4

RISK ASSESSMENT

Sub-category	Definition
Disaster database (4.1)	Disaster data is recorded and used for science-based analysis
Hydro-meteorological data management and climate risk analysis (4.2)	Climate risk is analysed based on hydro-meteorological monitoring and efforts are made to integrate downscaling from Global Climate Models (GCMs)
Hazard and risk mapping (4.3)	Hazard maps and risk maps for flood, storm surge, landslide and drought are prepared by assessing the damages of the past disasters, the capacity and vulnerability of local authorities and communities, and the climate risk and they are provided with high resolution for local planning
Data sharing and dissemination (4.4)	Disaster and climate risk data including hazard and risk maps are accessible to wide variety of stakeholders
Early warning system and disaster risk communication (4.5)	Prediction, forecasting and early warning systems are setup and disaster risks are communicated through traditional media, social media and mobile phone networks

GP-4.1: Web-based and Open-source Disaster Loss Database, Indonesia

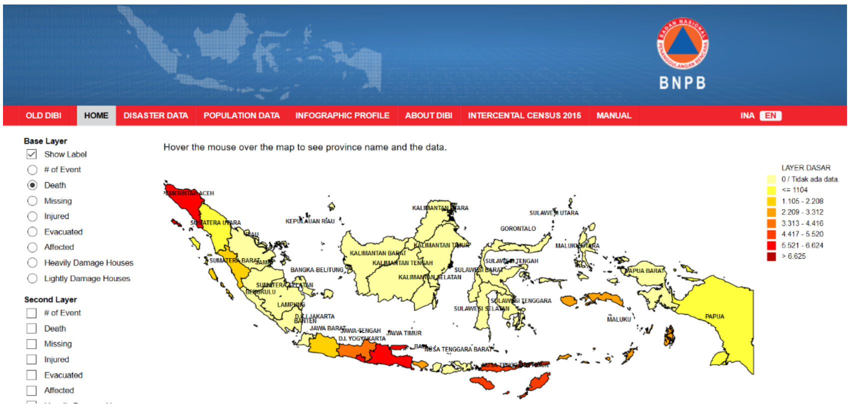


Figure 17. Disaster Loss Database (GP-4.1)
Source: BNPB

Description of practice: This disaster loss database is developed by BAPPENAS, BNPB, DEPDAGRI in cooperation with UNDP and DFID of UK based on the DesInventar, which is a free, open-source methodology and software. The tool has a range of options for analysis allowing national and sub-national authorities and DRR practitioners to understand disaster trends, patterns and their impacts in a systematic manner. With increased understanding of the disaster trends and their impacts, better prevention, mitigation and preparedness measures can be planned to reduce the impact of disasters on communities.

Climate hazards addressed by the practice: All kinds of disasters

DRR and CCA benefits: Disaster loss databases (DLDB's) are essential for countries to report on Sendai Framework Targets, especially on the first four out of seven targets, which refer to the imperative of reducing disaster losses and impacts. Accounting for losses will allow countries to monitor progress against such targets, and can be used as powerful knowledge tool for disaster risk analysis.

Scalability potential: Highly scalable to all ASEAN countries. Several ASEAN countries including Cambodia, Indonesia, Lao PDR, Myanmar and Viet Nam have already put in place similar databases.

- *Social and political acceptability:* Highly acceptable due to well-established, reliable and cost-efficient methodology. Users of the database can access data and analytical reports on-line. Reports are furthermore distributed in paper format. Data can be aggregated or disaggregated using the web interface, according to the user's convenience.
- *Economic viability and sustainability:* Initial investment is required for the collection of detailed and homogeneous data about disasters at all scales using DesInventar and for capacity building of the staff. As the DesInventar is free, open-source and well-established methodology, economic viability and sustainability is high.
- *Institutional and policy needs:* Initial investment and operation and maintenance system are required.

Source/Contact: Badan Nasional Penanggulangan Bencana (BNPB), Indonesia.

GP-4.2a: Climate data distribution system, Southeast Asia START Regional Center, Thailand

Description of practice: The Climate Data Distribution System gives future climate data (temperature and rainfall) in the Southeast Asia region from several climate scenarios, which are developed from future climate projections using PRECIS regional climate model. The simulation of future climate is based on initial data from ECHAM4 Global Circulation Model under SRES A2 and B2 GHG scenarios. The Southeast START Regional Center has been conducting the study on climate change impact, vulnerability and adaptation in Southeast Asia region since 1997 for an understanding on climate change at the regional scale, to develop research capacity and research network in the region.

Climate hazards addressed by the practice: Storm, flood, landslide, drought

DRR and CCA benefits: The system provides easy access to future hydro meteorological data (temperature and rainfall) with an effective visualization. The data is indispensable for evaluating climate change impact and taking the impact into DRR and CCA planning and implementation.

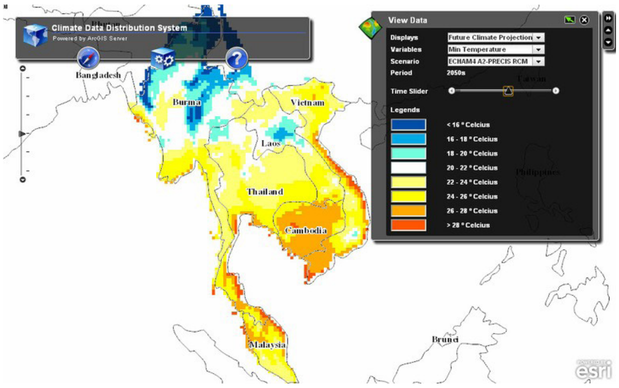


Figure 18. Climate data distribution system (GP-4.2a)

Source: SEA START RC

Scalability potential: Scalable to all ASEAN countries in coordination with other downscaling activities.

- *Social and political acceptability:* START (SysTem for Analysis, Research and Training) is a global network that supports multidisciplinary research on the interactions between humans and the environment, and works in conjunction with various stakeholders creating ownership.
- *Economic viability and sustainability:* It may require international cooperation or regional collaboration since large investment for research activities, building the system and capacity development are necessary.
- *Institutional and policy needs:* Investment for system development, operation and maintenance, training and capacity building of staff, and continuous study on climate change impacts.

Source/Contact: Southeast Asia START Regional Center (SEA START RC), Bangkok, Thailand.

GP-4.2b: Regional collaboration for GCM downscaling

Description of practice: This good practice is the Southeast Asia Regional Climate Downscaling (SEACLID)/CORDEX Southeast Asia Project. 13 Countries and 17 Institutions are involved in the project. They include NAHRIM, MetMalaysia (Malaysia), BMKG (Indonesia), DMH (Lao PDR), MRI, Kyoto Univ. (Japan), among others. The objective is, on a task-sharing basis, carry out a joint regional climate downscaling activity over a common SEA domain with RegCM4 (and other RCMs) using a number of CMIP5 GCMs and RCP scenarios. The resolution of the 1st phase was: 25 km × 25 km. The 2nd Phase (plan): 3 km x 3 km resolution over key vulnerable areas.

Climate hazards addressed by the practice: Storm surge, flood, landslide, drought

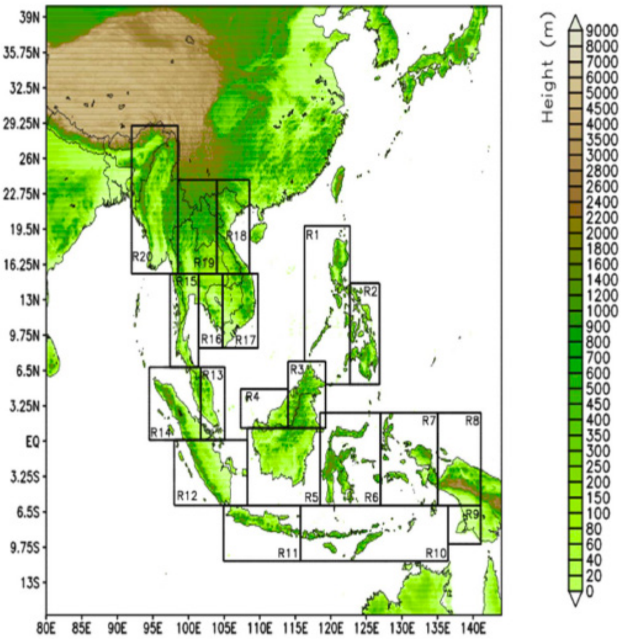


Figure 19. Twenty sub-regions used for the regional model (GP-4.2b)

Source: SEACLID

DRR and CCA benefits: High-resolution climate change scenarios are the basic requirement for climate change impact, vulnerability and risk assessment studies at local and regional scales. Generation of such information requires downscaling of coarser general circulation model (GCM) outputs using regional climate model (RCM). Due to requirement of multiple GCMs, multiple RCMs and multiple emission scenarios for quantification of uncertainties in future climate projection, regional downscaling is a time-consuming and resource-expensive exercise. Given the overlapping domains, having a collaborative effort is in the best interest of countries within the Southeast Asia (SEA) region. This collaborative practice will satisfy such requirements effectively and efficiently.

Scalability potential: Scalable to all ASEAN countries.

- *Social and political acceptability:* Agreements on role-sharing arrangement, expense sharing and so on are required.
- *Economic viability and sustainability:* This kind of regional collaboration has advantage in cost-efficiency and knowledge accumulation.
- *Institutional and policy needs:* Investments for continuous study on climate change impacts and coordination activities among member states are required.

Source/Contact: The Southeast Asia Regional Climate Downscaling (SEACLID) / CORDEX Southeast Asia Project, Bangi, Malaysia.

GP-4.3a: Flood hazard mapping with climate change impacts, Malaysia

Description of practice: Flood hazard or risk maps without climate change impact are prepared by the Department of Irrigation and Drainage (JPS) of Malaysia based on hydrological and hydraulic simulation. Taking a step further, the National Hydraulic Research Institute of Malaysia (NAHRIM) carried out the study on flood hazard mapping under future conditions including climate change impact. Flood hazard maps with climate change impact were created based on four scenarios which are baseline, baseline with future land use, baseline with climate change (current land use) for 2030 and 2050, and baseline with future land use and climate change for 2030 and 2050.

Climate hazards addressed by the practice: Flood

DRR and CCA benefits: Assessment of climate change impacts is a primary technical step to integrate DRR and CCA. Hazard and risk mapping with climate change impacts is an effective standard tool for risk assessment.

Scalability potential: Highly scalable to all ASEAN countries.

- *Social and political acceptability:* Technical knowledge sharing and initial training are necessary. Climate change impacts have great uncertainty. For example, projected future rainfall including climate change impacts have a range of values based on various scenarios.
- *Economic viability and sustainability:* Large investment is required if projected future hydro meteorological data have to be prepared by themselves, but if not (for example, using outputs from regional collaborative GCM downscaling such as SEACLID-CORDEX), necessary funding will be relatively small.
- *Institutional and policy needs:* Funding for study or technical transfer to develop the methodology and capacity building is necessary.

Source/Contact: Department of Irrigation and Drainage (JPS), Ministry of Natural Resources and Environment, Malaysia; National Hydraulic Research Institute of Malaysia (NAHRIM).

GP-4.3b: Inundation map with and without sea level rise caused by climate change, Viet Nam

Description of practice: Climate change impact predictions in Viet Nam are being carried out by the Viet Nam National Institute of Meteorology, Hydrology and Environment (IMHEN), which

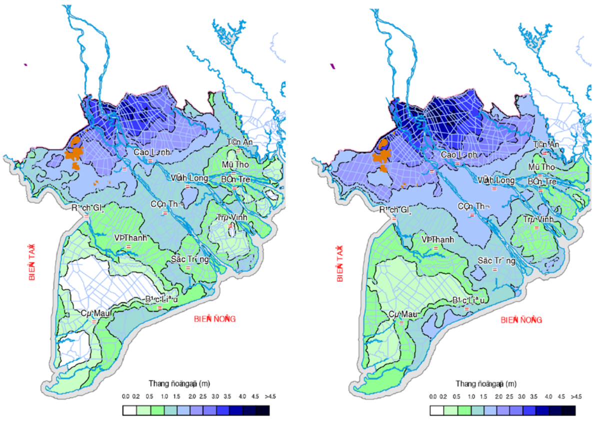


Figure 20. Inundation map without (left) and with sea level rise (right) by 30 cm in 2050 (GP-4.3b)

Source: SIWRP, MARD

developed three scenarios for the country: Low emission (B1), Average emission (B2) and High emission (A2). The figure 20 shows inundation maps with and without sea level rise estimated by 30cm in 2050 based on SRES B2 Scenario.

Climate hazards addressed by the practice: Storm surge, floods

DRR and CCA benefits: Risk assessment with consideration of the future climate change impacts constitutes the primary technical step to integrate DRR and CCA. Hazard and risk mapping with climate change impacts is an effective standard tool for risk assessment.

Scalability potential: Highly scalable to all ASEAN countries.

- *Social and political acceptability:* Technical knowledge sharing and initial training are necessary. Since sea level rise has been already gradually observed, the hazard maps incorporating projected future sea level rise would be more acceptable due to their higher utility in decision making and risk reduction.
- *Economic viability and sustainability:* Large investment is required if projected future hydro meteorological data have to be prepared by countries themselves, but if not (for example, using outputs from regional collaborative GCM downscaling such as SEACLID-CORDEX), necessary funding will be relatively small.
- *Institutional and policy needs:* Funding for carrying out the study or technical transfer to develop the methodology and capacity building is necessary.

Source/Contact: Southern Institute for Water Resources Planning (SIWRP), MARD, Viet Nam.

GP-4.3c: Landslide hazard maps, Thailand

Description of practice: Thailand has been a pioneer among the ASEAN countries in developing detailed landslide hazard maps at the national, provincial and village levels. These maps were developed by DMR using a customized mathematical model for analysis. GIS and remote sensing tools were used for analyzing and modeling to delineate and categorize landslide susceptible areas and define villages with landslide risk. Hazard maps at community levels are provided to vulnerable villages with explanation and landslide warning volunteer network has been built in each village.

Climate hazards addressed by the practice: Landslide

DRR and CCA benefits: If climate change impacts are incorporated into the threshold values of landslide, it will be a better practice for the basic information for landslide risk management under the condition of climate change impacts.

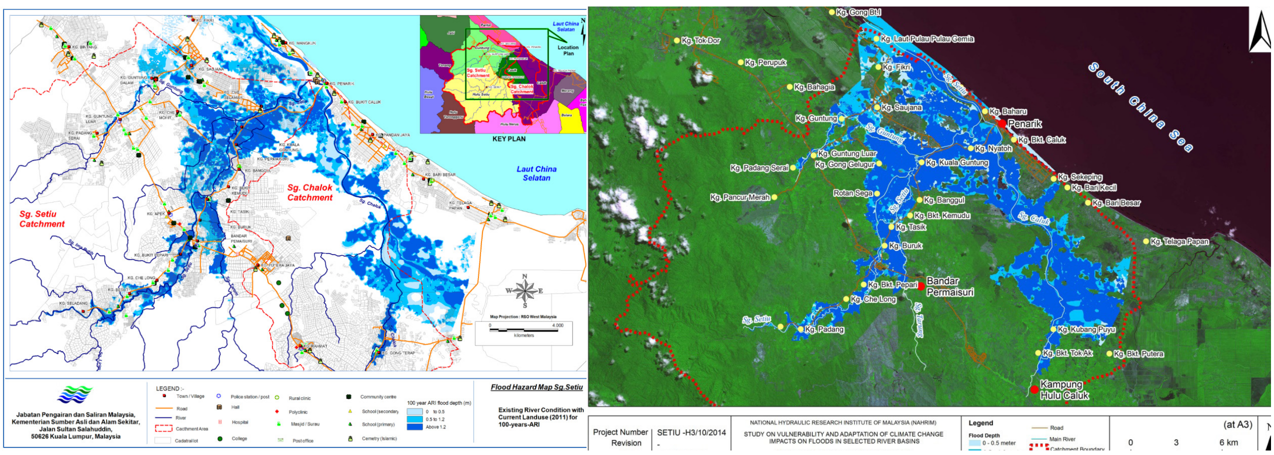


Figure 21. Hazard map of 100-year flood without (on the left) and with (on the right) climate change impacts (GP-4.3a)

Source: JPS and NAHRIM, Malaysia

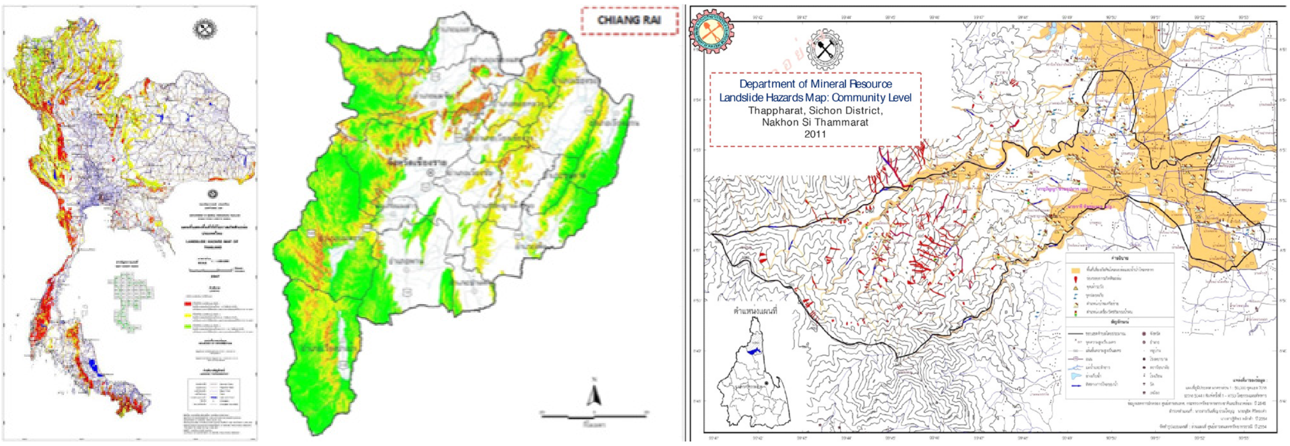


Figure 22. Landslide hazard map at country (left), provincial (middle) and community (right) levels (GP-4.3c)
Source: DDPM and DMR, Thailand

Scalability potential: Highly scalable to all ASEAN countries.

- *Social and political acceptability:* Landslides hazard maps at country and provincial level are important in planning and decision making by policymakers and maps at community level are important to prevent and mitigate landslides damage.
- *Economic viability and sustainability:* Resettlement from hazard area can dramatically decrease disaster damage. The cost for preparing hazard maps is less than probable disaster damage incurred in absence of these maps.
- *Institutional and policy needs*: Since hazard zoning will influence the price of land, national regulation and uniform guidelines for landslide hazard mapping is required.

Source/Contact: Department of Disaster Prevention and Mitigation (DDPM) and Department of Mineral Resources (DMR), Thailand.

GP-4.4a: GIS-based web portal site of hazard maps, the Philippines

Description of practice: The Project NOAH (Nationwide Operational Assessment of Hazards), the flagship disaster prevention and mitigation program of the Department of Science and Technology, developed GIS based DRM web platform. It allows interactive viewing of various kinds of hazard maps and other relevant information such as rainfall, river water levels, tide levels and so on at the same time. The hazard maps were newly produced in 18 major river basins based on computer simulations that reflect flood-prone areas discernible at a local scale or community level.

Climate hazards addressed by the practice: Storm surge, flood, landslides

DRR and CCA benefits: This system will inspire people's awareness of natural hazards, which is key in cultivating a culture of preparedness and reducing the catastrophic impacts of extreme hazard events. This system can provide end-users and relevant agencies an easy access to necessary information. And effective visualization will help users' better understanding.

Scalability potential: Scalable to all ASEAN countries.

- *Social and political acceptability:* Technical knowledge sharing and initial training are necessary. Since hazard maps may include sensitive information, the agreement on disclosure of hazard maps is required.
- *Economic viability and sustainability:* Initial investment is necessary for building the system, and continuous O&M cost is required.
- *Institutional and policy needs:* Investment for system development, operation and maintenance, training and capacity building of staff is required.

Source/Contact: The University of the Philippines Nationwide Operational Assessment of Hazards (UP-NOAH), the Philippines.

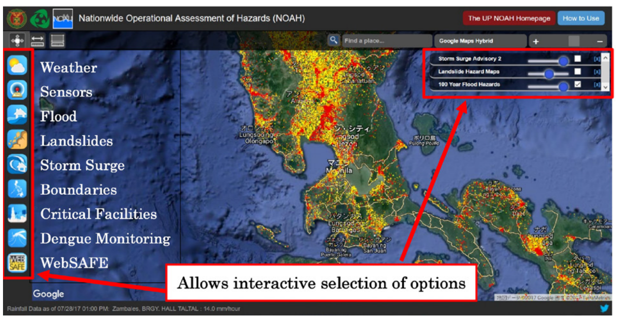


Figure 23. Web GIS based portal site of hazard maps (GP-4.4a)
Source: UP-NOAH

GP-4.4b: Hydrological data sharing and flood forecasting, Mekong River Commission (MRC)

Description of practice: The data sharing system shows the location and status of 23 hydrological stations. Clicking on a station will bring viewers to individual station information: observed and forecasted water levels, as well as yearly observations. This information is supplied as a service to the governments of the MRC member states, so that it may be used as a tool within existing national disaster forecast and warning systems.

Climate hazards addressed by the practice: Flood

DRR and CCA benefits: This system provides effective data sharing of water level stations which is often not easy to be obtained in international rivers. Data accumulation will lead to better planning in DRR. Water level data can also give quick flood forecast in downstream and such forecast is realistic and effective especially in case of long rivers.

Scalability potential: Scalable to river management for long river.

- *Social and political acceptability:* International agreement on hydrological data sharing and data standardization is required in case of transboundary rivers.
- *Economic viability and sustainability:* Initial investment is necessary for building the system and continuous O&M cost is required.
- *Institutional and policy needs:* Investment for system development, operation, maintenance, and data standardization guidelines are required.

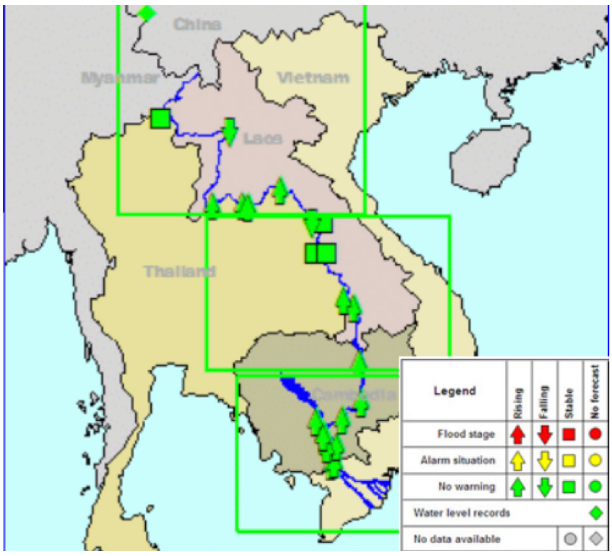


Figure 24. Hydrological data sharing and flood forecasting (GP-4.4b)

Source: MRC

Source/Contact: Mekong River Commission (MRC), Phnom Penh, Cambodia.

GP-4.5a: National Flood Forecasting and Warning System, Malaysia

Description of practice: The Malaysian government's Department of Irrigation and Drainage (DID) provides a flood forecasting and warning service to the public. It is developing a programme based on the phased implementation of systems, which together form a new National Flood Forecasting and Warning System (NaFFWS) for its key river basins. The objective of the new NaFFWS is to develop and maintain an effective and efficient integrated flood forecasting and river monitoring system (iFFRM), with flood warning dissemination, using national network data, telemetry data, radar data and rainfall forecasts. This iFFRM tool is designed to enable effective decision support by DID.

Climate hazards addressed by the practice: Flood

DRR and CCA benefits: The results are used to inform and warn DID staff, so that they can take immediate action to provide an effective and proactive emergency response. Results are also passed to DID web pages, and to dedicated smartphone applications, enabling forecasts to be disseminated more widely. Early warning provides as much lead-time as possible for the affected residents to take appropriate preparatory actions to prevent loss of life and minimise damage property.

Scalability potential: Highly scalable to all ASEAN countries

- *Social and political acceptability:* Early warning system enables people to take effective preparedness and response action. Dissemination of disaster warning through social media such as smart phone offers easy access to relevant emergency information.
- *Economic viability and sustainability:* Initial investment is necessary for building the system and continuous operation and maintenance (O&M) costs are required.
- *Institutional and policy needs:* System development, O&M, and data standardization are required.

Source/Contact: Department of Irrigation and Drainage (DID), Malaysia.

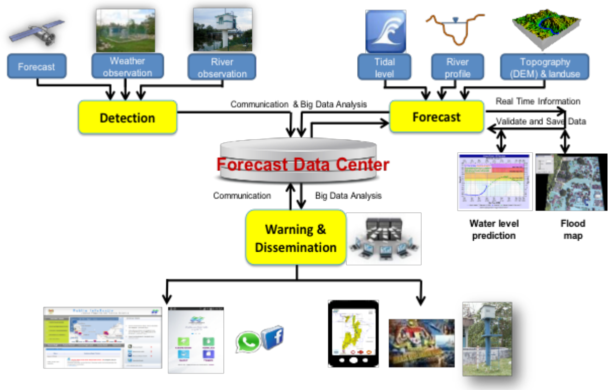


Figure 25. Dissemination of advisory and warning (GP-4.5a)

Source: DID, MONRE translated by JICA Project Team

GP-4.5b: Satellite-based drought monitoring and early-warning system

Description of practice: Drought is a slow-onset hazard and is often difficult to detect at early stages. Addressing this issue, the Institute of Industrial Science of University of Tokyo has developed a satellite-based drought monitoring and warning system that helps all the major Member States to monitor drought and as an early-warning mechanism. The regional partners from Indonesia (Indonesian Center for Agricultural Land Resources Research and Development) and Thailand (Geoinformatics Center, Asian Institute of Technology) have collaborated with Tokyo University in developing this system. The system assesses the drought conditions using MODIS-based drought codes and Keetch-Byram Drought Index (KBDI) that is based on the net effect of evapotranspiration and precipitation to compute the moisture deficiency in the soil.

Climate hazards addressed by the practice: Drought

DRR and CCA benefits: This drought monitoring is based on the real-time drought conditions using the remote-sensing methodologies and hence do not consider the future climate change conditions. However, the real-time drought monitoring helps governments and local institutional stakeholders to prepare and mitigate the possible drought impacts well in time due to its early warning capabilities. Drought prediction is possible if combined with weather forecasts. Such actions will have long-term impact on the wellbeing and resilience of communities since impacts on their social and economic conditions are mitigated consideration. With increased spatial resolution, the system can be used for local level decision making. Ability to capture historical droughts over the time can help in understanding the drought characteristics of a region and put in place appropriate drought risk reduction measures.

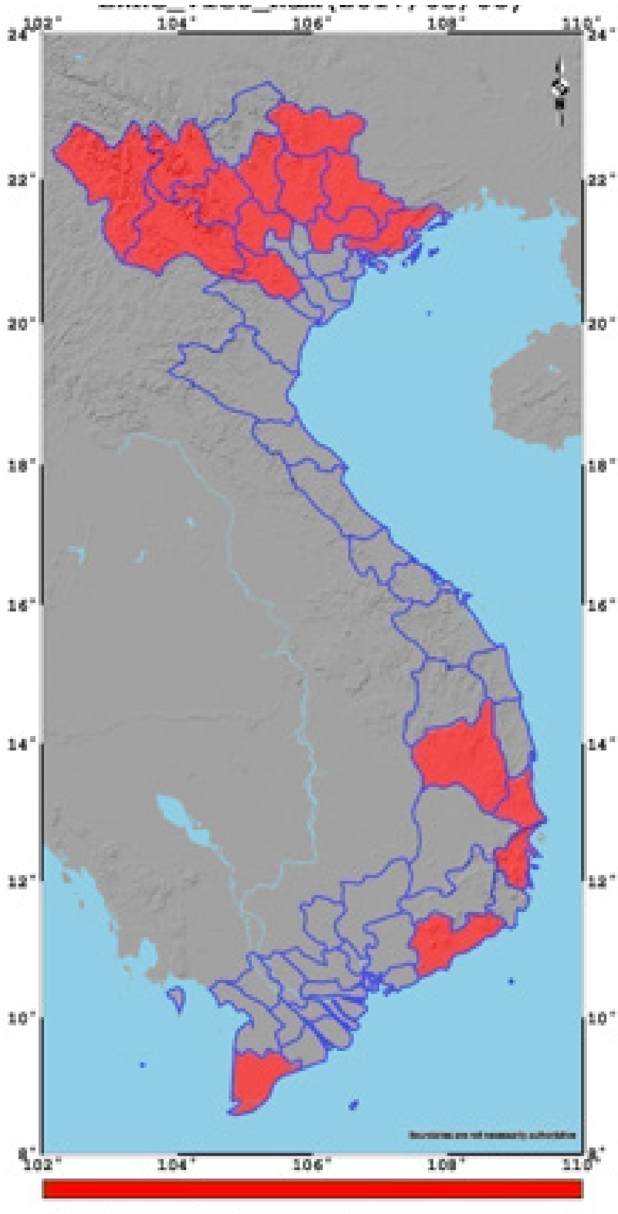


Figure 26. Satellite-based early warning of drought shown for Viet Nam (GP-4.5b)

Source: University of Tokyo

Scalability potential: Highly scalable to all ASEAN countries

- *Social and political acceptability:* Early warning system enables people to take effective preparedness and response action. There is a potential to disseminate early warning through social media for easy access to relevant stakeholders.
- *Economic viability and sustainability:* Even though remote-sensing data is costly, open source remote-sensing data provides a cost-effective option especially at relatively lower resolutions. Already some of the member states such as the Philippine, Thailand and Indonesia have initiated measures to adopt this system and improve for their country-specific conditions.

- *Institutional and policy needs:* There is a need for major drought-prone countries of the Member States to recognize and use this system for the immediate and long-term drought risk reduction measures in respective countries.

Source/Contact: Institute of Industrial Science, University of Tokyo, Japan

GP-4.5c: Specialized Expert System for Agro-Meteorological Early Warning (SESAME), Myanmar

Description of practice: Current weather forecasts have low skill and value and often are at low resolution hence are not assisting farmers in their daily, weekly and seasonal cropping decisions. To address this issue, location-specific weather information has been generated for 3 and 10-days duration along with Agri-weather advice to farmers with the location-specific agronomic practices and weather forecast in 2 townships by DMH starting from 2013-14. The skill of the forecast was improved by using the advanced forecasting techniques such as ECMWF Deterministic Forecast and WRF models.

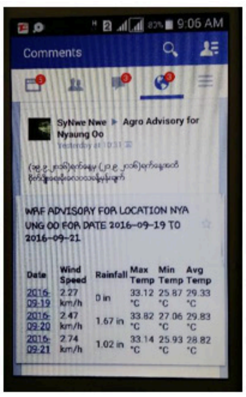
Climate hazards addressed by the practice: Droughts, high temperature, low temperature, typhoons

DRR and CCA benefits: High skill of weather forecasting is helping farmers to design their cropping practices and operation calendar avoiding suboptimal days. As a result, 30% of farmers in two townships successfully avoided losing crop by adjusting the crop practices compared to those who did not receive weather forecast during the two years of the project. World Bank and UNDP have picked it up as a best case for further scaling up. Direct provision of location-specific weather information to farmers is helping build the awareness and trust on the application of weather information in crop management and integrating well with the local agriculture advisory services. Extension service agents could able to improve their knowledge and skill in advising farmers according to the reliable weather information.

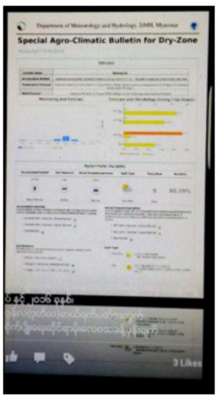
Scalability potential: Highly scalability depending on the application of high skill weather information.

- *Social and political acceptability:* Highly acceptable due to the direct benefits to farmers and extension services.
- *Economic viability and sustainability:* Initial costs for developing the downscaled weather information should be taken care and sustainability depends on the skill of the weather forecast and the usability of the information generated by the farmers.
- *Institutional and policy needs:* Technical capacity building is necessary for generating the downscaled weather information and necessary infrastructure to conduct required calculations and dissemination of information to the functionaries on the ground.

Source/Contact: DMH, Yangon and RIMES, Bangkok, Thailand.



3-day forecast



10-day forecast

Farmers are trained on using the system through farmer field school

Figure 27. Specialized Expert System for Agro-Meteorological Early Warning (SESAME), Myanmar (GP-4.5c)
Source: JICA Project Team