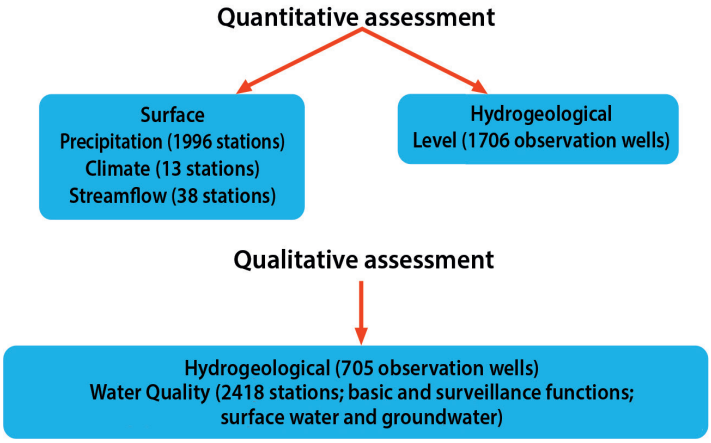
HYDROLOGICAL MONITORING

It is the systematic and reliable assessment of the current and perspective water availability. It aims to manage the necessary information for decision making on the state and development of the country's water resources (quantity, quality, temporal and spatial distribution). It is the support for the safety of people and wealth in water-related hazards, particularly floods and droughts.

The hydrological observation is materialized through hydrological networks, whose stable operation in our country virtually involve, with a broad sense of organization, systematization and discipline, all the NIHR system and the precipitation volunteer observers.

Charco Mono telemetric station, Santiago de Cuba



Precipitation volunteer observers

As a possible way to ensure the collection of rainfall data, the NIHR generated and fostered for over 50 years the "Volunteer Observers Movement". Of total of precipitation network stations, 1198 are operated by volunteer observers of whom 529 are women, 669 are men and the age ranges between 17 and 100 years.

Over the years, the observers have become trainers within their own family, preparing new generations and ensuring the continuation of the task.

The role of the volunteer observer and his family has been and it is essential in promoting the culture of water, the prevention and the evaluation of floods and droughts, as well as the protection of communication and monitoring resources and equipment.

Hydrological early warning and prevention against hurricanes, heavy rains and flash floods caused by precipitation events

Main objectives:

- Ensuring the safety of dams and water works in extreme events situations.
- Ensuring the warning to populations and socioeconomic objectives of the watersheds in cases of extraordinary rains and floods.
- Reporting the behavior and trend of flooding for adopting the necessary response measures.
- Knowledge of parameters that constitute pollution warning indicators in both main and tributary rivers.

This material has been made in the framework of the project: **"Improvement of the hydro-meteorological Early Warning Systems to increase disaster preparedness and to reduce vulnerability of the population living in the affected provinces by Hurricane Sandy (Cuba)"**; implemented by the United Nations Development Programme (UNDP); under the Action Plan for the Caribbean from the European Commission's Disaster-Preparedness Programme (DIPECHO).

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Starting point: "Conventional System"

Non automated structure for observation and transmission. It requires the physical presence of qualified personnel in conventional monitoring stations (789 rain gauges, 38 streamflow stations and 242 reservoirs), representing watersheds upstream to each flooding zone and the elements of the Political Administrative Division. It is also characterized by:

- Manual measurement, oral transmission (telephones and radio plants) and manual data digitizing.
- Storage, processing and generation of preset outputs in alphanumeric databases applications and Geographic Information System (GIS).
- Prediction of runoff volumes using traditional hydrologic calculation methods and regular computer applications.
- Information delivery via email.

Target: "Integrated system of conventional and automated monitoring"

Efforts are made through national and international projects aimed to strengthen the monitoring system and hydrological prevention, by incorporating advanced technology of specialized equipment and tools for operation, evaluation and analysis.

The proposed and being implemented system is based primarily on the use of:

- Measurements in ground hydro meteorological stations: (1) conventional stations and (2) automatic telemetric stations with real-time and digital format data transmission.
- Web-based software for evaluation and management of hydrological data and alarms.
- Probabilistic forecasts and quantitative precipitation forecasts by numerical models generated by INSMET.
- Meteorological Radar-based rainfall rates estimations.
- Numerical models for hydrological and hydraulic simulation.

Project "Strengthening the hydro meteorological EWS in the most damaged provinces by hurricane Sandy"

- 10 automatic telemetric stations: Bio and Güirabo reservoirs in Holguín province; Cautillo reservoir and La Fuente streamflow station, in Granma province; and Carlos Manuel de Céspedes, Charco Mono, Gilbert, Gota Blanca, Hatillo and Protesta de Baraguá reservoirs, in Santiago de Cuba province.
- 10 VHF radio communication equipment in: "Borgita", "Salvador Rosales", "Abundancia, "La Maya", "Palo Picao", "Tumba 7", "San Nicolás" and "Seboruco" rain gages operated by volunteer observers; "Carlos Manuel de Céspedes" reservoir; and Control Office of the NIHR branch in Santiago de Cuba province.
- System conceptualization of automated hydrological for forecasting.

Volunteer observer of Palo Picao precipitation station, Santiago de Cuba