and 2(f) “Socio-economic and food security dimensions of climate change in the agricultural sector.” The KJWA presents an opportunity for countries to highlight sectoral needs and priorities, particularly reducing food loss, developing EWSs, capacity development for building resilience, and developing MRV and M&E systems to track mitigation and adaptation progress.

**The transformational changes needed to place agriculture at the center of climate change and sustainable development responses will only come about if more support is made available, particularly to developing countries.** Overall, the lack of financial resources and weak technical capacities and institutional arrangements are highlighted as the main barriers to NDC implementation in Asia, and 96 percent of countries in the region stipulate the conditionality of their mitigation and adaptation contributions to the provision of international support.

By highlighting the gaps in the coverage of mitigation and adaptation in the agriculture and land use sectors, as well as illustrating opportunities for enhancing climate action ambitions in the next round of NDCs, this analysis can serve as an important roadmap for informing policies and directing future investments in support of low-emission, climate-resilient and inclusive agriculture and food systems in the region.



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# ANNEXES

## ANNEX 1.

### SOURCE OF NATIONAL DATA FOR ANALYSIS

COUNTRY	NDC	NC	BUR	NGHGI	TNA
CHINA, MAINLAND	2016		2017		
DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA	2016	2013			
JAPAN	2016			2018	
MONGOLIA	2016	2018			2013
REPUBLIC OF KOREA	2016		2017		
EASTERN ASIA					
BRUNEI DARUSSALAM	2016	2017			
CAMBODIA	2017	2016			
INDONESIA	2016	2018			2012
LAO PEOPLE'S DEMOCRATIC REPUBLIC	2016	2013			2013
MALAYSIA	2016	2018			
MYANMAR	2017	2012			
PHILIPPINES	2017	2014			2004
SINGAPORE	2016	2018			
THAILAND	2016	2018			2012
TIMOR-LESTE	2017	2014			
VIET NAM	2016	2019			2012
SOUTH-EASTERN ASIA					
AFGHANISTAN	2017	2013			
BANGLADESH	2016	2018			2012
BHUTAN	2017	2011			2013
INDIA	2016		2016		
IRAN (ISLAMIC REPUBLIC OF)		2018			2004
MALDIVES	2016	2018			
NEPAL	2016	2015			
PAKISTAN	2016	2003			2016
SRI LANKA	2016	2012			2012
SOUTHERN ASIA					

## ANNEX 2.

## GENERAL MITIGATION CONTRIBUTIONS IN ASIA, BY SCOPE, TYPE AND TARGET

COUNTRY	SOURCE	SCOPE OF CONTRIBUTION	TYPE OF CONTRIBUTION	TYPE OF GHG TARGET	2030 UNCONDITIONAL REDUCTION (%)	2030 CONDITIONAL REDUCTION (%)	2030 COMBINED REDUCTION (%)
CHINA, MAINLAND	NDC	ECONOMY-WIDE	GHG TARGET	BASE YEAR	65.00	0.00	65.00
DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA	NDC	ECONOMY-WIDE	GHG TARGET	BAU	8.00	32.25	40.25
JAPAN	NDC	ECONOMY-WIDE	GHG TARGET	BASE YEAR	26.00	0.00	26.00
MONGOLIA	NDC	MULTI-SECTORAL	GHG TARGET	BAU	NA	NA	14.00
REPUBLIC OF KOREA	NDC	MULTI-SECTORAL	GHG TARGET	BAU	NA	NA	37.00
EASTERN ASIA							
BRUNEI DARUSSALAM	NDC	MULTI-SECTORAL	ACTION ONLY	NA	NA	NA	NA
CAMBODIA	NDC	MULTI-SECTORAL	GHG TARGET	BAU	NA	NA	26.72
INDONESIA	NDC	ECONOMY-WIDE	GHG TARGET	BAU	29.00	12.00	41.00
LAO PEOPLE'S DEMOCRATIC REPUBLIC	NDC	MULTI-SECTORAL	ACTION ONLY	NA	NA	NA	NA
MALAYSIA	NDC	ECONOMY-WIDE	GHG TARGET	BAU	35.00	10.00	45.00
MYANMAR	NDC	MULTI-SECTORAL	ACTION ONLY	NA	NA	NA	NA
PHILIPPINES	NDC	MULTI-SECTORAL	GHG TARGET	BAU	0.00	70.00	70.00
SINGAPORE	NDC	ECONOMY-WIDE	GHG TARGET	BASE YEAR	36.00	0.00	36.00
THAILAND	NDC	MULTI-SECTORAL	GHG TARGET	BAU	20.80	4.20	25.00
TIMOR-LESTE	NDC	MULTI-SECTORAL	ACTION ONLY	NA	NA	NA	NA
VIET NAM	NDC	MULTI-SECTORAL	GHG TARGET	BAU	8.00	17.00	25.00
SOUTH-EASTERN ASIA							
AFGHANISTAN	NDC	MULTI-SECTORAL	GHG TARGET	BAU	0.00	13.60	13.60
BANGLADESH	NDC	MULTI-SECTORAL	GHG TARGET	BAU	5.00	10.00	15.00
BHUTAN	NDC	ECONOMY-WIDE	ACTION ONLY	NA	NA	NA	NA
INDIA	NDC	MULTI-SECTORAL	GHG TARGET	BASE YEAR	NA	NA	35.00
IRAN (ISLAMIC REPUBLIC OF)	(I)NDC	ECONOMY-WIDE	GHG TARGET	BASE YEAR	4.00	8.00	12.00
MALDIVES	NDC	MULTI-SECTORAL	GHG TARGET	BAU	10.00	14.00	24.00
NEPAL	NDC	MULTI-SECTORAL	ACTION ONLY	NA	NA	NA	NA
PAKISTAN	NDC	ECONOMY-WIDE	GHG TARGET	BAU	0.00	NA	20.00
SRI LANKA	NDC	MULTI-SECTORAL	GHG TARGET	BASE YEAR	7.00	23.00	30.00
SOUTHERN ASIA							

\* Calculated based on reported data.

## ANNEX 3.

## NATIONAL MITIGATION CONTRIBUTIONS IN THE AGRICULTURE SECTOR, BY TYPE AND TARGET

COUNTRY	SOURCE	TYPE OF CONTRIBUTION	TYPE OF GHG TARGET	2030 UNCONDITIONAL REDUCTION (%)	2030 CONDITIONAL REDUCTION (%)	2030 COMBINED REDUCTION (%)
CHINA, MAINLAND	NDC	POLICIES OR MEASURES ONLY	NA	NA	NA	NA
DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA	NDC	POLICIES OR MEASURES ONLY	NA	NA	NA	NA
JAPAN	NDC	POLICIES OR MEASURES ONLY	NA	NA	NA	NA
MONGOLIA	NDC	POLICIES OR MEASURES ONLY	NA	NA	NA	NA
REPUBLIC OF KOREA	NDC	SECTOR INCLUDED IN GENERAL CONTRIBUTION ONLY	NA	NA	NA	NA
EASTERN ASIA						
BRUNEI DARUSSALAM	NA	NO CONTRIBUTION	NA	NA	NA	NA
CAMBODIA	NDC	NO CONTRIBUTION	NA	NA	NA	NA
INDONESIA	NDC	GHG TARGET	BAU	3.18	4.57	7.75
LAO PEOPLE'S DEMOCRATIC REPUBLIC	NDC	NO CONTRIBUTION	NA	NA	NA	NA
MALAYSIA	NC	GHG TARGET	BAU	3.48	3.72	7.20
MYANMAR	NDC	POLICIES OR MEASURES ONLY	NA	NA	NA	NA
PHILIPPINES	NDC	NO CONTRIBUTION	NA	NA	NA	NA
SINGAPORE	NDC	SECTOR INCLUDED IN GENERAL CONTRIBUTION ONLY	NA	NA	NA	NA
THAILAND	NDC	NO CONTRIBUTION	NA	NA	NA	NA
TIMOR-LESTE	NDC	POLICIES OR MEASURES ONLY	NA	NA	NA	NA
VIET NAM	NC	GHG TARGET	BAU	NA	NA	10.33
SOUTH-EASTERN ASIA						
AFGHANISTAN	NDC	POLICIES OR MEASURES ONLY	NA	NA	NA	NA
BANGLADESH	NDC	NO CONTRIBUTION	NA	NA	NA	NA
BHUTAN	NDC	POLICIES OR MEASURES ONLY	NA	NA	NA	NA
INDIA	NDC	SECTOR INCLUDED IN GENERAL CONTRIBUTION ONLY	NA	NA	NA	NA
IRAN (ISLAMIC REPUBLIC OF)	NC	GHG TARGET	BAU	NA	NA	14.30
MALDIVES	NDC	NO CONTRIBUTION	NA	NA	NA	NA
NEPAL	NDC	POLICIES OR MEASURES ONLY	NA	NA	NA	NA
PAKISTAN	NDC	POLICIES OR MEASURES ONLY	NA	NA	NA	NA
SRI LANKA	NDC	NO CONTRIBUTION	NA	NA	NA	NA
SOUTHERN ASIA						

\* Calculated based on reported data.

## ANNEX 4.

## NATIONAL MITIGATION CONTRIBUTIONS IN THE LAND USE, LAND USE CHANGE AND FORESTRY (LULUCF) SECTOR, BY TYPE AND TARGET

COUNTRY	SOURCE	TYPE OF CONTRIBUTION	TYPE OF GHG TARGET	2030 UNCONDITIONAL REDUCTION (%)	2030 CONDITIONAL REDUCTION (%)	2030 COMBINED REDUCTION (%)
CHINA, MAINLAND	NDC	NON-GHG TARGET	NA	NA	NA	NA
DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA	NDC	POLICIES OR MEASURES ONLY	NA	NA	NA	NA
JAPAN	NDC	GHG TARGET	BASE YEAR	2.60	0.0	2.60
MONGOLIA	NDC	NO CONTRIBUTION	NA	NA	NA	NA
REPUBLIC OF KOREA	NDC	NO CONTRIBUTION	NA	NA	NA	NA
EASTERN ASIA						
BRUNEI DARUSSALAM	NDC	NON-GHG TARGET	NA	NA	NA	NA
CAMBODIA	NDC	GHG TARGET	BAU	NA	630.79	630.79
INDONESIA	NDC	GHG TARGET	BAU	69.58	21.42	91.01
LAO PEOPLE'S DEMOCRATIC REPUBLIC	NDC	GHG TARGET	BASE YEAR	NA	NA	264.61
MALAYSIA	NC	GHG TARGET	BAU	5.89	6.80	12.69
MYANMAR	NDC	POLICIES OR MEASURES ONLY	NA	NA	NA	NA
PHILIPPINES	NDC	SECTOR INCLUDED IN GENERAL CONTRIBUTION ONLY	NA	NA	NA	NA
SINGAPORE	NDC	SECTOR INCLUDED IN GENERAL CONTRIBUTION ONLY	NA	NA	NA	NA
THAILAND	NDC	NO CONTRIBUTION	NA	NA	NA	NA
TIMOR-LESTE	NDC	NON-GHG TARGET	NA	NA	NA	NA
VIET NAM	NC	GHG TARGET	BAU	NA	NA	10.33
SOUTH-EASTERN ASIA						
AFGHANISTAN	NDC	POLICIES OR MEASURES ONLY	NA	NA	NA	NA
BANGLADESH	NDC	NO CONTRIBUTION	NA	NA	NA	NA
BHUTAN	NDC	NON-GHG TARGET	NA	NA	NA	NA
INDIA	NDC	GHG TARGET	BASE YEAR	NA	NA	215.99
IRAN (ISLAMIC REPUBLIC OF)	NC	GHG TARGET	BASE YEAR	NA	NA	23.23*
MALDIVES	NDC	NO CONTRIBUTION	NA	NA	NA	NA
NEPAL	NDC	POLICIES OR MEASURES ONLY	NA	NA	NA	NA
PAKISTAN	NDC	POLICIES OR MEASURES ONLY	NA	NA	NA	NA
SRI LANKA	NDC	POLICIES OR MEASURES ONLY	NA	NA	NA	NA
SOUTHERN ASIA						

\* India's GHG target is set for year 2025. Calculated based on reported data.

Annex 5-7 can be found online at <http://www.fao.org/climate-change/resources/publications/en/>

This report provides a unique, sector-specific synthesis of the NDCs from Asia. It summarizes the substantial contributions already put forward by countries, opportunities for further action and the gaps, barriers and needs that will need to be addressed if the agriculture sector in Asia is to raise mitigation and adaptation ambitions. The findings of this report will help member countries to reflect on their progress in advancing toward NDC priorities for agriculture and associated national climate goals including related targets under the Sustainable Development Goals (SDGs).

The analysis also helps to make clear the links between the NDCs from the region and the ongoing work of the United Nations Framework Convention on Climate Change in support of the Koronivia Joint Work on Agriculture (KJWA). Finally, the report serves as a guide to FAO, as well as other international actors, of the support that will be required to help countries in the region move forward to implement agriculture sector priorities in their NDCs and ensure that future commitments from the agriculture sector are quantifiable, verifiable and sufficiently ambitious.

Climate and Environment Division (CBC)

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