Webinar 03

Educational module on WIS
Module pédagogique sur les SIE
Módulo pedagógico sobre SIA

P2P
Peer-to-Peer
for Basin Organisations

European Commission

INBO
international network of Basin Organizations

09/10/2026

Concept of common reference framework and data integration

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Water data integration

Diversity of input formats

Geographic data

Vector layers defining hydrographic territories and features :

- Administrative boundaries (departments, regions, municipalities)
- River basins and sub-basins
- Stream segments & water bodies

Formats : Shapefile, GeoJSON, GeoPackage

In situ measurements

Physical and chemical observations collected directly in the field :

- Automated telemetry (water levels, discharge/flow rates)
- Manual sampling & laboratory analyses
- Piezometric readings & turbidity

Formats : CSV files, JSON, XML

Complementary data

External sources enriching the analysis:

- Hydraulic structures (dams, discharge points)
- Radar rainfall grid data & weather forecasts
- Remote sensing (snow cover, soil moisture)

Formats : Raster GeoTIFF, NetCDF, API

Water data integration

Example of using FTP / SFTP server

What is FTP ? The File Transfer Protocol provides a remote and secure storage space

Automated deposit from the field: The monitoring station, equipped with a 4G or satellite modem, connects and deposits its raw file (e.g., text or CSV file) at regular intervals without human intervention.

External sensors have no direct access to the central database: they only write to their dedicated FTP directory.

In the event of database server maintenance, the data remains stored on the FTP server with no risk of loss.

Water data integration

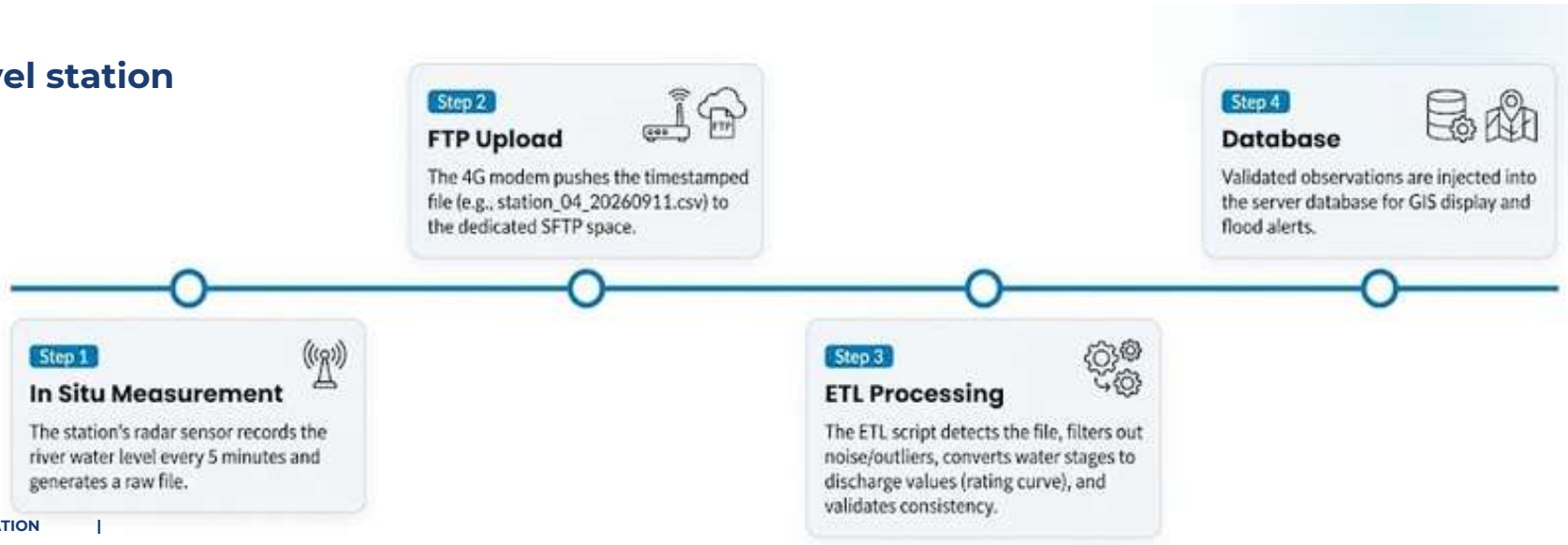
Example of using ETL pipeline

E • Extract (Extraire)
Data collection from heterogeneous sources:
-Automated FTP folder polling
-Reading of deposited files (CSV, XML, SHP)
-Timestamp management to prevent duplicate records

T • Transform (Transformer)
Data cleaning and domain normalization:
•Filtering of outliers or null values
•Unit conversion (water level from cm to m)
•Harmonization of station codes
•Spatial reprojection of geometries

L • Load (Charger)
Loading into the target database :
-Populating the time-series table
-Foreign key linking with the GIS station
-Aggregate calculations (hourly/daily averages)
-Archiving of the processed source file

Example : Water level station



Water data integration

Example of using WMS vs WFS for geographic information: Key differences

WMS (Web Map Service)

- Simple visual display. The user can zoom and pan, but cannot select or edit geometries.
- Extremely lightweight for the client workstation or web browser, making it ideal for displaying very large volumes of geographic data.

Water applications: River basin background maps, orthophotos, public mapping portals for flood/drought monitoring and alerts.

WFS (Web Feature Service)

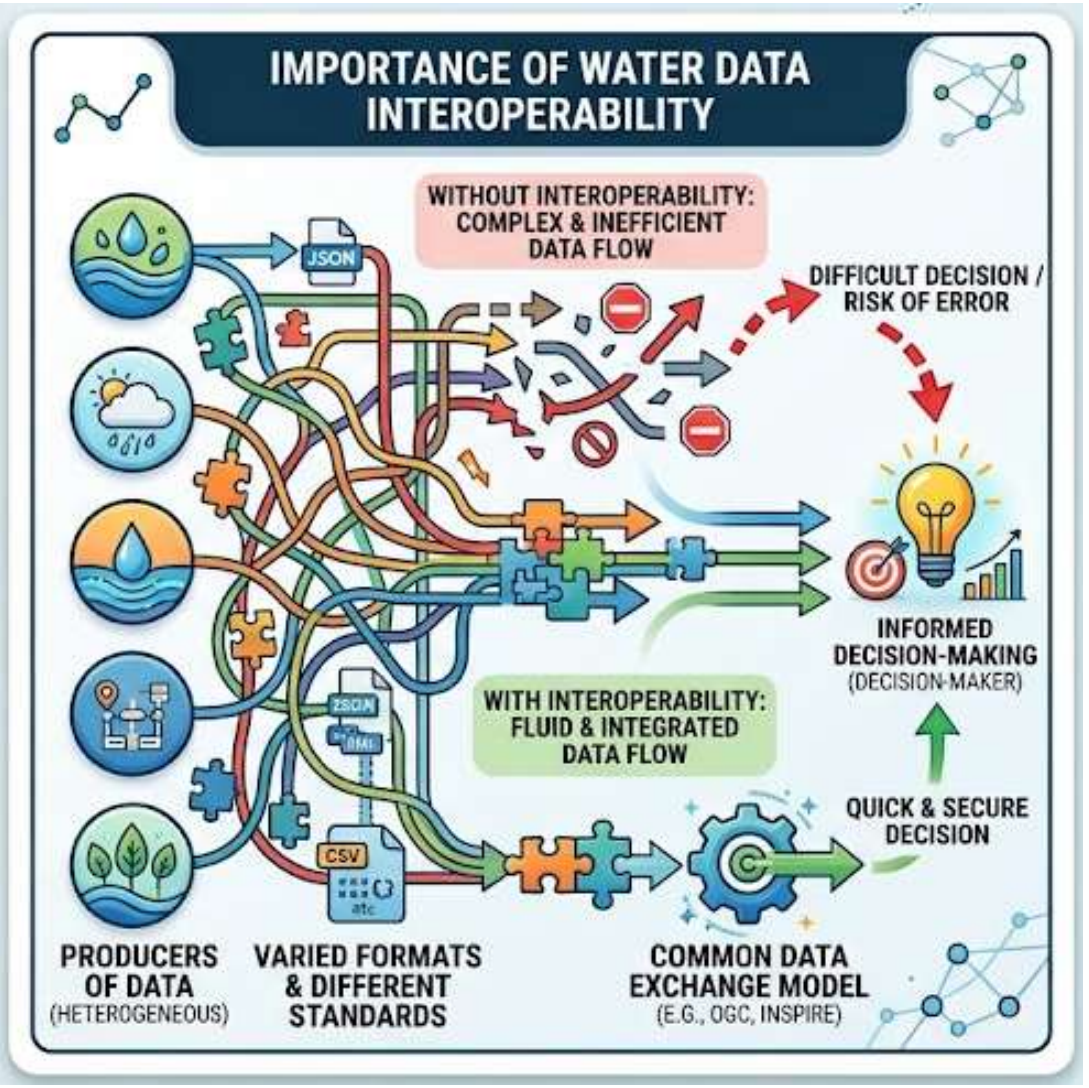
- Full access to features. Enables attribute and spatial filtering, GIS analysis, custom symbology, and editing (WFS-T).
- Higher network consumption as every geometric vertex and attribute value is downloaded.

Water applications: Downloading precise stream network line work, overlaying land parcels with flood hazard zones, and performing hydrological calculations..

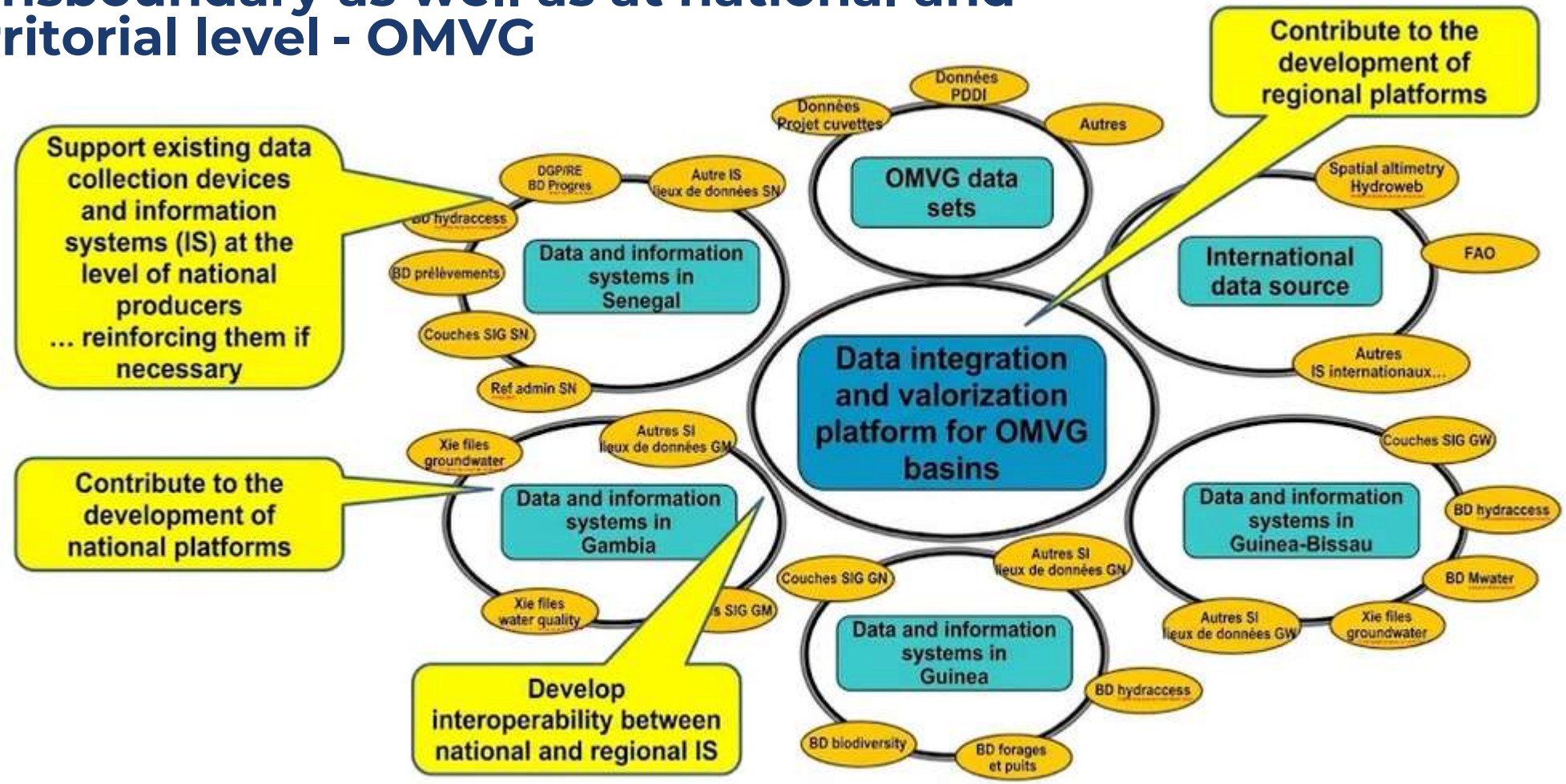
Interoperability

Consequences of the lack of interoperability





Reinforcing data exchanges at transboundary as well as at national and territorial level - OMVG



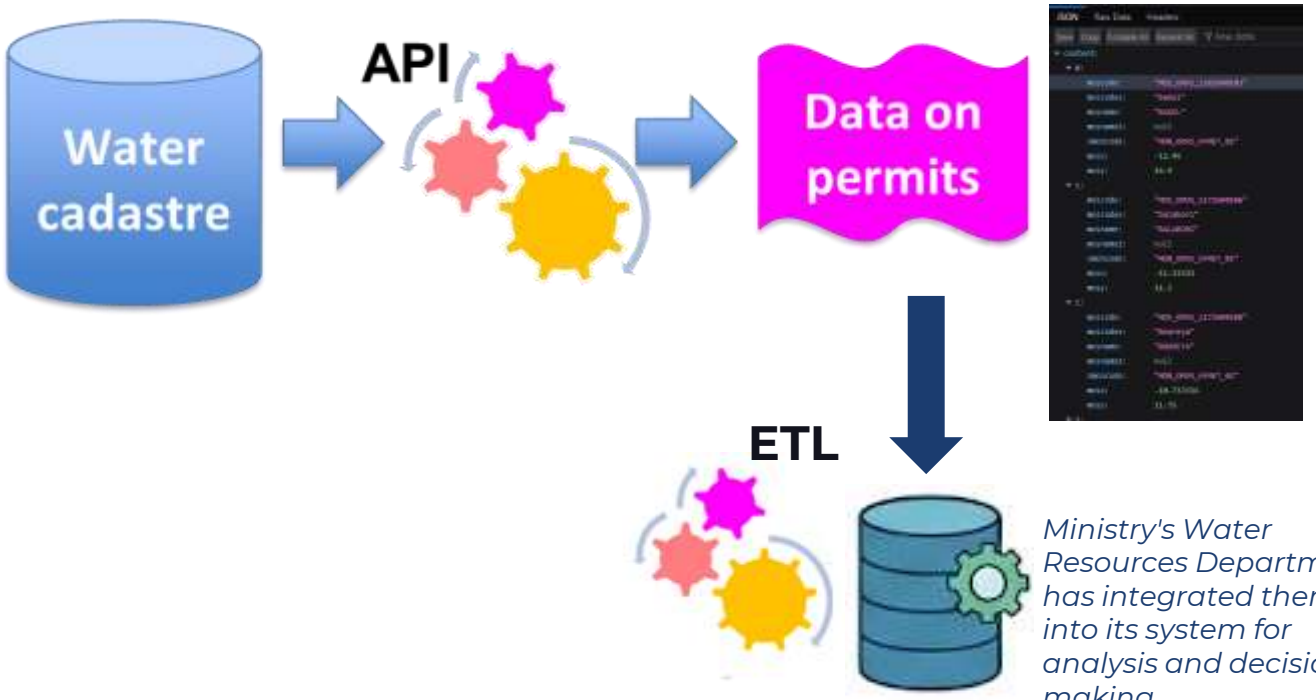
Introduction to API (Application programming interface)



APIs allows to consume tabular datasets made available by a data producer thanks to a simple URL

Results are generally received in a JSON / XML format

Example:



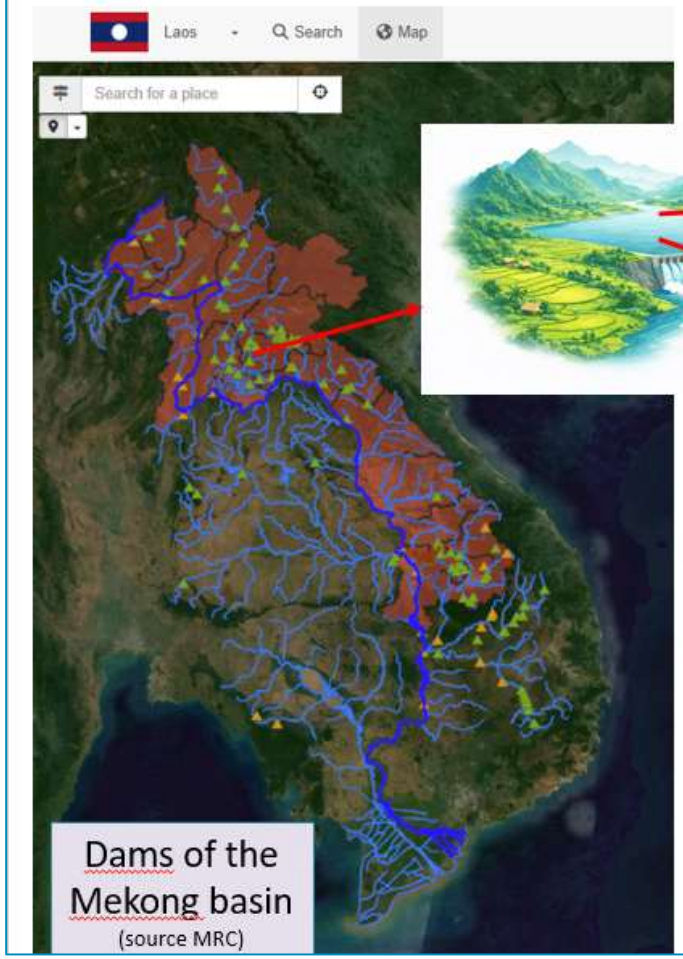
Ministry's Water Resources Department has integrated them into its system for analysis and decision-making.

Example of integration of various data production processes

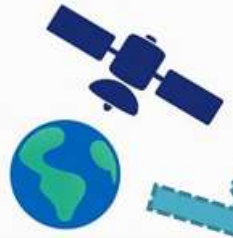
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OiEau
Office International de l'Eau

Example of application combining interoperability /satellite data and modelling for quantitative management on the Mekong basin (Lao area case)



Dams of the Mekong basin
(source MRC)







DHM

MEM

Dam managers

API

LaoWIS

API

API

API

API

Visualization

Modelling

Decision support systems

Digital twins

....

AI

MRC/ IS Aquarius / ....

Mekong water resource management

National water resource management

European Commission

INBO
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Data lifecycle from production to publication

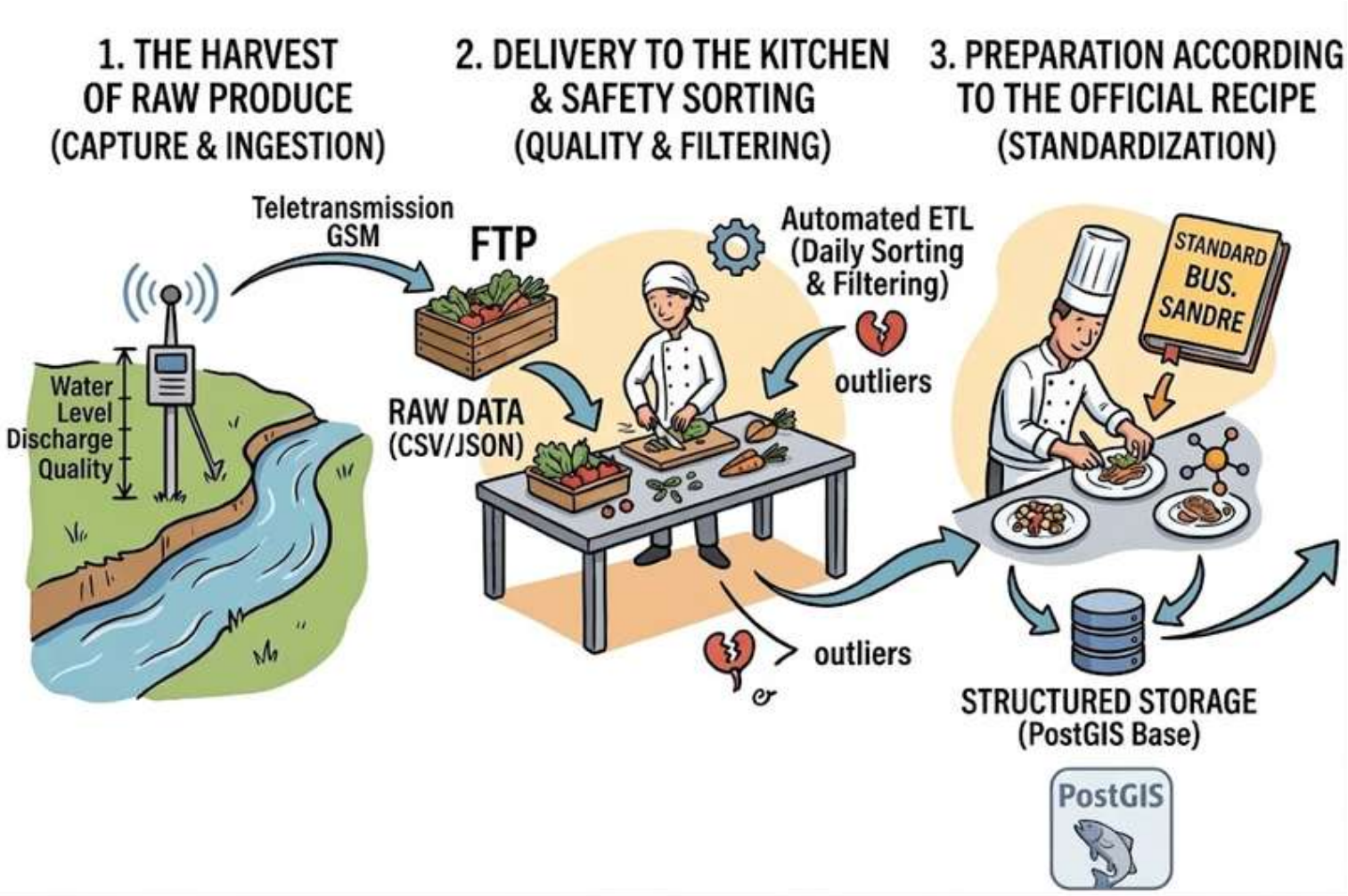
From field to plate : data processing pipeline

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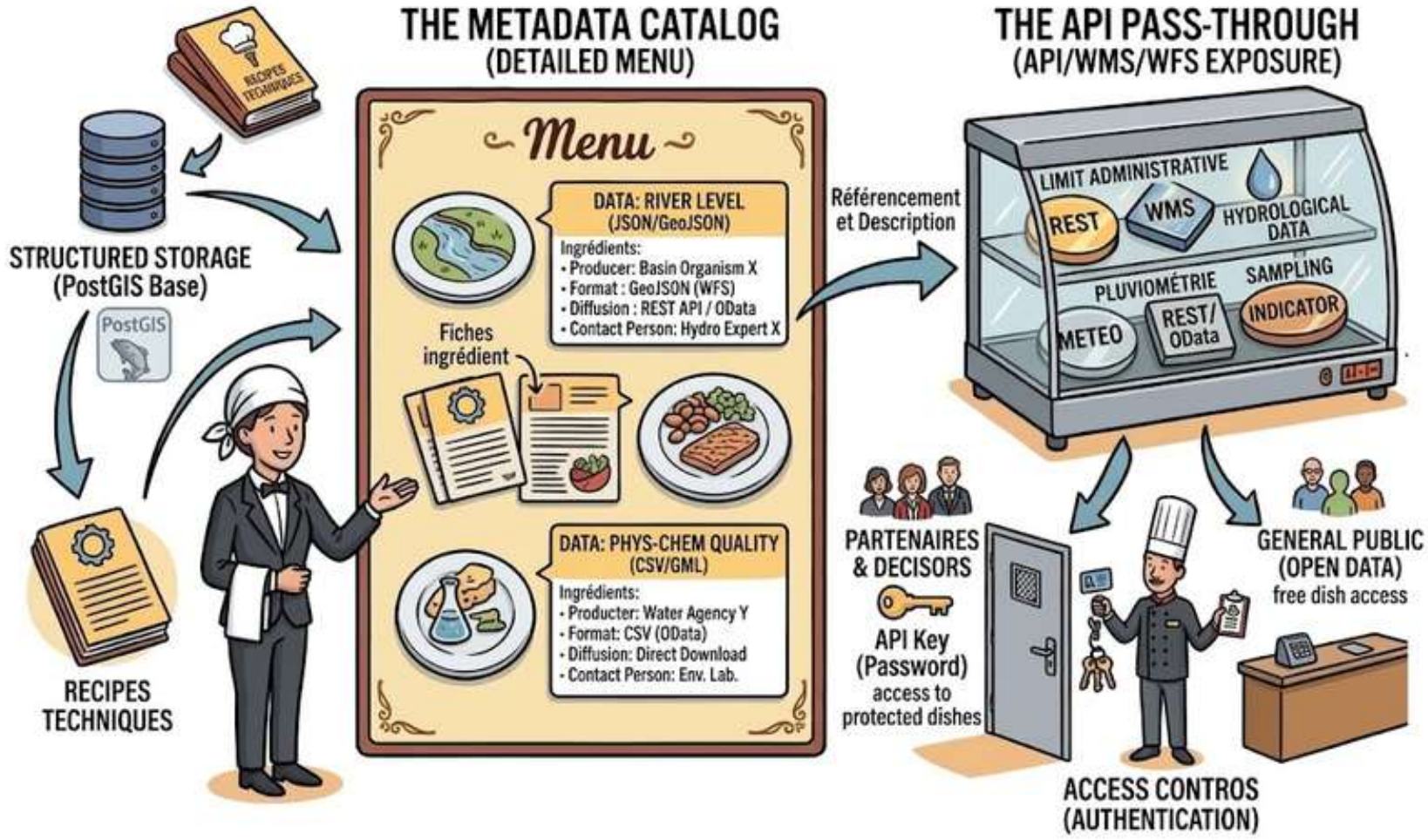
Mastering the data lifecycle from production to exposure

Data capture, processing and storage



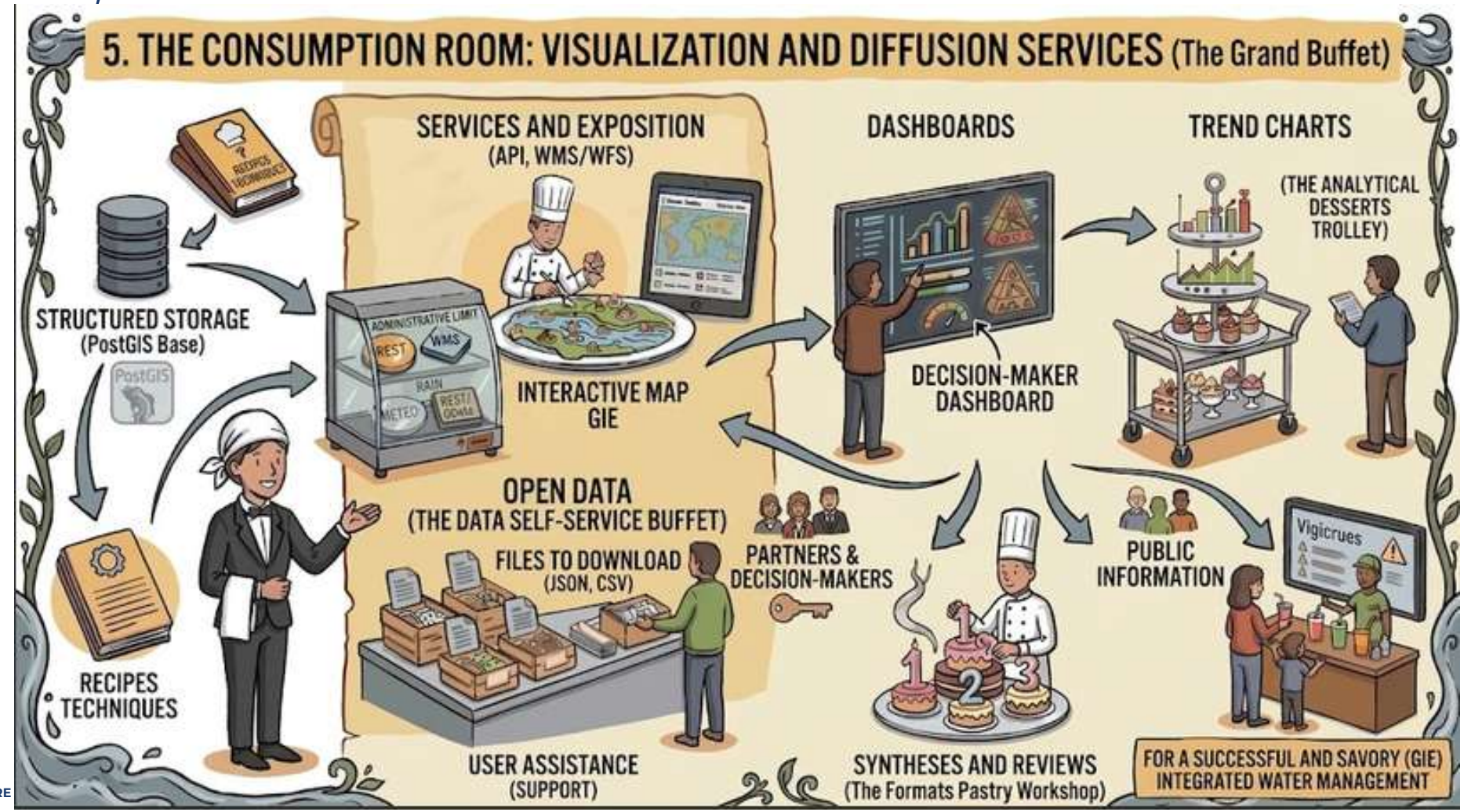
Mastering the data lifecycle from production to exposure

Catalog, exposure, and access control



Mastering the data lifecycle from production to exposure

Restitution, valorisation and dissemination



Question and answer session

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Debrief

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