

# Hydromet Services

Modernizing weather, climate, and hydrological hazards.

Solutions Brief

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The experience of Japan in identifying, predicting, and managing the risks posed by hydro-meteorological hazards, offers key lessons for the developing countries to modernize their hydromet systems.

## Hydromet hazards: posing risk to lives and livelihoods globally

Hydrological and meteorological (“hydromet”) hazards—such as storms, floods, droughts, and heat and cold waves—are responsible for the greatest proportion of losses from adverse natural events globally, causing nearly 80% of disasters and over 50% of disaster-related deaths from 1980 and 2011.

A lack of technical capacity and delivery capability needed to provide effective service are key challenges many developing countries face. However, well-prepared and well-resourced hydromet services can help in minimizing the

disruptions caused by natural hazards, by providing warning to governments and communities in advance of events. Additionally, resources such as flood hazard maps can help guide reconstruction efforts after disaster strikes.

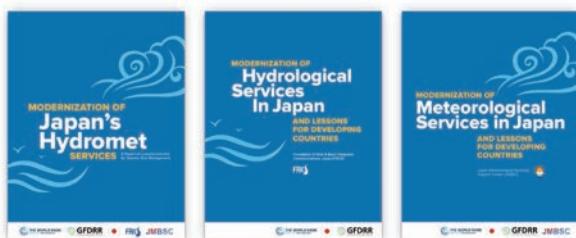
Japan is a global leader in identifying, predicting, and managing the risks posed by hydro-meteorological hazards. Domestically, the Ministry of Land, Infrastructure, Transport and Tourism (MLIT)’s Water and Disaster Management Bureau and the Japan Meteorological Agency (JMA) are among the most sophisticated agencies in the world in their field, providing critical services to the Japanese public and private industry. Internationally, JICA is a world leader supporting investments to build the capacity of developing countries in this area, often working and coordinating with the World Bank.

## A knowledge base to enable natural disaster preparedness

To support the needs of developing countries in establishing a modernized hydromet service, the Japan - World Bank Program for Mainstreaming Disaster Risk Management in Developing Countries commissioned two comprehensive background papers and a related summary report.

### These reports:

- Contribute to a growing knowledge base on how to avoid uncoordinated investments in the hydrological and meteorological services sector;
- Outline some lessons learned from Japan's experience in modernizing hydromet services, in terms of changes in legal and institutional arrangements over time, advances in technology, and the reforming influence of major natural disasters;
- Provide a foundation for policymakers, decision-makers, and other stakeholders to understand the fundamental elements of weather, climate, and hydrological services in Japan;
- Support efforts to map priorities for potential international cooperation for developing countries in modernizing their national meteorological and hydrological services (NMHSs); and
- Describe the role of regional and global structures and frameworks such as the World Meteorological Organization (WMO) and the Global Framework for Climate Services within the hydromet space.



## Modernizing hydromet services in developing countries: lessons from the Japanese experience

Japan has one of the world's more advanced hydromet services programs. The country's experience offers some historical perspectives on choices developing countries can make when embarking on their own hydromet service development efforts. Its model is an example of a modern system with strong government involvement and institutional governance.

Additionally, Japan's comprehensive multi-hazard approach that covers weather, climate, ocean-related, and terrestrial services has been developed over the course of more than a century, and applied and refined after disaster events such as the 2011 Great East Japan Earthquake, strong typhoon landfalls, and volcanic eruption.

Using a three-component framework for large-scale modernization, the reports support developing countries seeking to undertake: (i) institutional strengthening; (ii) the modernization of systems; and (iii) enhanced service delivery. Toward these goals, key lessons from Japan's experience include:

### 1. The modernization of hydromet services requires long-term step-by-step efforts, which should be anchored to well-defined medium- and long-term strategies.

Hydromet strategies should take into consideration science and technology, as well as available financial and human resources. Thorough strategic planning is a continuous and iterative process. Special attention should be paid to opportunities to reexamine and revise these strategies immediately after major disasters, as such events usually offer valuable lessons on gaps in systems or services. If funding support for NMHSs comes from multiple sources, well-defined strategies should also facilitate coordination among donors.

**2. Legal and regulatory frameworks should clearly define the roles and responsibilities of NMHSs, as well as those of public and private sector stakeholders who provide meteorological, hydrological, and early warning services.**

Effective early warning systems require good coordination among stakeholders, clearly defined roles and responsibilities, and streamlined operational procedures to ensure timely delivery of actionable messages to all residents at risk, and to avoid multiple and contradicting warnings. To promote these effective systems, national law(s) should clearly define the NMHSs as the single authoritative voice for warning services, and effective regulatory framework and standard operational procedures should be in place.

**3. The design and development of hydrological regulatory frameworks in developing countries should be fully aligned with, and where possible fully included within, integrated water resources management (IWRM).**

In Japan, hydrological services have evolved as an integral part of IWRM. IWRM is a target of the United Nation's Sustainable Development Goal to ensure access to water and sanitation, and is being enhanced through a river basin approach around the world.

**4. Sound meteorological, seismic, and hydrological observation and data management systems are a prerequisite for any associated services. An open data policy supports broader use of these systems, as well as higher value data for communities.**

Maintaining and operating robust, sustainable, quality-assured, and user-oriented observation systems are critical for successful hydromet services. Observation systems should use instruments with a high degree of traceability within national, regional, and global meteorological and hydrological communities, and with adequate maintenance mechanisms in place.

In Japan, the Meteorological Agency has established data sharing arrangements through the Japan Meteorological Business Support Center to facilitate and ensure the broader use of meteorological and hydrological data. The Foundation of River & Basin Integrated Communications uses data from the River Authorities.

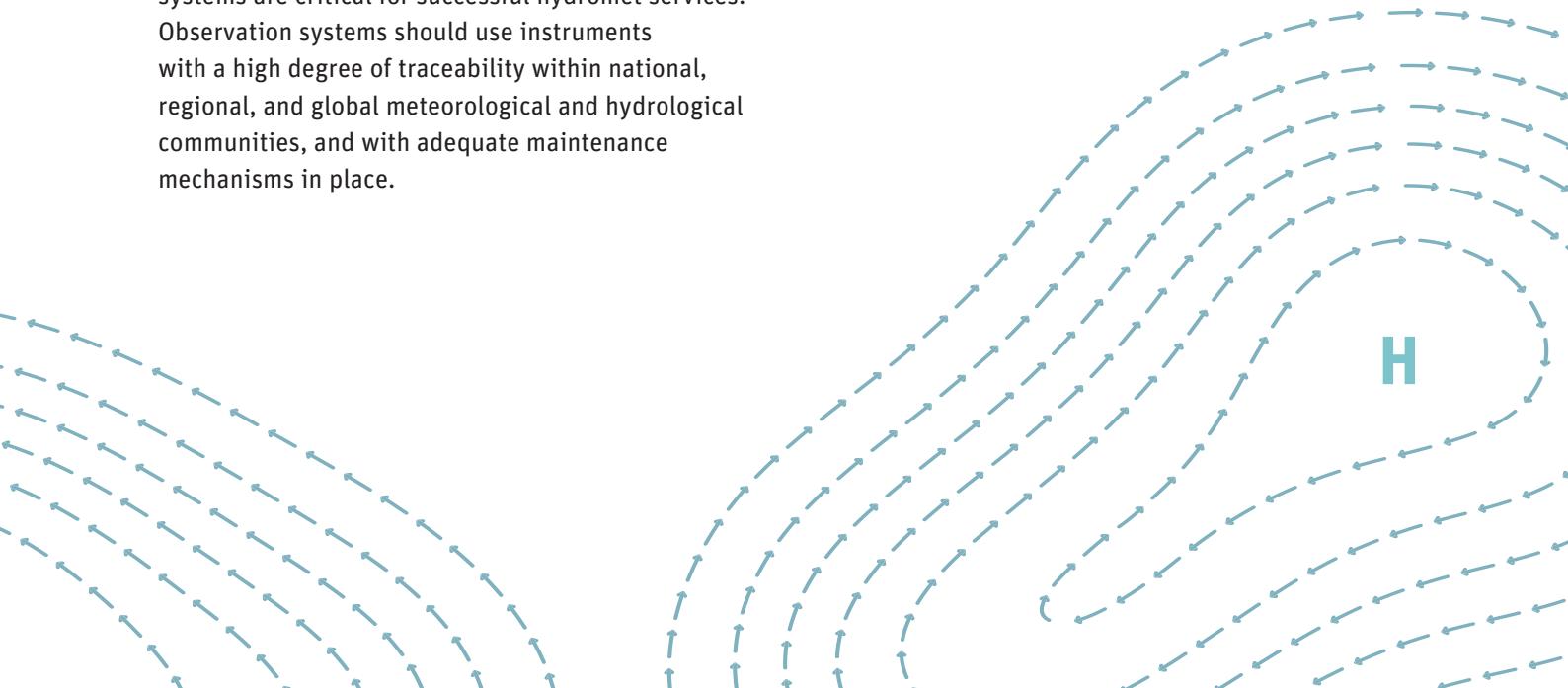
**5. A backup of hydrology and meteorology systems-and-services hub is essential for business continuity.**

In modern NMHSs, it is important to have a level of redundancy in systems to ensure the functioning of emergency services (such as typhoon warnings) and some aviation services at a minimum.

This dual form of redundancy is extremely effective in case of earthquake, fire, power loss, pandemic, or other disaster. In developing countries, there should be a geographically separated “second” services center that can operate the most basic emergency services. This should include duplicative observations, ICT, and minimal services for “hot” rapid activation.

**6. User-oriented, risk-based, and seamless early warning services should be established and advanced in close cooperation with relevant authorities and the public. Maintaining and testing institutional arrangements is key to an effective hydromet service.**

Some disasters result from a complex combination of numerous natural hazard events. Thus, effective preparation and management requires a comprehensive multi-hazard approach through collaboration with multiple stakeholders, including water authorities, disaster management agencies, and local government.



## **7. It is imperative to maintain a strong collaboration with local emergency first responders and the public. This “last mile” is critical to the success of the early warning systems.**

At the local level, it is imperative to strengthen interactions with local governments and the public. Early action is generally not ensured just by issuing warnings and associated information, nor by the management of the government authorities, but instead through strong coordination with first responders and communities. This is an important lesson for emerging NMHSs.

For example, Japan’s NMHSs classify events in terms of danger levels corresponding to recommended actions to be taken by municipalities and residents when an advisory, early warning, or emergency warning is issued. They further encourage municipalities and the public to promptly respond to those advisories and warnings, which may change with the evolving stages of severe weather events, in cooperation with the relevant authorities.

## **8. User needs should define the modernization of hydromet services.**

The modernization of hydromet services in Japan has been largely driven by evolving user needs, be it for flood management, water use planning, navigation, transport, agriculture, energy, or early warning for hydromet hazards.

Meteorological and hydrological information is only socioeconomically valuable when users understand and utilize information to make decisions and take action. Moreover, user needs should define the scope and type of services needed to provide this information, as well as minimum quality requirements.

## **Looking forward**

As a follow on to these two in-depth reports exploring Japan’s experience in hydromet services modernization, future studies could examine:

- Valuable parallels and additional lessons from the experiences of other countries with advanced, modernized hydromet systems;
- A particular challenge faced by developing countries from a lack of little observed data to exchange, which affects all aspects of meteorological and hydrological service delivery;
- The challenges countries such as Japan face when the national meteorological service and national hydrological service operate separately, leading to multiple organizations requiring coordination; and
- The coordination of donors for hydromet services as modernization efforts proceed. Mechanisms such as those of the WMO and certain NMHSs are effective in modernizing NMHSs in developing countries and may offer critical lessons.

## **Additional resources**

Global Facility for Disaster Reduction and Recovery (GFDRR), The World Bank “Modernization of Japan’s Hydromet Services: A Report on Lessons Learned for Disaster Risk Management” (2016).

Japan Meteorological Business Support Center (JMBSC), “Review of Japanese Meteorological and Hydrological Services and Lessons for Developing Countries: Meteorological Component” (2016).

Foundation of River & Basin Integrated Communications, Japan (FRICS), “Review of Hydrological Services in Japan and Lessons for Developing Countries” (2016). Each paper stands alone in its value to operational and policy clients.

David P. Rogers and Vladimir V. Tsirkunov, Weather and Climate Resilience: Effective Preparedness through National Meteorological and Hydrological Services (Washington, DC: World Bank, 2013)