P2P
Peer-to-Peer
for Basin Organisations

Funded by
the European Union

Didactic Curriculum – IWRM thematic module Advanced Information Systems for Water Management, Part 1

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General Information

14 and 18 September, 9 October, 2026

Online

INBO, ANBO, UCAD, OMVS, AMSCLAE, ANA Peru, TSA, MRC

Peers

1/ Summary

The P2P (Peer-to-Peer) project, funded by the European Union, is run by the International Network of Basin Organisations (INBO). Co-led by the INBO and the ANBO, its objective is to strengthen integrated and sustainable water resources management (IWRM), through exchanges between basin organisations and countries.

The P2P educational didactic curriculums to strengthen the expertise and capacities of beneficiaries in the main areas of IWRM.

The online sessions on 14 September, 18 September and 9 October 2026 constituted the first part of the thematic module on Advanced Information Systems for Water Management.

2/ Agenda

Introduction and methods of production and acquisition of water data: International Network for Basin Organisations (INBO) - Mélanie FAYET, participants

The conditions necessary for sustainable water resource monitoring: Cheikh Anta Diop University of Dakar (UCAD) - Abdoulaye FATY, Authority for the Sustainable Management of the Lake Atitlan Basin and its Surroundings (AMSCLAE) – Mervin Pérez, National Water Authority of Peru (ANA) – Javier Segovia and Jaime Gutierrez Huanqui, Tonle Sap Authority (TSA) - Chanvoitna PRAK)

Importance and principles of shared data and metadata management: International Office for Water (OiEau) – Paul HAENER and Marta BOYKO

Data quality control to facilitate management: INBO – Mélanie FAYET, participants.

Concept of a common repository and data integration: Mekong River Commission (MRC) - Ballah TITH, Organisation for the Development of the Senegal River (OMVS) – Moustapha Lo, OiEau – Marta BOYKO

Mastering the lifecycle of data from its production to its presentation and conclusion: OiEau – Marta BOYKO

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3/ Topics and themes of the meeting

The conditions necessary for sustainable water resource monitoring

Abdoulaye FATY: Dr. Abdoulaye Faty's lecture focused on the monitoring of water resources applied to West African drainage basins, particularly that of the Senegal River. He described the resources monitored (surface and groundwater) as well as the parameters measured (quantity, quality, pollution, climate and uses). Monitoring relies on traditional tools such as hydrometry and piezometry but now incorporates technological innovations such as spatial data and remote transmission. The speaker emphasised the importance of this monitoring to anticipate risks (droughts, floods, pollution) and prevent water use conflicts. He emphasised governance, assigning responsibility for collection to national directorates (such as the DGPRE in Senegal or the DNHS in Mali). Finally, he presented the use of metadata standards and the role of universities in training and technical capacity building.

Chanvoitna PRAK: Chanvoitna PRAK presented the monitoring of the water resources of the great Tonlé Sap lake in Cambodia, characterised by a large seasonal variation in water depth. Fed by the Mekong River, the lake's surface area fluctuates between 2,400 km² in the dry season (depth less than 1 meter) and 12,400 km² in the rainy season (depth reaching 8 meters). The speaker pointed out that over the past ten years, the dry season has lengthened from 3 to 5 months, degrading water quality and exacerbating eutrophication. To address this, a systematic monitoring network (39 sites) analyses 17 physical and chemical parameters. The data from this monitoring network is stored locally in Excel files.

Mervin Pérez: Mervin Pérez presented the actions of AMSCLAE to preserve Lake Atitlán in Guatemala. He explained the limnological status of the lake, a closed basin particularly vulnerable to pollution. Faced with the deterioration of the water quality, eutrophication and continuously falling water levels in the lake, the institution is conducting rigorous scientific monitoring (water quality, cyanobacteria blooms, river flows and climate). The data collected highlights the impact of untreated wastewater, agricultural fertilisers, and deforestation. To address this, AMSCLAE is implementing nature-based solutions, such as the restoration of "tullayes" (coastal wetlands) and the reforestation of the drainage basin. The institution also assists municipalities in waste management, wastewater treatment and raising awareness among local communities about resource protection.

Javier Segovia and Jaime Gutierrez Huanqui: Javier Segovia presented the observation network of the Quilca Chilli basin in Peru. He explained that data on rivers, lakes, glaciers and dams is centralised on a web observatory for crisis management and monthly monitoring of multi-sectoral needs. He specified that the national water resources system, which is hosted at the ANA headquarters, is managed by a multidisciplinary team. Jaime Gutierrez Huanqui presented the National Water Observatory of Peru. He showed the aquifer monitoring tool, the graphs available online on water quality, and information on hydrometric and rainfall stations. He specified that the information can be displayed by basin.

Importance and principles of shared data and metadata management

Paul HAENER: Paul HAENER reminded us that data is fundamental to water resource management, and that the same data can be used for multiple purposes: sectoral management (drinking water, irrigation), basin-wide planning, monitoring climate change or decision-making. To meet these needs, it is necessary to combine different themes:

knowledge and state (quantitative and qualitative) of the resource, current and future uses and users, infrastructure, as well as social, economic and environmental indicators. He highlighted the growing contribution of satellite data to complement in-situ measurements. This data comes in various forms (spatial, temporal, alphanumeric, qualitative). In a context where there are multiple institutional stakeholders, he recommended the creation of a mapping of the stakeholders to identify who produces and uses what. In light of the wide range of production processes (stations on site, remote sensing, administrative processes, modelling), Paul HAENER stressed the importance of adopting the FAIR principles (= Findable, Accessible, Interoperable, Reusable). The goal is not to centralise information, but to enable decentralised and automated data sharing through metadata catalogues and web services.

Metadata organisation

Marta BOYKO: She presented metadata as a central element of water data governance, generally presented by the expression "data about data". Data without metadata remains unusable, because it lacks context (author, method, date, accuracy). The OiEau approach is based on the FAIR principles and the ISO 19115 standard. The implementation of metadata records addresses four strategic challenges: strengthening trust, facilitating institutional collaboration, safeguarding the legal aspects and preserving institutional memory. Using the example of a GIS layer in Senegal, she described the filling out of a metadata sheet: title, summary, keywords, format, projection, as well as the crucial distinction between the producer contact and the author of the sheet. Finally, she illustrated the use of an online catalogue (e.g. in Armenia) allowing data to be sorted, viewed and shared.

Concept of a common repository and data integration

Ballah TITH: Ballah Tith presented the management and integration of data within the Mekong River Commission (MRC), an intergovernmental organisation comprising Cambodia, Laos, Thailand and Vietnam. Based on the 1995 agreement, the MRC relies on the PDIES (procedures for the exchange and sharing of information) which covers twelve major data themes (hydrology, agriculture, environment, etc.). The technical architecture is based around a central database (Aquarius), fed by telemetry stations, modelling and external inputs. The MRC disseminates this information via a web portal, mapping services and an API (Application Programming Interface). While Thailand already shares its dam data via API, other countries still use Google Sheets files. The main challenges lie in harmonising the formats, the regularity of updates, security (following cyberattacks) and data governance between Member States.

Moustapha Lo: Mr. Moustapha LO presented the Water Information System (SIE) of the Senegal River basin, developed by the OMVS in partnership with the Société du Canal de Provence and the OiEau. This system makes it possible to monitor the compliance of the implementation of environmental legislation, to analyse human pressures, to assess the state of resources and to measure the performance of water services. It also serves as a decision support tool for planning, risk management and implementation of the commitments of the Water Charter. The SIE offers various mapping services and interactive dashboards covering administrative divisions, the hydrographic network, water quality, withdrawals and mining activities. It includes a web portal providing access to hydrological data, documentation and regulatory texts. Finally, Mr. LO addressed the interoperability of the system with the Hydraccess database and the Early Warning System (EWS) for flood forecasting.

Marta BOYKO: Ms. Marta BOYKO presented the challenges of data integration and management within a water information system. In light of the wide range of formats (vector data, time series, satellite images), she explained that integration does not consist of imposing a single software solution, but of adopting a standardised scheme to make this heterogeneous data communicate without loss of information. She then described two key tools: The FTP server: It serves as a secure area to automatically collect raw files sent by field sensors, avoiding direct access to the central database and preventing losses in case of failure. The ETL (Extract, Transform, Load) pipeline: This script automates the retrieval of files, their cleaning (filtering outliers, unit conversion) and their loading into the final database. Lastly, she differentiated between WMS services (lightweight images for display) and WFS services (raw vector data for GIS analysis). She also addressed decentralised interoperability between producers, and the use of APIs to share real-time data streams.

The data life cycle from data production to its presentation and conclusion.

Marta BOYKO: She summarised the water data value chain through the metaphor of the restaurant: Harvesting and preparation: Raw data, like the ingredients of a recipe, is collected in the field, routed via FTP, then "cleaned" and structured by the ETL process before being stored. The menu: The metadata catalogue acts like a menu. Data access is secure and distributed according to each person's rights (via API, WMS, WFS). Data enhancement: The processed data is served in different forms adapted to users: in self-service (Open Data) mode, in decision-making dashboards, like an à la carte meal served at the restaurant table, or in summary reports comparable with an ultra-processed pastry.

4/ Summary of questions and answers

Subject	Question	Answer
Metadata, exercise	Once the metadata forms are filled out, how do we proceed to sharing on a website and where will the data be stored?	The metadata catalogue presented during the module is an example. For their own data, peers can create their online metadata catalogue, which must be hosted on a server. They can also simply enter the data into PDF files. This is what is proposed for this exercise.
Data sharing	How can the data be shared with the general public?	Metadata catalogues do not necessarily provide access to the data, unless it is public. However, they can indicate a contact person to whom the public can refer to request access to the data. To go further, a national data portal (like that of Peru) is an example of a tool for sharing data with the general public.
Data sharing	How can the 30 years of data currently stored in Excel be upgraded into an open and interoperable water information system?	Storing data in a Geographic Information System (GIS) is a first step towards its dissemination. Several options exist for providing access to the data: leaving it in Excel and storing it as-is on an online server to share it with the public, or sharing it on a portal with an API, having made it interoperable beforehand in a structured database.
Data access rules	Who decides which data is publicly accessible and at what level of access?	It depends on the country's legislation. In Europe, for example, all data produced by public institutions must be freely accessible. For countries that have not signed the European convention, access to data varies. More and more countries are making their data available to all

Subject	Question	Answer
		stakeholders, and this benefits everyone. In many countries, each institution decides who has access to its data.
Description of data and metadata	How do you currently document and describe existing datasets?	Within SIC ICWC, metadata is created for each step, in particular for satellite images or sensors, in order to generate precise information layers (coastal areas, water perimeters).
National procedures	What procedures are currently in place to facilitate access to data at national level?	Central Asian countries are integrating their databases (hydrology, land registry) into national information systems that are being modernised and harmonised.
Governance and security	What are the main obstacles to data sharing?	The main obstacle in Central Asia lies in the fact that water is treated there as a highly sensitive national security issue. To circumvent the reluctance to share certain data, the use of complementary satellite data is preferred.

5/ Interactive discussions

Means of producing and acquiring water data

Q1: An interactive exchange using the Wooclap tool allowed participants to discuss the means of production and acquisition of water data that exist in their regions. This resulted in the following word cloud and lists:



Figure1: Word cloud of answers to Q1 – 14/09

- Ground and satellite based production of water and land data
- Hydrological, water quality, drought, rainfall, dam operational data
- water assessment
- Water extention monitorin by using satellite image
- Surface water and underground water monitoring of Syrdarya river basin Taj

Figure2 List of answers to the first question – 09/10

- Dam Levels (Observers), Discharge (Automatic)
- Calidad de agua- aforos- hidrometria- meteorologia
- Monitoreo calidad de agua, estaciones climáticas
- Monitoreo de Ríos, Monitoreo del lago muestreo
- Monitoreo nivel del agua del lago
- 1) profils verticaux avec sondes multiparamètres
- 2) Bouée Hydrometeorologique profileuse
- 3) satellite Sentinel ESA

Figure3 List of answers to the first question - 18/09

The comments allowed several peers to describe processes in place in their area: data theme (surface water quality/ quantity/quantity withdrawn), production method (monitoring, satellite, administrative) and governance.

Q2: A subsequent question concerned a method supplementing the physical monitoring of watercourses or aquifers, allowing the quantification of the volumes of water actually withdrawn by users.

The participants who responded all chose the following method: The combination of remote meter readings, usage declarations and field surveys. That was the correct answer. This response helped to emphasise the importance of administrative data in addition to field measurements and other data acquisition processes.

Data quality control to facilitate management

Q3: A second participatory session addressed data control through a case study: During inspection of a water level measurement station, a discrepancy is observed between the visual staff gauge and the value displayed by the pressure probe or other sensor. What is the very first step to take on the ground before any adjustments or cleaning?

The issue of discrepancies observed between manual measurements using staff gauges and data automatically transmitted by pressure probes is cited in response. A rigorous on-site verification is therefore essential before making any modifications or adjustments to equipment. The first action consists of taking an accurate reading on the scale and simultaneously carrying out a manual verification measurement to confirm the water height. The sensors should not be adjusted too hastily or the calibration curve modified without having identified the exact cause of the anomaly.

Q4: To continue this case study, the following questions concerned the processing of the series of data from this sensor over the last three months, in the event of a progressive drift in water level, and then how to mark this corrected series in the database, so that a re-user knows that it has been modified. It is advisable to invalidate the series and apply a correction by linear interpolation between the two controls and flag the data. Flagging the data makes it possible to specify in the metadata whether it is modified or raw data.

Q5: Another question concerned a technique for disseminating information without revealing a precise location, for example for water data whose location relates to national security (e.g., sensitive drinking water intakes). For this, the method of spatial degradation by blurring or aggregation to water body or sub-basin level is possible. Access management is also a point to consider before sharing.

Q6: In summary, the golden rules to ensure that processed data remains reliable and usable by a partner could be: traceability, preservation of raw data, “flagging” and respect for the level of confidentiality.

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6/ Conclusion, follow-up

All countries and basin organisations face similar challenges in terms of data management, quality and access. The principles of governance, fairness and interoperability are essential to ensure seamless sharing.

The module is structured around the complete data cycle, from its raw collection to its valorisation for decision-makers and the public. The second part of this module is scheduled for the week of 9 November 2026. It will focus on data valorisation and decision support tools. Participants are invited to express their interest if they wish to present their own feedback.

The organisers thank all the speakers for the quality of the presentations and discussions. The presentations, written summary and recording of the session will be made available to participants on the project platform or the INBO website.

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