Published by:

In cooperation with:

Climate-Smart Land Use Insight Brief No. 3

Climate services to support adaptation and livelihoods

Key Messages

- Climate services – the translation, tailoring, packaging and communication of climate data to meet users' needs – play a key role in adaptation to climate change. For farmers, they provide vital information about the onset of seasons, temperature and rainfall projections, and extreme weather events, as well as longer-term trends they need to understand to plan and adapt.
- In ASEAN Member States, where agriculture is highly vulnerable to climate change, governments already recognise the importance of climate services. National meteorological and hydrological institutes provide a growing array of data, disseminated online, on broadcast media and via SMS, and through agricultural extension services and innovative programmes such as farmer field schools. Still, there are significant capacity and resource gaps that need to be filled.
- To be effective, climate services must be tailored to users' needs. This requires direct engagement with those users – e.g. farmers – to learn how climate and weather data are relevant to their work, how they make decisions, and how to best deliver information to them. It is also essential to recognise the insights that farmers bring to the table, including traditional ecological knowledge, and incorporate them into adaptation strategies. There is a trend away from top-down delivery of information and towards knowledge co-production, which also helps build farmers' capacities and helps ensure that climate services have long-lasting benefits.
- It is not enough to tailor climate services to a specific context; equity and inclusion require paying attention to the differentiated needs of men and women, Indigenous Peoples, ethnic minorities, and other groups. Within a single community, perspectives on climate risks, information needs, preferences for how to receive climate information, and capacities to use it may vary, even just reflecting the different roles that men and women may play in agriculture.
- Delivering high-quality climate services to all who need them is a significant challenge. Given the urgent need to adapt to climate change and to support the most vulnerable populations and sectors, it is crucial to address resource gaps and build capacity in key institutions, so they can continue to improve climate information services and products. Promising models, such as climate field schools and climate services built around knowledge co-production, need to be scaled up, and this requires allocating appropriate resources.
- Climate service providers and policy-makers must work with traditional ecological knowledge holders and practitioners and ensure their knowledge is harnessed for climate change adaptation and disaster resilience and not displaced by conventional climate service.

Farmers have always monitored the weather, tracked the seasons, and looked out for hazards that could harm their crops or their livestock: from droughts and heat waves, to storms and floods. Now, with climate change shifting seasonal patterns and bringing more frequent and intense extreme events, up-to-date and usable information is more crucial than ever to enable farmers to adapt their practices and mitigate risks.

A new field has emerged to meet that need: climate services. Bridging the gap between scientists and the people who need scientific knowledge to inform their decisions, climate services are offered in multiple settings, but have become particularly crucial to farmers, pastoralists and other rural people whose livelihoods may depend on having good weather data and understanding the changing climate.

This Insight Brief, part of a series on climate-smart land use in the ASEAN countries, provides an overview of the field of climate services, with multiple examples from Southeast Asia, and explains how these services fit into ASEAN's broader approach to adaptation and resilience-building in agriculture. It explores how climate services can connect science with traditional ecological knowledge to identify contextually appropriate solutions, and it addresses issues of equity and inclusion. It ends with recommendations for policy-makers, development partners, and researchers in the region.

Climate services in ASEAN

Climate change poses significant threats to Southeast Asia and the entire world, making it crucial to adapt. This requires understanding future climate projections, which can be quite uncertain; gauging the vulnerability of different sectors, communities and population groups, which depends not only on their exposure to climate hazards, but also on social, economic, and other factors; and identifying adaptation options, such as climate-smart agricultural methods.

In this context, climate services are crucial resources. Having access to and effectively using climate information can help societies and individuals to better understand climate-related risks and opportunities, so they can make more effective decisions on agriculture, land use and food security (Vaughan and Dessai 2014).

The need for climate services in ASEAN countries is significant. Agriculture in Southeast Asia faces multiple climate threats: from slow-onset impacts such as rising temperatures, changes in precipitation, ecosystems

Presenting the climate and agrosystem observation at Climate Field School, 2013, South Sulawesi, Indonesia. Photo credit: The World Meteorological Organization (WMO) degradation, sea-level rise and saltwater intrusion, to more frequent and severe extreme events that can ruin crops and damage or destroy infrastructure (AHA Centre 2020).

A basic but crucial need is to have accurate and timely climate and weather information relevant to farming. Meteorological and hydrological data are important elements of climate services and essential to adaptation efforts. The World Meteorological Organization (WMO) estimates that improving weather, climate, water observations and forecasting could increase global productivity by up to US$30 billion per year and reduce losses by US$2 billion per year (WMO 2019, p.11).

For farmers, key information may include monthly seasonal outlooks, monitoring of dry spells (or droughts), analyses of soil water availability, and warnings about extreme weather: from heat waves, to heavy rainfall, to storms. Climate services can also help users adapt to changes that manifest on a longer time-scale, such as trends in temperature and rainfall and shifts in the onset of seasons, for example, with projections of future conditions.

To be most useful, the information needs to be tailored to users' specific needs. This means presenting information at an appropriate spatial and temporal scale – to reflect conditions in Bali, for example, not Indonesia or Southeast Asia as a whole, and within a time period relevant to the farmer, not 20, 50 or 100 years into the future. It is also important to tailor climate services to users' literacy levels, access to technology and other capacities, and the local context. There is a trend towards engaging directly with stakeholders to incorporate their knowledge and produce more relevant and accessible climate information (Daniels et al. 2020; Guido et al. 2020).

ASEAN Member States recognise the importance of climate services for agriculture and have worked to meet that urgent need. National meteorological and hydrological services are mandated to provide climate services, and NGOs, research organisations and other entities are also providing services (ASMC 2017).

In Thailand, for example, climate information for water management is provided, via local extension services, to at least 900 villages, helping to build resilience (FAO 2017; FAO and UNDP 2017). Indonesia, the Philippines and Lao PDR are using field schools to train extension workers and farmers to interpret weather and seasonal forecasts and adapt agricultural practices accordingly. In addition, a network of nearly 1,000 automatic weather stations in the Philippines aims to provide free, reliable, localised weather information to 100 million people.

Vietnam has developed a climate-informed agro-advisory service for major food crops, including recommended farming practices (FAO 2017; FAO and UNDP 2017). And across the region, climate information is also disseminated to farmers via radio broadcasts, SMS, emails and farm visits. Some countries also incorporate information about insurance and market access. Mobile applications have been recognised as having particular potential – for instance, in Vietnam, 80–90% of farmers targeted by climate services used mobile platforms – and several countries have prioritised technological upgrades. Governments also see potential for more private actors to get involved; in Myanmar, for example, a social enterprise called Greenovator launched an app for sustainable and resilient farming.[1]

Several studies have reviewed the impacts of these efforts; for example, of monthly seasonal rainfall scenarios provided by SMS in Indonesia (Stigter et al. 2016); international NGOs and local government units collaborating to train farmers in the Philippines on how to use weather and climate forecasts (Ewbank 2016); and the dissemination of information from national meteorological and hydrological agencies in Vietnam, Lao PDR and Cambodia (Simelton et al. 2018).

ASEAN Member States have also evaluated the effectiveness of their own climate services and sought ways to improve them, including through a survey commissioned by the ASEAN Specialised Meteorological Centre (ASMC 2017). The survey that national services were already providing a wide range of products, including statistics on climate extremes, historical datasets, monthly seasonal outlooks, and various climate summaries, bulletins and special statements. Areas in which agencies wished to improve included information on uncertainties in monthly to seasonal forecasts, products focused on sea surface temperatures and variability, and downscaled climate change projections, among others.

In 2017, with the support of ASEAN-CRN and GIZ, representatives of ASEAN Member States, research institutes and development organisations came together to exchange knowledge on climate services for agriculture. They identified several best practices, including close coordination between national data management and local extension offices; the translation of climate data into actionable agro-advisories; the utilisation of field schools to help farmers understand and act on climate services; and the development of mobile platforms to share information (FAO and UNDP 2017).

[1] See https://www.mmgreenovator.com/greenway-app.

Using climate information in decision-making and planning

Climate and weather services are important for a range of stakeholders at the national, sub-national and community levels. Climate information that is relevant to the specific social and environmental context can enable better adaptation decisions and more effective management of available resources (Daniels et al. 2020). Policy-makers at different levels are also provided climate data and analyses to inform decisions related to broader economic and development planning. At the farm level, tailored data can help farmers decide what is best to plant, when and how to plant it, when to look out for pest and disease outbreaks, when to harvest and, if needed, dry the crops, and when to take emergency measures to protect the fields (for instance, if a major storm is coming).

Yet as crucial as good climate and weather information is for farmers and others with land-based livelihoods, researchers and practitioners have found that meteorological and hydrological data, as generated by scientists, are often not very useful (see, e.g., ASEAN-CRN 2017b; Brugger et al. 2016; Daniels et al. 2020; MeteoSwiss and Senamhi 2018; Raaphorst et al. 2020). They may not match the time-frame or geographic scale at which they operate – looking at 10-year increments to 2050, for instance, instead of near-term, or at the whole country instead of their province – and/or it may be difficult to read, provided in complex graphics or in highly technical scientific English. And the scientists conveying the information may not be skilled communicators and teachers, and thus struggle to support users.

It is now widely accepted that climate services need to “translate” and tailor the science, sometimes gathering and/or producing new knowledge as well, to fit the needs of individual decision-makers – whether they are public officials, business owners or farmers – and deliver that knowledge to them in the ways that will be most useful (Daniels et al. 2020; Practical Action 2020; Raaphorst et al. 2020). It is also important to recognise differences in technology access, literacy and numeracy, and local languages, for instance.

In the context of agriculture, climate services need to provide at different time scales: from daily or seasonal forecasts and warnings, to longer-term trends relevant for planning. Near-term (and real-time) weather information may include the expected temperatures and precipitation for the coming days to weeks, extreme weather warnings, and alerts on pests and diseases. Daily weather observations, usually gathered by government agencies, provide the foundation, including current and historical data on temperatures, precipitation and evaporation (as well as snow depth in other contexts).

Medium-term information may include the expected onset of seasons (e.g. when the rain will start) and forecasts for rainfall and temperatures for the season, contributing to farmers’ selection of crops, intensity of fertiliser and pesticide use, and potential measures to diversify their incomes. Information on long-term trends can provide indications of how climate change may influence conditions for farming in the coming years and inform agricultural investments and livelihood strategies.

Who is providing climate services?

A wide range of sources provide data that feed into climate services, including international agencies, research institutions, global climate information portals, insurance companies and other private enterprises. For example, the World Meteorological Organization (WMO) Climate Data Catalogue provides information from 18 global climate databases covering temperature, precipitation, sea level, climate indices and hydrology.[2] The WMO and the Global Framework for Climate Services also offer guidelines and technical support to agencies and organisations around the world.

The Asia Pacific Economic Cooperation Climate Center, meanwhile, provides more region-specific projections and analysis.[3] The Specialised Meteorological Centre supports ASEAN Member States in their development of climate services. Within individual countries, national meteorological and hydrological services are the most important data sources, as they collect, analyse, and produce nationally relevant climate services.

In Indonesia, for example, BMKG (the Meteorological, Climatological, and Geophysical Agency) provides a wide range of information on weather, climate change, air quality and disaster risks, including from non-climate hazards such as earthquakes and tsunamis.[4] In Lao PDR, the Department of Meteorology and Hydrology under the Ministry of Natural Resources and Environment provides weather information, while in Cambodia, general forecasts and early warnings of storms are provided by the Ministry of Water Resources and Meteorology.

[2] See https://climatedata-catalogue.wmo.int.

[3] See https://www.apcc21.org/abt/intro.do?lang=en&menuId=intro.

[4] See https://www.bmkg.go.id/?lang=EN.

The Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) is responsible for delivering services in meteorology, hydrology, climatology, astronomy and other geophysical sciences to ensure safety and economic security for the country. This includes weather forecasts, typhoon and flood forecasts and warnings, climatological and farm weather services, research and development, and education and public outreach. In Thailand, the Thai Meteorological Department is responsible for weather forecasting and monitoring, and the National Centre for Hydro-Meteorological Forecasting does the same in Vietnam.

Locally, weather stations are used to gather data on temperature, relative humidity, precipitation, solar radiation, wind speed and direction, cloud cover, atmospheric pressure, and visibility information. These are "essential climate variables" that inform climate models and future projections.[5] These variables also inform risk assessments and allow the attribution of specific changes or events to underlying causes.[6]

Once data have been collected and analysed, advisory communications are distributed by numerous actors, including agriculture extension workers, national and local meteorological staff, international and non-governmental organisations, and other intermediaries. The materials provided by climate services take the information and package it for its intended use (and users), covering the most relevant aspects of historical and current climate data, future projections, global emission scenarios, and impact and vulnerability assessments. That tailoring is essential to the effectiveness of climate services: Even within a single community, an individual farmer, for example, will have very different needs than a public official making decisions on land use and development. There are also different actors and components in the climate services "value chain", described in Box 1.

Box 1.

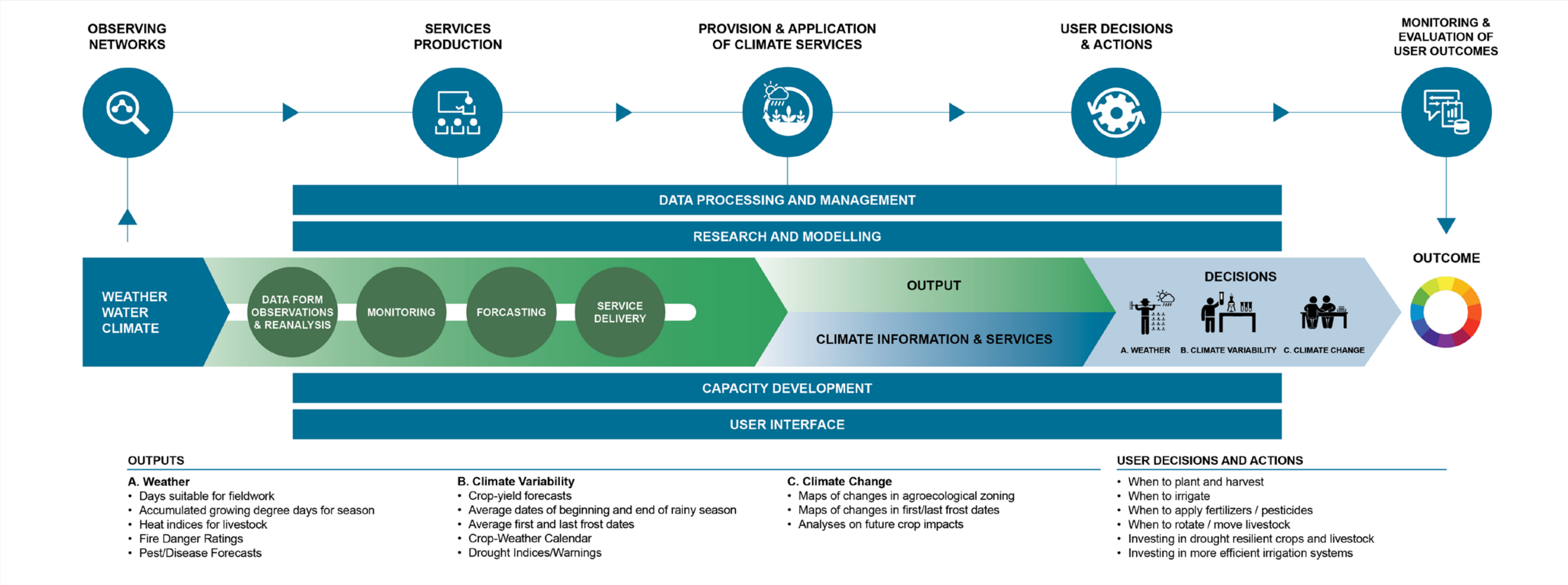
Climate services value chain

The 2019 State of Climate Services (WMO 2019) outlines the climate services value chain, which encompasses not only the production and delivery of climate services, but also their use and resulting outcomes. The value chain approach ensures that credible information is meaningfully translated to best benefit the end users and contribute towards informed decision making.

The climate services value chain consists of five main elements (see figure): climate and water observation; services production; provision and application of climate services; user decisions and actions; and monitoring and evaluation of outcomes. A weakness in any one aspect of the chain has the potential to limit the usefulness of the information, products, and services provided and therefore must be addressed holistically. Delivering climate services requires understanding the demand by asking end-users what they need in order to collect the necessary data and create relevant products. It also requires creating strong links between climate scientists and advisory services to ensure the information provided is complemented by agricultural knowledge. User needs are context specific and may vary from one village to the next and may rely on local knowledge. Advisory products should be tailored to local needs and effectively communicated, with particular emphasis on providing support to vulnerable communities.

All components of the value change are important to ASEAN countries' success in using climate services to support adaptation to climate change. It is not enough to have basic meteorological systems, or even forecasts and alerts. They need to be grounded in policies that embed them in adaptation strategies and planning. They require user interfaces that enable effective two-way learning and tailoring of information to the needs of the users as well as regularly tracking the use of climate services that their outcomes and the challenges they encountered are known. Finally, the capacities of users and providers need to be regularly enhanced.

[5] See Global Climate Observing System: https://gcos.wmo.int/en/essential-climate-variables/about.
[6] See WMO explainer: https://public.wmo.int/en/programmes/global-climate-observing-system/essential-climate-variables.



Box 1. WMO's Comprehensive Climate Services Value Chain (Adapted from WMO 2019: pp.12-13)

Types of climate services, products and modes of communication

As noted earlier, ASEAN Member States are already providing climate information relevant to farmers in a number of ways. A survey of the services provided in communities in Vietnam, Cambodia and Lao PDR found that weather information was overwhelmingly made available via television, radio and extension offices (Simelton et al. 2018). Farming advice, on the other hand – including climate-smart agriculture techniques – was communicated by village leaders, agriculture extension offices, local unions and NGOs.

National meteorological services recognise the importance of tailoring information to local needs (Cheng et al. 2020). This means not only the collection and synthesis of local weather and climate data, but often also maps, risk and vulnerability assessments and long-term projections. That, in turn, requires a broader range of non-meteorological information, including on the local development context, the crops grown, the market prices of those crops and inputs used. This deeper understanding can help ensure that climate services are widely used and truly helpful to farmers.

Another key element is to understand how and why the target users of a climate service make decisions – something best learned by engaging directly with them (Brugger et al. 2016). The goal is to provide easy-to-understand, actionable information. This is one advantage of climate field schools, which link climate service providers with users and enable them to learn from one another. The relationships they build are important to create user-focused climate services, turn information into action, and help ensure sustained use of climate services. For best results, scientists must work collaboratively with practitioners, policy-makers, and communities to develop and communicate climate information that supports adaptation planning and decision-making (Guido et al. 2020).

Capacity-building is also crucial – both for climate services providers, who may not have a grounding in science communications (Brugger et al. 2016), and for users, who need to learn to understand the basic science and how to apply it to their decision-making. This is yet another benefit of programmes such as climate field schools, which provide opportunities for farmers to learn from experts, while also sharing their own knowledge and providing feedback on how such services can be further improved.

Box 2 offers an example of a climate field school in Indonesia that integrates conventional climate services with traditional ecological knowledge (TEK), recognising that farmers' own experience and the wisdom passed down over generations are also highly valuable for adaptation.

Climate services themselves are evolving. Most notably, there are ongoing initiatives to refocus climate services away from the production and dissemination of climate services and products and more towards the process of co-producing this information so that climate services inform decision-making in more meaningful and usable ways and build capacity at the same time. This has been the intention of the Tandem framework, described in Box 3.

Box 2.

The School of Climate and Living Traditions (SaLT)

Climate field schools are in-depth trainings to help farmers understand how to access climate information and apply it across all relevant aspects of their crop production. The field school model is derived from earlier experiences in Indonesia, where it was used to give field demonstrations of rice farming techniques, so these were originally branded as farmer field schools. As the focus shifted to climate change adaptation, they became known as climate field schools.

The School of Climate and Living Traditions (SaLT) is a project that was implemented in Bali and Bajawa, Indonesia, to integrate conventional climate services with traditional ecological knowledge. The project was supported by the Stockholm Environment Institute's Initiative on Climate Services, su-re.co (Sustainability and Resilience Co), and BMKG. It began as a series of climate field schools to increase farmers'' knowledge on the application of climate information in the farming of coffee and cacao.

SaLT starts with an introduction to weather and climate concepts, then covers agro-ecosystems observation, how to understand and use weather and climate information, and how to incorporate local knowledge in agriculture, including to support climate change adaptation.

To learn more about SaLT, see https://www.sei.org/featured/indigenous-knowledge-modern-science/.

Box 3.

Tandem, a framework for co-designing transdisciplinary knowledge services

Tandem is a tool to guide practitioners on how to pursue structured and purposeful collaboration in developing climate services that is participatory and inclusive of diverse users to produce relevant, actionable, and sustainable climate services. It has seven elements, as shown in the diagram.
These elements are iterative, flexible and adaptable. These elements are described in detail in Daniels et al. (2020). The weADAPT platform hosts a number of materials on Tandem, including an online guidance on how to use the framework.[7]

Adapted from Daniels et al. 2020, p.11

[7] See http://www.weadapt.org/tandem

Challenges for climate services

A number of challenges exist in the collection, dissemination and use of climate data. At the national level, meteorological institutions may not be able to provide actionable information because they lack capacity or data may not be consistent in quality or available in all places or translatable to the agriculture context. Climate data is derived from ground-based national weather stations and satellite data. While ground-based systems often provide accurate measurements, they are not evenly distributed throughout Southeast Asia and often do not cover rural areas (ASEAN-CRN 2017a). Additionally, where there are existing weather stations, observations may be of poor quality and inconsistent. Ensuring that weather stations are calibrated regularly to ensure data integrity and consistency is a problem in many AMS. Financing increased climate data collection is a challenge, as increasing coverage and upgrading of equipment to ensure high-quality data requires substantial investments.

In addition to challenges of collecting climate information, there are also gaps in generating and delivering climate services at the national level. Common concerns among national meteorological institutions include a lack of personnel and training, inadequate computing facilities and equipment, insufficient access to data at the local, regional and international levels, and a need for more quality control (ASEAN-CRN 2017b; ASMC 2017).

Another, significant challenge is the need to tailor climate services to specific contexts and user needs. Farmers and other stakeholders may not use climate information if it is not localised enough, lacks critical information (such as rainfall projections), is unreliable forecasts, or is not presented in the local language. Meeting all those needs, however, is resource- and labour-intensive. Building capacity among farmers, so they can interpret the information provided and translate it into meaningful action, is also demanding work. Furthermore, for many reasons, people within communities may not all get equal access to climate information, or they may not receive it in a timely manner. The next section delves deeper into equity and inclusion issues.

There are also several "usability gaps" in climate services: from presenting information in formats that are not easy for users to grasp, such as complex graphs, to failing to recognise the roles of different actors in mitigating climate risks (Raaphorst et al. 2020). A variety of stakeholders are needed to address these challenges including government agencies, research institutions, extension workers, civil society, the private sector and farmers themselves.

Ensuring equity and inclusion

In agro-ecological settings, the vulnerabilities of communities and households to climate change impacts are determined by their gender, age, wealth, religion, ethnicity, education and identities so that they require particular climate information to address them. This means that even a climate service designed to address a specific hazard might work for one group, but not for others (Carr and Onzere 2017). Women and men, for instance, often have different roles and responsibilities on the farm, and sometimes different educational levels. Additionally, socio-economic conditions and circumstances may impact a farmer's opportunities and challenges in accessing climate services and applying them to their decision-making. As a result, the benefits of climate services are uneven, especially in developing countries.

The best way to address this problem is to develop climate services to meet the needs of specific, underserved groups. In 2015, for example, World Agroforestry (ICRAF) partnered with Care International and national, provincial, and local government and other stakeholders in Vietnam, Cambodia, and Lao PDR to ensure that women and ethnic minority smallholders could better access resources that would enhance their resilience to climate shocks.

This project recognised that women and ethnic minorities are often restricted by limited financial resources and inadequate access to information, alongside social, cultural and language barriers. The Agro-Climate Information Services (ACIS) project used a five-tier approach, including a knowledge generation platform, action-oriented capacity-building and agro-climate advisories. Farmer learning networks were used to further build capacity, while policy dialogues helped lay a foundation for scaling up this model.

Achieving broad-based benefits from climate services also requires clear, accessible and inclusive communication. The use of weather icons, for example, may not be universal and interpreted differently based on culture, gender, or literacy level (Simelton and Le 2020). There is also evidence that women and men perceive climate risks and information needs differently and have different preferences for how to receive it, but more knowledge on this is needed (Diouf et al. 2019; Practical Action 2020). While access to climate services is a potential means of empowerment and resilience-building for rural women and other marginalised groups, there is a risk of inequalities being reinforced if their specific needs are not addressed (Gumucio et al. 2020). In some cases, gender, ethnicity and area of residence may limit access to climate information, so special measures are needed to close the gap. For example, in Haryana, India, climate information was delivered to women through their mobile phones (CCAFS and CIMMYT 2014).

In some cases, access to climate services may not be enough, if certain individuals or groups are unable to make land management-related decisions (Gumucio et al. 2020). This may be influenced by socio-cultural norms influencing gendered labour roles and responsibilities. Control over resources and decision-making power may also impact an individual's ability to act on the information received. Ensuring fair and equitable access to climate services requires an intersectional approach, looking not only at gender, for example, but also social class, ethnicity, seniority, educational level and decision-making power.

For this reason, several checklists on gender-inclusive actionable agro-advisories have been developed to unpack whether climate information is available, accessible, timely and understandable for the intended users (Gumucio and Schwager 2019; MeteoSwiss and Senamhi 2018; see, e.g., Simelton and Le 2020).

Equity and traditional ecological knowledge

In Southeast Asia, it is well known that local and Indigenous communities have extensive knowledge of natural systems and farming, including strategies for coping with adverse conditions. This is known as traditional ecological knowledge, which Berkes (2017, p.7) defines as "a cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment".

There are various examples of traditional ecological knowledge in Southeast Asia, such as the Balinese subaks (Lansing 2007), the use of pranata mangsa calendar among Javanese farmers (Winarto et al. 2008), or the use of environmental signals among the Mamanwas in southern Philippines (Cuaton and Su 2020). Hiwasaki et al. (2014; 2014) have documented many more cases on the use of local and Indigenous knowledge among coastal communities in Southeast Asia to adapt to hydro-meteorological hazards.

The continued use of traditional ecological knowledge in many communities across the region highlights the importance of integrating this knowledge with conventional climate services to guide local adaptation strategies. Box 2 above provides an example of how this has been done in Indonesia, the School of Climate and Living Traditions.

When working with Indigenous Peoples and their traditional knowledge, however, it is crucial to ensure their free, prior and informed consent and respect the cultural norms associated with that knowledge (UNFCCC 2017). In addition, the Local Communities and Indigenous Peoples Platform Facilitative Working Group advises: "Engagement with indigenous peoples for knowledge sharing and exchange should recognize that indigenous peoples' knowledge and ways of knowing are collective, experiential, time tested and inter-generational, bridging both what is sometimes termed "tangible" and "intangible" cultural heritage, and is thus distinct in many ways from other knowledge systems" (email communication with A. Carmen, April 2021).

Relevant ASEAN guidelines and frameworks

ASEAN has embraced the increased development and use of climate services in two major ways. First, the establishment of Global Framework for Climate Services (GFCS) was endorsed by 13 heads of government and 81 ministers, including delegates from ASEAN Member States. Volume I of the ASEAN Regional Guidelines for Promoting Climate Smart Agriculture (CSA) Practices outlines the use of agro-insurance using weather indices (see 10 Phases in Developing a National Crop Insurance Program guidance), which requires an array of climate services, such as historical weather, agro-climatic, hydro-meteorological data, the localised context and the capacity to utilise the information effectively (ASEAN-CRN 2015).

Climate services are further detailed in Volume II of the Regional CSA Guidelines (ASEAN-CRN 2017a). This volume contains detailed information on climate service design and production, climate information dissemination and channels, including gender considerations, institutional arrangements, and potential regional collaborations.

ASEAN is also part of a global network of Regional Climate Outlook Forums (RCOFs) initiated by the WMO with national, regional and international partners. RCOFs are multi-sectoral, involving stakeholders from agriculture, water, energy, health, communications and disaster risk reduction, and aim to deliver consensus-based, user-relevant climate information as well as trainings to strengthen the capacity of scientists, media experts and policy-makers.

The ASEAN RCOF is run by the ASEAN Specialised Meteorological Centre (ASMC), which supports ASEAN Member States in their development of national meteorological services. Established in 1993, the ASMC is hosted by Singapore's National Meteorological Service. It conducts research and development to better understand and predict weather and climate systems and runs regional capacity development programmes. Since 2018, the ASMC has produced a biannual bulletin providing an overview of the climate, fire and haze situation and outlook as well as significant weather events in the region. Regional weather observations, including wind and rainfall, and climate information are available on the Centre's website.

In 2016, Vietnam made a statement on behalf of the ASEAN Negotiators Group on Agriculture at the UNFCCC Subsidiary Body for Scientific and Technological Advice in-session workshop on agriculture. The statement highlighted climate services for smallholder farmers as a regional adaptation priority (ASEAN Negotiators Group on Agriculture 2016).

An agenda for action

Given the increasing climate-related challenges facing countries in Southeast Asia, access to timely, reliable and actionable climate information is crucial to farmers' success and to their ability to adapt to climate change in the long term. The good news for ASEAN is that significant efforts to deliver high-quality, tailored climate services to agricultural communities are already under way, and many people have given a great deal of thought to what is needed in the region.

In March 2017, an ASEAN-CRN Knowledge Exchange Event in Cebu City brought together representatives of ASEAN agriculture and environment ministries, national meteorological and hydrological institutes, development partners, academia and civil society organisations involved in creating and delivering climate services for farmers. They made a series of recommendations (ASEAN-CRN 2017b). As these have been jointly discussed and agreed already by key regional stakeholders, it is important that they be revisited and implemented. Critical actions ensuring that climate actions meet the the needs of adaptation decision-makers were also reviewed in 2019 (Hansen et al. 2019). The recommendations below build on those insights.

Farmers listened to a lecture by Meteorological, Climatological, and Geophysical Agency (BMKG) during one of the climate field schools in Bali, Indonesia. Photo: su-re.co (Sustainability and Resilience Company)

Recommendations for policy-makers

- Explicitly incorporate climate services in National Adaptation Plans (NAPs) as crucial elements in supporting adaptation in vulnerable sectors and communities.
- Increase budgetary support for climate services, in line with national adaptation priorities, to ensure that national meteorological and hydrological institutes, extension services and other key actors in the climate services value chain (see Box 1) have the resources they need.
- Improve the provision of localised information through the use of geographic information systems (GIS), crop zoning and agricultural maps, and improve the local accuracy of forecasts, including through the expansion of weather station networks.
- Increase collaboration between the ministries of agriculture and related ministries and departments, local government units and other stakeholders to identify information needs and embed climate services in sectoral and local programmes. It is also crucial to track progress on existing action plans to deliver climate services for agriculture and assess outcomes.
- Continually build capacity within national meteorological and hydrological institutes, including through short courses and trainings on agro-meteorology, as well as on effective climate communications. Similar courses should also be provided in universities.

Priorities for donors and project implementers

- Invest and support policymakers and decision-makers in climate-sensitive sectors to develop their capacities to use climate information effectively, identify their information needs, and strategically drive the co-production of climate services. This is the highest priority identified by Hansen et al (2019) to scale up climate services.
- Support the integration of Indigenous knowledge in science field schools, farmer field schools and climate field schools in ASEAN.
- Provide more training for agricultural extension staff, including through exchanges with national meteorological and hydrological institutes. It may be appropriate to develop specialised climate extension services, building on the model of climate field schools.
- Ensure that climate services are designed and implemented in such a way that they are tailored to the needs of different users, accounting for gender, class, ethnic minorities and other factors to ensure equity and inclusion. This will require direct engagement with farmers to understand their needs and how they will apply knowledge.
- Support the integration of Indigenous knowledge in science field schools, farmer field schools and climate field schools.
- Use a wide array of channels to deliver climate information, including via mobile phones and the internet. This, in turn, requires improving internet access in rural communities; it is also crucial to translate information into local languages, including scientific and technical terms, and use visual communication and audio programming to help bridge literacy gaps.
- Continually monitor and evaluate the outcomes of existing climate services in Southeast Asia to that they are achieving the desired outcomes in terms of enhancing adaptive capacity, building resilience, and helping farmers adopt climate-smart practices.

Priorities for further research

- Produce more agriculture-specific climate information, such as on potential impacts on crop yields, pests and diseases. This requires combining agricultural research with meteorological research, and could involve exchanging tools as well as real-time monitoring.
- Delve deeper into existing climate services in the ASEAN countries to identify best practices, models that can be replicated or scaled up, and key challenges to address. This should include – if not prioritise – climate services that co-produce knowledge with Indigenous Peoples, smallholder farmers and other vulnerable user groups, and that effectively engage women and marginalised communities.
- Through direct engagement with communities, identify traditional ecological knowledge in Southeast Asian countries that can be incorporated into climate services to provide richer insights into climate and weather monitoring as well as adaptation strategies and resilience-building.

References

AHA Centre (2020). *ASEAN Risk Monitor and Disaster Management Review (ARMOR) 2nd Edition.* ASEAN Coordinating Centre for Humanitarian Assistance on disaster management (AHA Centre), Jakarta. https://ahacentre.org/publication/armor/

ASEAN Negotiators Group on Agriculture (2016). *Statement by Viet Nam at the UNFCCC SBSTA 44 In-Session Workshop on Agriculture.* Association of Southeast Asian Nations, Bonn, Germany. https://unfccc.int/files/land_use_and_climate_change/agriculture/application/pdf/viet_nam_sbsta_44_in_session_workshop_on_adaptation_measures_20_may_(2).pdf

ASEAN-CRN (2015). *ASEAN Regional Guidelines for Promoting Climate Smart Agriculture (CSA) Practices Vol. I.* Endorsed by the 37th AMAF, 10 September 2015, Makati, the Philippines. ASEAN Climate Resilience Network, Association of Southeast Asian Nations, Jakarta. https://asean-crn.org/asean-regional-guidelines-for-promoting-climate-smart-agriculture-csa-practices-vol-i-2/

ASEAN-CRN (2017a). *ASEAN Guidelines on the Promotion of Climate Smart Agriculture Practices: Volume II*. ASEAN Climate Resilience Network, Association of Southeast Asian Nations, Jakarta. https://asean-crn.org/asean-guidelines-on-the-promotion-of-climate-smart-agriculture-practices-volume-ii/

ASEAN-CRN (2017b). *Effective Climate Information Services for Agriculture in ASEAN. ASEAN-CRN Knowledge Exchange Event to Increase Climate Resilience in Asian, 21-23 March 2017, Cebu City.* ASEAN Climate Resilience Network, Jakarta. https://asean-crn.org/wp-content/uploads/2020/03/22May_Summary_ACRN-CIS-KEE.pdf

ASMC (2017). *Climate Information and Services Survey Results: Review on the Current Status of Climate Information and Services Provided by the National Meteorological and Hydrological Services of Southeast Asia.* ASEAN Specialised Meteorological Centre (AMSC), Singapore. http://asmc.asean.org/wp-content/uploads/2016/10/Climate-Services-Survey-Results-for-ASEAN-NMHSs-2016-17.pdf

Berkes, F. (2017). *Sacred Ecology.* 4th Ed. Routledge, New York

Brugger, J., Meadow, A. and Horangic, A. (2016). Lessons from First-Generation Climate Science Integrators. *Bulletin of the American Meteorological Society,* 97(3). 355–65. DOI: 10.1175/BAMS-D-14-00289.1

Carr, E. R. and Onzere, S. N. (2017). Really effective (for 15% of the men): Lessons in understanding and addressing user needs in climate services from Mali. *Climate Risk Management.* 22, 82-95. DOI: 10.1016/j.crm.2017.03.002

CCAFS and CIMMYT (2014). *Climate-Smart Villages in Haryana, India.* CGIAR Research Program on Climate Change, Agriculture and Food Security and International Maize and Wheat Improvement Center. https://hdl.handle.net/10568/42346

Cheng, C.-P., Lin, H.-I., Wang, S., Liu, P.-T. D. and Chao, K.-Y. C. (2020). Climate Services in Asia Pacific: Emerging Trends and Prospects. *Bulletin of the American Meteorological Society,* 101(9). E1568–71. DOI: 10.1175/BAMS-D-20-0093.1

Cuaton, G. P. and Su, Y. (2020). Local-indigenous knowledge on disaster risk reduction: Insights from the Mamanwa indigenous peoples in Basey, Samar after Typhoon Haiyan in the Philippines. *International Journal of Disaster Risk Reduction,* 48. 101596. DOI: 10.1016/j.ijdrr.2020.101596

Daniels, E., Bharwani, S., Swartling, Å. G. and Vulturius, G. (2020). Refocusing the climate services lens: introducing a framework for co-designing "transdisciplinary knowledge integration processes" to build climate resilience. *Climate Services,* 19. DOI: 10.1016/j.cliser.2020.100181

Diouf, N. S., Ouedraogo, I., Zougmoré, R. B., Ouedraogo, M., Partey, S. T. and Gumucio, T. (2019). Factors influencing gendered access to climate information services for farming in Senegal. *Gender, Technology and Development*, 23(2). 93–110. DOI: 10.1080/09718524.2019.1649790

Ewbank, R. (2016). *Developing Climate Services in the Philippines*. Christian Aid. https://www.christianaid.org.uk/sites/default/files/2017-11/Developing-Climate-Services-Philippines-report-July2016.pdf

FAO (2017). The power of climate information in agriculture | Integrating Agriculture in National Adaptation Plans (NAPs) | Food and Agriculture Organization of the United Nations. Food and Agriculture Organization of the United Nations News. http://www.fao.org/in-action/naps/news-events/detail/en/c/1118408/

FAO and UNDP (2017). The power of climate information in agriculture | UNDP Climate Change Adaptation. https://www.adaptation-undp.org/power-climate-information-agriculture

Guido, Z., Knudson, C., Campbell, D. and Tomlinson, J. (2020). Climate information services for adaptation: what does it mean to know the context? *Climate and Development,* 12(5). 395–407. DOI: 10.1080/17565529.2019.1630352

Gumucio, T., Hansen, J., Huyer, S. and Huysen, T. van (2020). Gender-responsive rural climate services: a review of the literature. *Climate and Development,* 12(3). 241–54. DOI: 10.1080/17565529.2019.1613216

Gumucio, T. and Schwager, S. (2019). *Checklist: Gender Considerations for Climate Services and Safety Nets.* CGIAR Research Program on Climate Change, Agriculture and Food Security, Washington, DC. https://hdl.handle.net/10568/99172

Hansen, J., Furlow, J., Goddard, L., Nissan, H., Vaughan, C., et al. (2019). *Scaling Climate Services to Enable Effective Adaptation Action.* Research Program on Climate Change, Agriculture and Food Security. https://cgspace.cgiar.org/bitstream/handle/10568/105763/ScalingClimateServices.pdf?sequence=1

Hiwasaki, L., Luna, E. and Syamsidik, S. R. (2014). *Local & Indigenous Knowledge for Community Resilience: Hydro-Meteorological Disaster Risk Reduction and Climate Change Adaptation in Coastal and Small Island Communities.* UNESCO, Jakarta

Hiwasaki, L., Luna, E., Syamsidik and Shaw, R. (2014). Process for integrating local and indigenous knowledge with science for hydro-meteorological disaster risk reduction and climate change adaptation in coastal and small island communities. *International Journal of Disaster Risk Reduction,* 10. 15–27. DOI: 10.1016/j.ijdrr.2014.07.007

Lansing, J. S. (2007). *Priests and Programmers: Technologies of Power in the Engineered Landscape of Bali.* Princeton University Press, Princeton

MeteoSwiss and Senamhi (2018). *Designing User-Driven Climate Services. What We Can Learn from the Climandes Project: A Checklist for Practitioners, Scientists and Policy Makers.* Global Framework for Climate Services, Zurich. https://gfcs.wmo.int/sites/default/files/UIP%20Publication_s.pdf

Practical Action (2020). *Climate Information Services Toolkit.* Practical Action, Rugby, UK. http://hdl.handle.net/11283/622661/

Raaphorst, K., Koers, G., Ellen, G. J., Oen, A., Kalsnes, B., van Well, L., Koerth, J. and van der Brugge, R. (2020). Mind the Gap: Towards a Typology of Climate Service Usability Gaps. *Sustainability,* 12(4). 1512. DOI: 10.3390/su12041512

Simelton, E., Coulier, M., Carter, A., Duong, T. M., Le, T. T., Luu, G. T. T. and Madsen, E. J. (2018). Info Note: Actionability of Climate Services in Southeast Asia. CGIAR Research Program on Climate Change, Agriculture and Food Security, Wageningen, The Netherlands. https://cgspace.cgiar.org/bitstream/handle/10568/92120/InfoNote_ACIS_Baseline.pdf?sequence=1&isAllowed=y

Simelton, E. and Le, T. T. (2020). Checklist: *Gender-Inclusive Actionable Agro-Advisories.* CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). https://cgspace.cgiar.org/handle/10568/106790

Stigter, C. (Kees) J., Winarto, Y. T. and Wicaksono, M. (2016). Towards Enhanced Resilience: Monthly Updated Seasonal Rainfall "Scenarios" as Climate Predictions for Farmers in Indonesia. In *Climate Change Adaptation, Resilience and Hazards.* Leal Filho, W., Musa, H., Cavan, G., O'Hare, P., and Seixas, J. (eds). Climate Change Management. Springer International Publishing, Cham. 289–303. DOI: 10.1007/978-3-319-39880-8_18

UNFCCC (2017). *Local Communities and Indigenous Peoples Platform: Proposals on Operationalization Based on the Open Multi- Stakeholder Dialogue and Submissions. FCCC/SBSTA/2017/6.* UNFCCC

Vaughan, C. and Dessai, S. (2014). Climate services for society: origins, institutional arrangements, and design elements for an evaluation framework. *Wiley Interdisciplinary Reviews: Climate Change,* 5. 587–603. DOI: 10.1002/wcc.290

Winarto, Y. T., Stigter, K., Anantasari, E. and Hidayah, S. N. (2008). Climate Field Schools in Indonesia: Improving "response farming" to climate change. *LEISA Magazine,* 24(4). 16–18.

WMO (2019). *2019 State of Climate Services: Agriculture and Food Security.* World Meteorological Organization, Geneva. https://library.wmo.int/index.php?lvl=notice_display&id=21609

About the Insight Brief series

This Insight Brief is part of a series prepared by the Stockholm Environment Institute on behalf of the Climate-Smart Land Use (CSLU) in ASEAN project, which receives funding from the German Federal Ministry for Economic Cooperation and Development (BMZ) and is implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH in close cooperation with the ASEAN Secretariat. The Insight Briefs aim to raise awareness on the mitigation and adaptation potential of selected climate-smart land use practices and approaches in order to contribute to their application in Southeast Asia as well as to enhance the technical knowledge exchange among ASEAN Member States (AMS).

All briefs are available at https://asean-crn.org/overview/publications/study-and-policy/.

The CSLU project builds on the successes of the Forestry and Climate Change Project (FOR-CC) under the Former ASEAN-German Program on Response to Climate Change (GAP-CC), which supported ASEAN in improving selected Framework conditions for sustainable agriculture and Forestry in AMS. CSLU aims to strengthen the coordination role of ASEAN in contributing to international and national climate policy processes for climate-smart land use in agriculture and forestry.

The authors would like to thank Ella Nanda for her research support, and Paul Teng, Hanna Reuter and Sukaina Bharwani for their helpful comments on earlier drafts. Thanks also to Moch Taufiqul Mujib for providing support in the publication of this brief.

Recommended citation
Anschell, N., Salamanca, A. and Davis, M (2021) Climate Services to Support Adaptation and Livelihoods, ASEAN Climate-Smart Land Use Insight Brief 3. Jakarta: Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ).

Published by
Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH

Registered offices Bonn and Eschborn, Germany

Address
Climate Smart Land Use (CSLU) in ASEAN
GIZ Office Indonesia
Menara BCA, 46th floor
Jl. M.H. Thamrin No. 1
Jakarta 10310 Indonesia
T +62 21 23587111
F +62 21 23587110
E hanna.reuter@giz.de
www.giz.de/en

As at
August 2021

Design
Jippy Rinaldi, Jakarta

Photo credits
The World Meteorological Organization (WMO)

Su-re.co (Sustainability & resilience)

Authors
Nicole Anschell and Albert Salamanca
Stockholm Environment Institute (SEI)
10th Floor, Kasem Uttayanin Building,
254 Chulalongkorn University, Henri Dunant Road,
Pathumwan, Bangkok, 10330 Thailand

Editor
Marion Davis