Water Information Systems (WIS):

MRC Framework & Data Integration

9 October 2026, Vientiane, Lao PDR



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01

MRC at a Glance

About MRC

The Mekong River Commission (MRC) is an intergovernmental organization established under the 1995 Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin by Cambodia, Lao PDR, Thailand, and Viet Nam. It serves as the regional platform for cooperation on the sustainable development, management, conservation, and use of the Mekong River Basin's water and related resources. The MRC supports evidence-based decision-making through data and information sharing, basin planning, water diplomacy, environmental monitoring, and the implementation of regional procedures, including the Procedures for Data and Information Exchange and Sharing (PDIES).

Key Facts

- Founded: 5 April 1995
- Member Countries: Cambodia, Lao PDR, Thailand, Viet Nam
- Headquarters: Vientiane, Lao PDR
- Mandate: Sustainable and cooperative management of the Mekong River Basin
- Core Areas: Water resources management, data and information sharing, basin development planning, environmental protection, flood and drought management, and regional cooperation.

"Promoting regional cooperation and knowledge sharing for the sustainable development and management of the Mekong River Basin."



02 PDIES Update: Key Highlights

PDIES is 'Procedures' for Data and Information Exchange and Sharing

- Established to operationalize data exchange among MRC member countries.
- Supports public access to basic data and promotes regional cooperation.
- Based on principles like efficiency, equity, and accuracy.
- Identifies 12 key data types for sharing within the MRC-Information System (MRC-IS).
- Aims to assist planning, development, decision-making, and monitoring under the Mekong Agreement.

The 12 Major Groups/types of data and information required for implementation of the MRC program/activities and Mekong Agreement, inter alia:

- Water Resources
- Topography
- Natural resources
- Agriculture
- Navigation and Transport
- Flood and Drought management and mitigation
- Infrastructure
- Urbanization/Industrialization
- Environment/Ecology
- Administrative boundaries
- Socio-economy
- Tourism

More Info: https://portal.mrcmekong.org/procedure/pdies-overview

Revision History and Related Developments

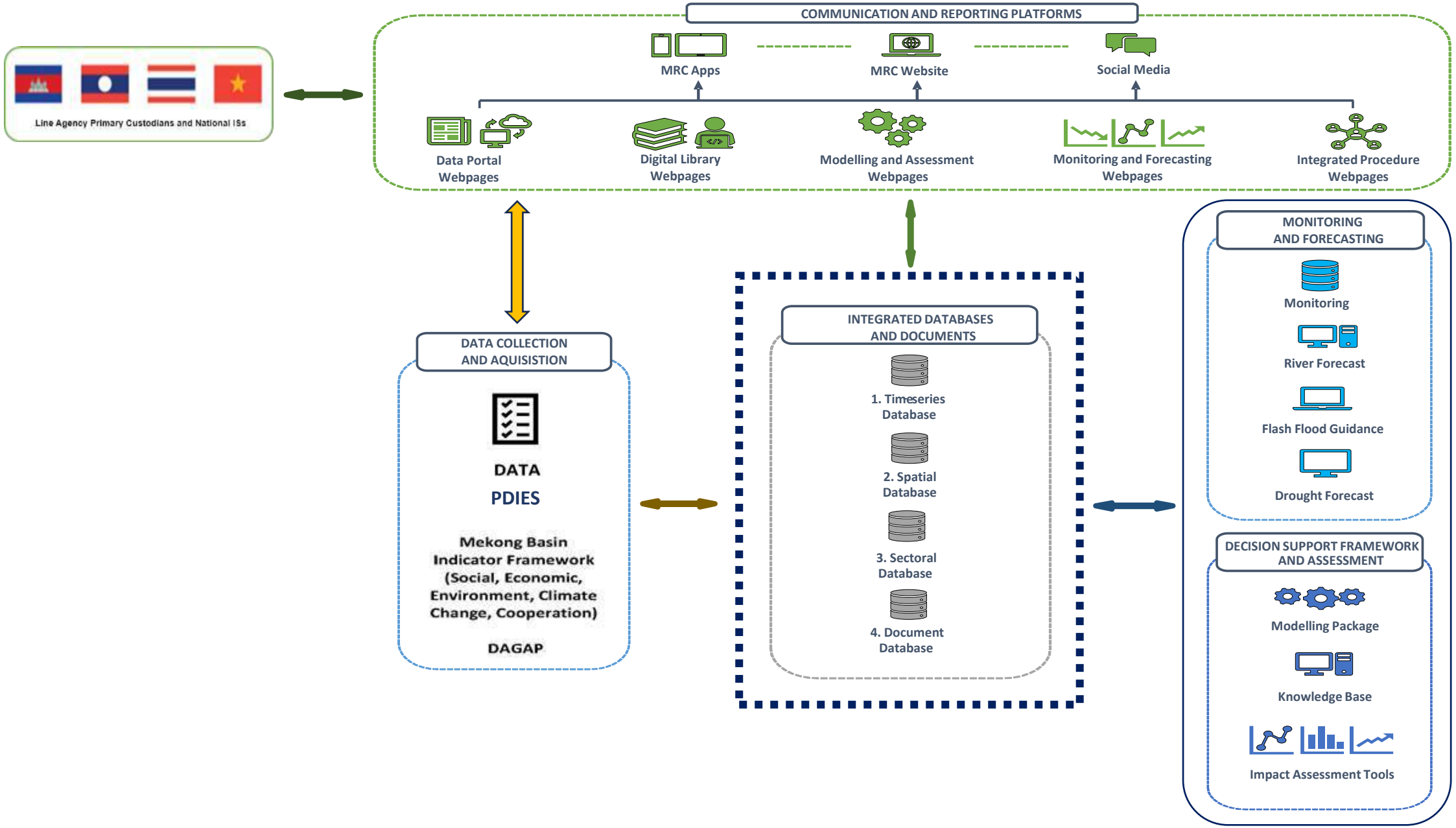
- 2002: Guidelines on Custodianship and Management of the MRC-IS were adopted to support PDIES implementation.
- PDIES is one of five core procedures developed under the MRC's Water Utilisation Programme:
  - PNPCA (Notification, Prior Consultation and Agreement) – 2003
  - PWUM (Water Use Monitoring) – 2003
  - PMFM (Maintenance of Flows on the Mainstream) – 2006
  - PWQ (Water Quality) – 2011



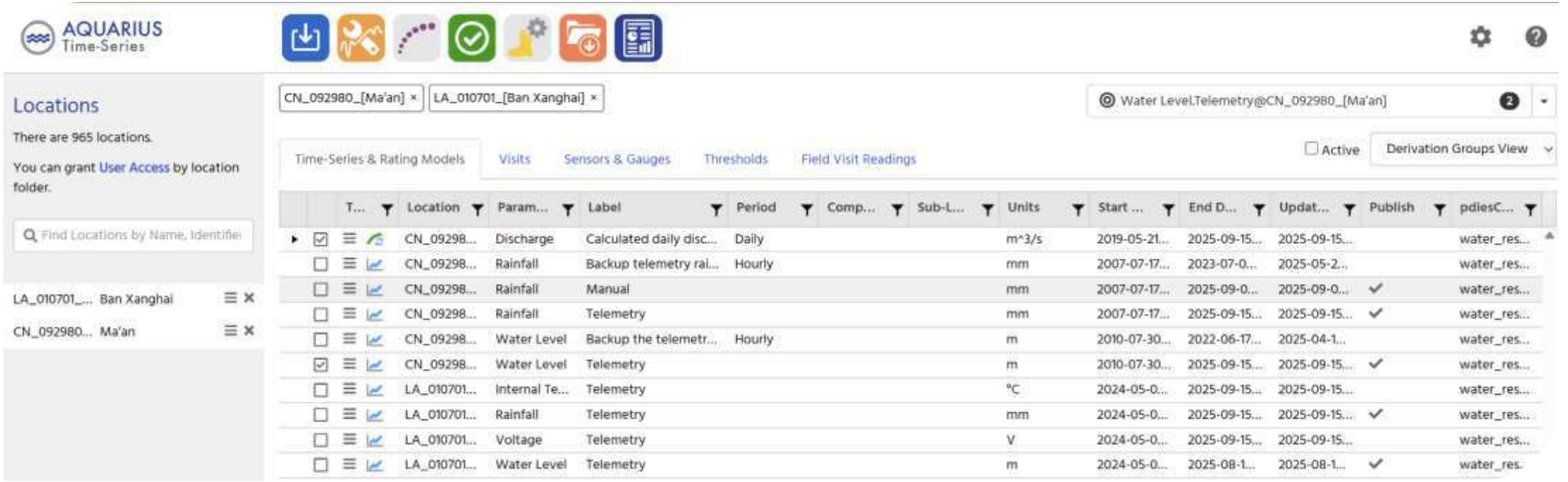
03

MRC-IS Web Service Data Access, Sharing, And Integrations

MRC Reinvigoration: Data, Information, Modelling, Forecasting and Communication Systems



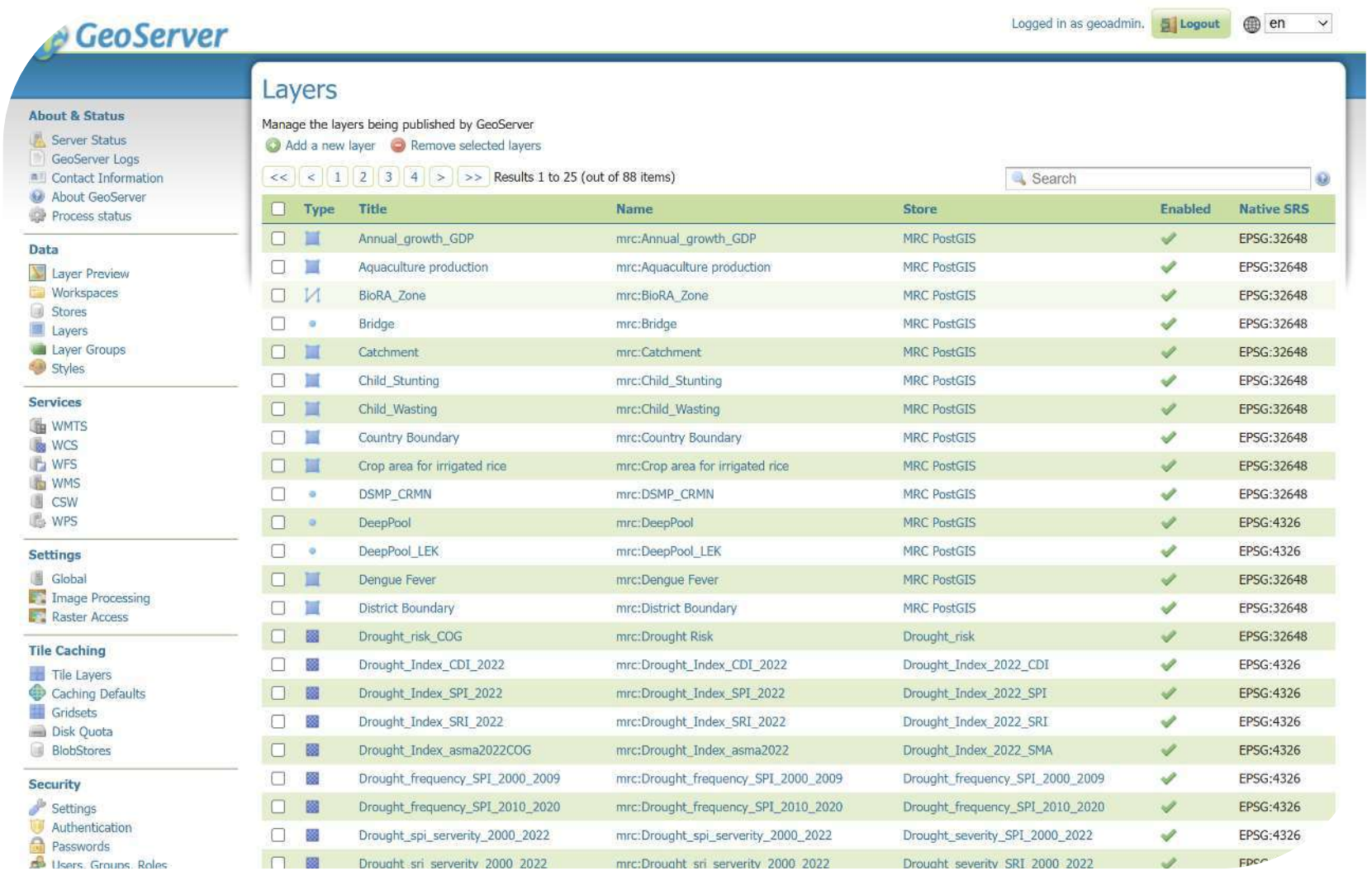
Aquarius Time-Series Springboard Frontend



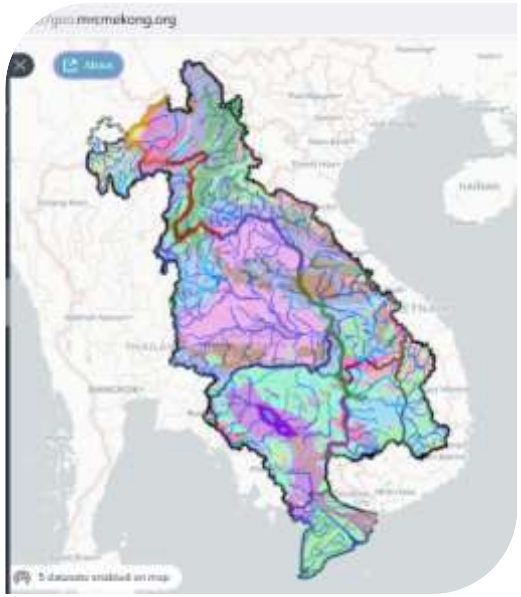


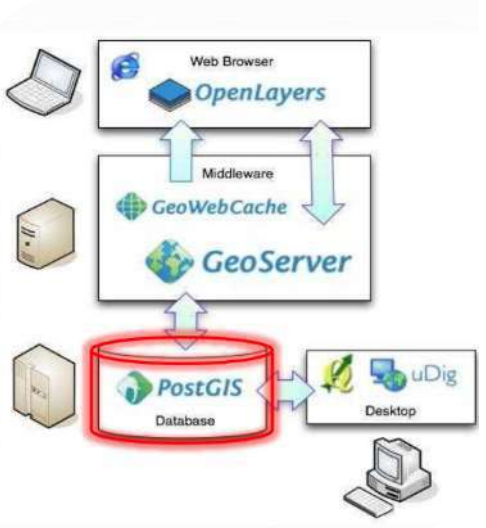


Geospatial Data and GeoServer System



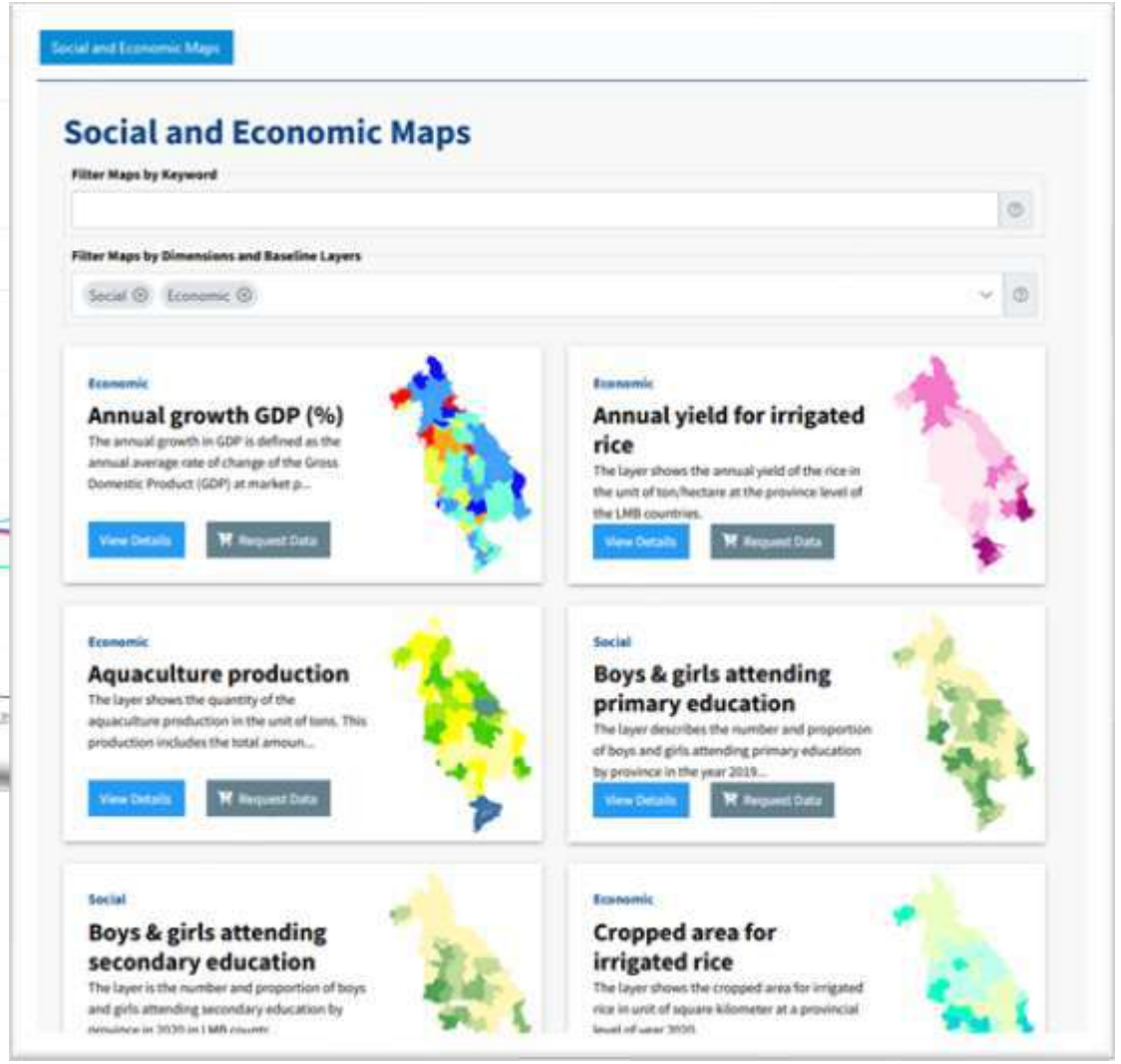
Type	Title	Name	Store	Enabled	Native SRS
	Annual_growth_GDP	mrc:Annual_growth_GDP	MRC PostGIS	✓	EPSG:32648
	Aquaculture production	mrc:Aquaculture production	MRC PostGIS	✓	EPSG:32648
	BioRA_Zone	mrc:BioRA_Zone	MRC PostGIS	✓	EPSG:32648
	Bridge	mrc:Bridge	MRC PostGIS	✓	EPSG:32648
	Catchment	mrc:Catchment	MRC PostGIS	✓	EPSG:32648
	Child_Stunting	mrc:Child_Stunting	MRC PostGIS	✓	EPSG:32648
	Child_Wasting	mrc:Child_Wasting	MRC PostGIS	✓	EPSG:32648
	Country Boundary	mrc:Country Boundary	MRC PostGIS	✓	EPSG:32648
	Crop area for irrigated rice	mrc:Crop area for irrigated rice	MRC PostGIS	✓	EPSG:32648
	DSMP_CRMN	mrc:DSMP_CRMN	MRC PostGIS	✓	EPSG:32648
	DeepPool	mrc:DeepPool	MRC PostGIS	✓	EPSG:4326
	DeepPool_LEK	mrc:DeepPool_LEK	MRC PostGIS	✓	EPSG:4326
	Dengue Fever	mrc:Dengue Fever	MRC PostGIS	✓	EPSG:32648
	District Boundary	mrc:District Boundary	MRC PostGIS	✓	EPSG:32648
	Drought_risk_COG	mrc:Drought Risk	Drought_risk	✓	EPSG:32648
	Drought_Index_CDI_2022	mrc:Drought_Index_CDI_2022	Drought_Index_2022_CDI	✓	EPSG:4326
	Drought_Index_SPI_2022	mrc:Drought_Index_SPI_2022	Drought_Index_2022_SPI	✓	EPSG:4326
	Drought_Index_SRI_2022	mrc:Drought_Index_SRI_2022	Drought_Index_2022_SRI	✓	EPSG:4326
	Drought_Index_asma2022COG	mrc:Drought_Index_asma2022	Drought_Index_2022_SMA	✓	EPSG:4326
	Drought_frequency_SPI_2000_2009	mrc:Drought_frequency_SPI_2000_2009	Drought_frequency_SPI_2000_2009	✓	EPSG:4326
	Drought_frequency_SPI_2010_2020	mrc:Drought_frequency_SPI_2010_2020	Drought_frequency_SPI_2010_2020	✓	EPSG:4326
	Drought_spi_serverity_2000_2022	mrc:Drought_spi_serverity_2000_2022	Drought_severity_SPI_2000_2022	✓	EPSG:4326
	Drought_sri_serverity_2000_2022	mrc:Drought_sri_serverity_2000_2022	Drought_severity_SRI_2000_2022	✓	EPSG:4326

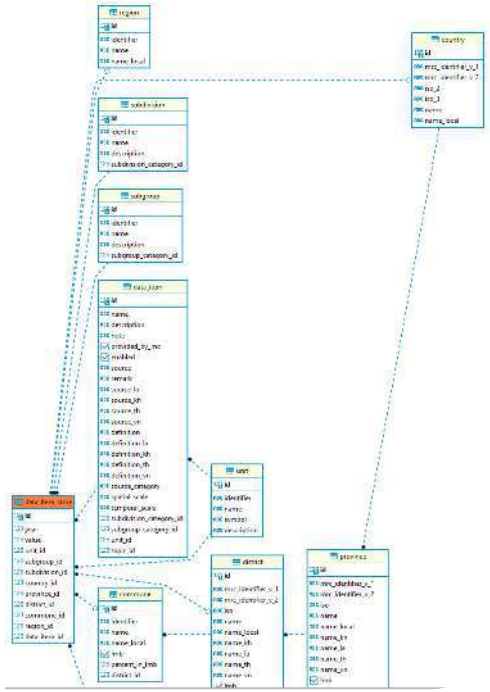




Socio-Economic Database Platform

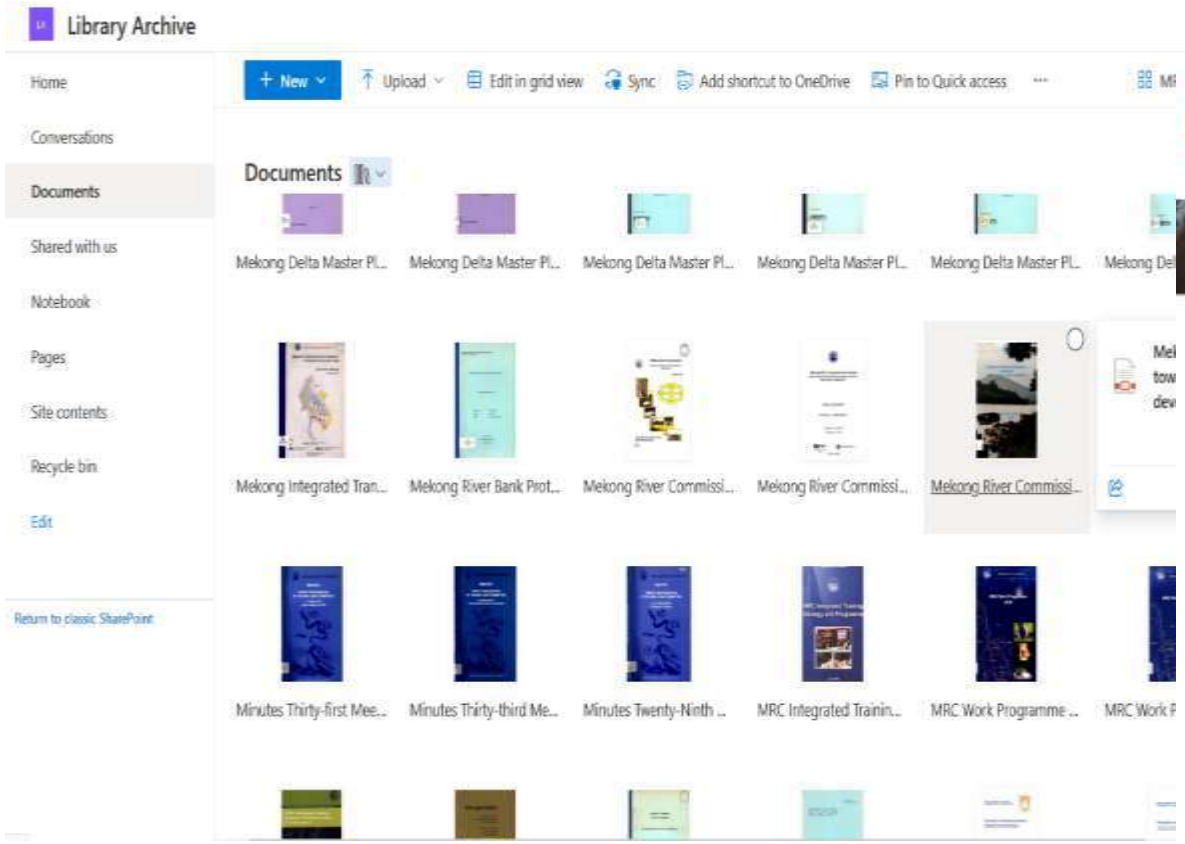


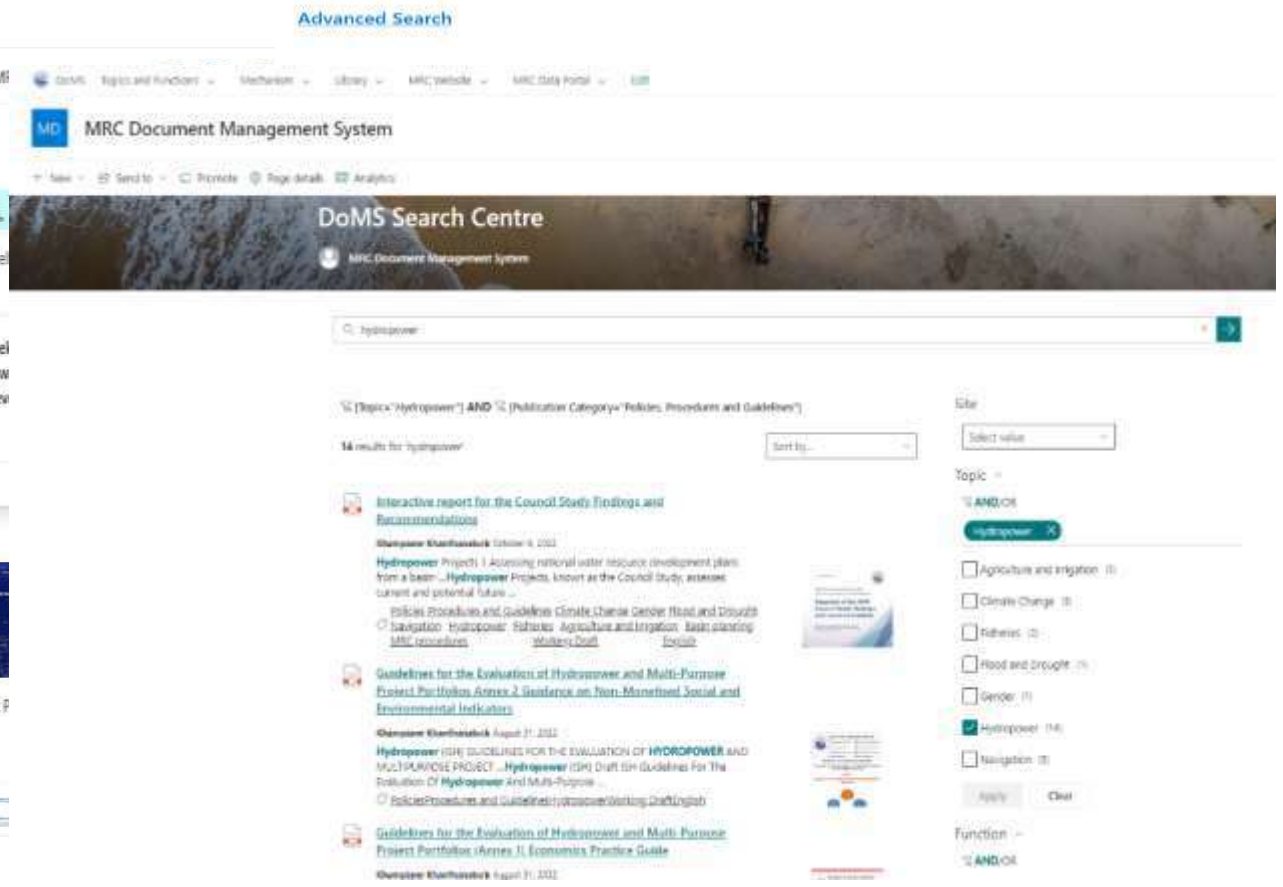




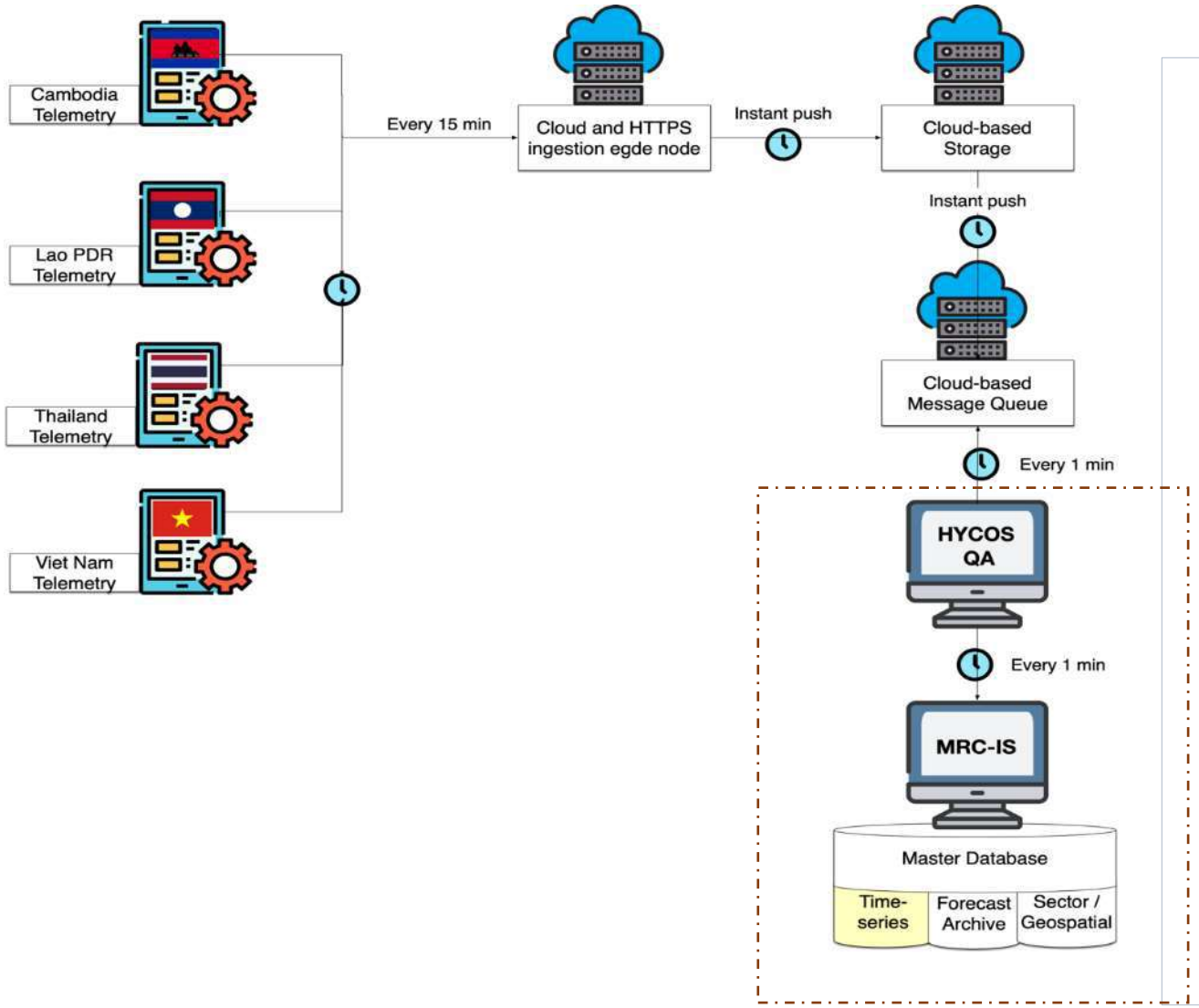
MS SharePoint Cloud based - MRC Document Management System (DoMS)



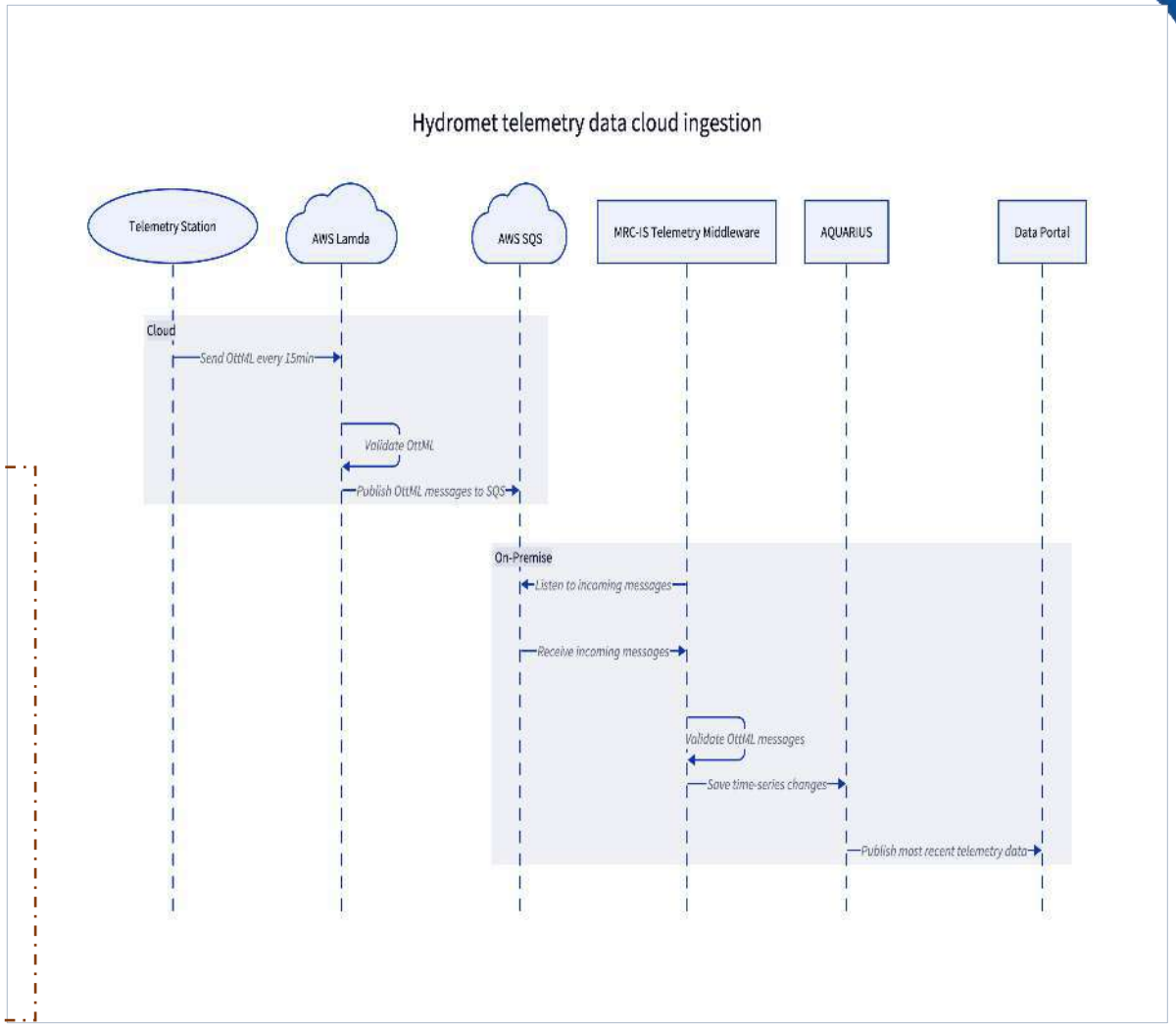


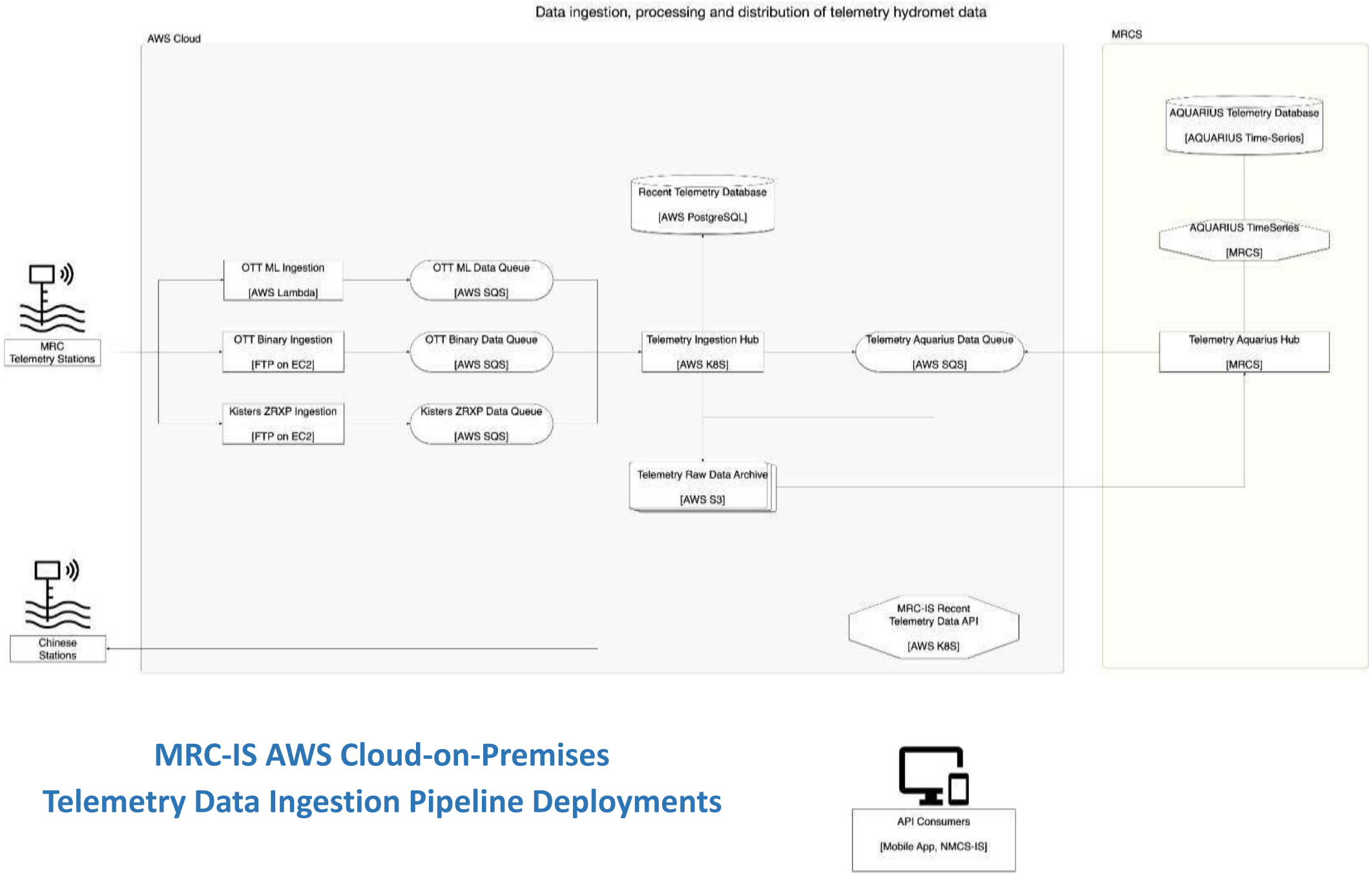


HYCOS Telemetry Data Flows - Cloud Ingestion (HTTPS)



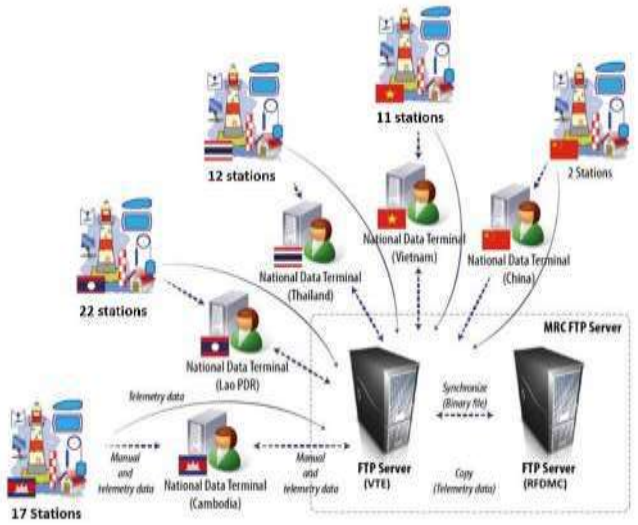
AWS Cloud Ingestion Pipeline





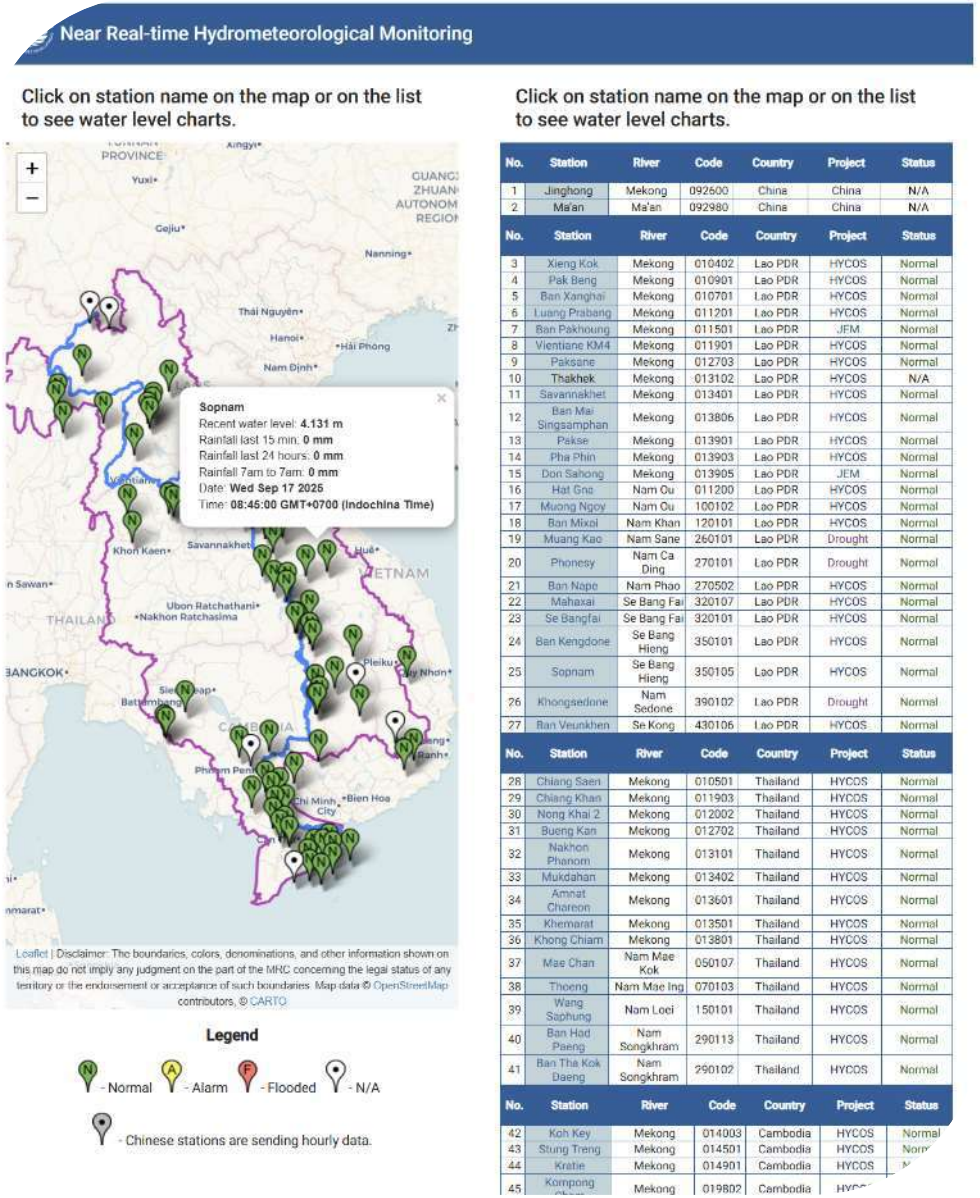
MRC-IS AWS Cloud-on-Premises
Telemetry Data Ingestion Pipeline Deployments

MRC Near Real-Time Monitoring Portal







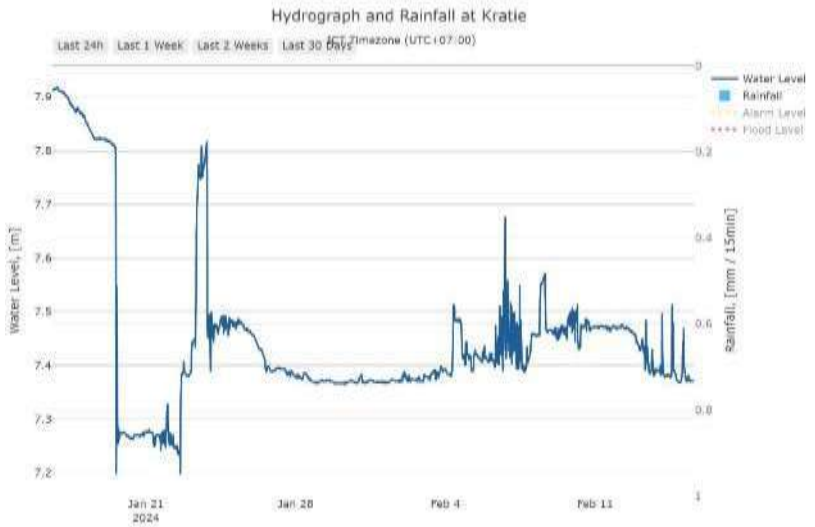


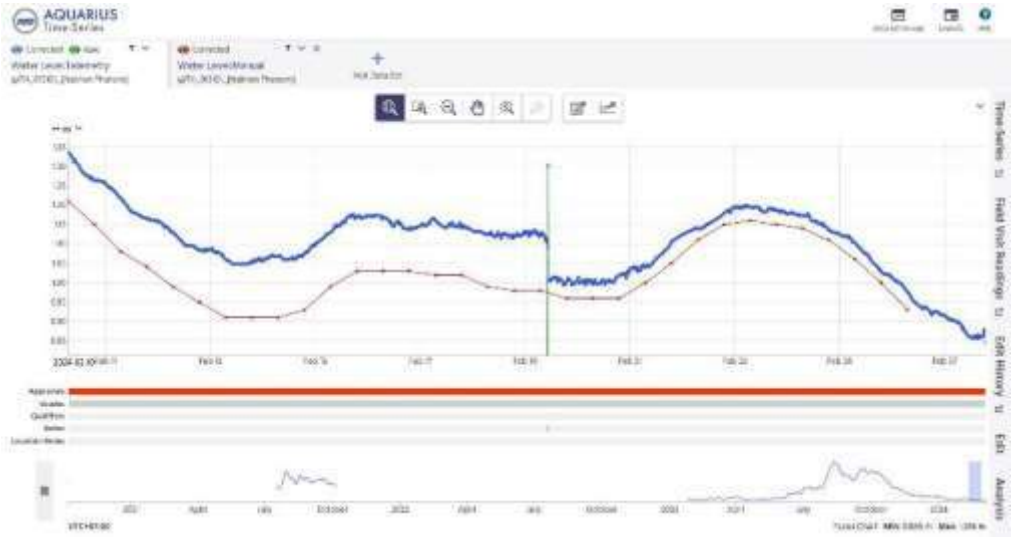
Click on station name on the map or on the list to see water level charts.

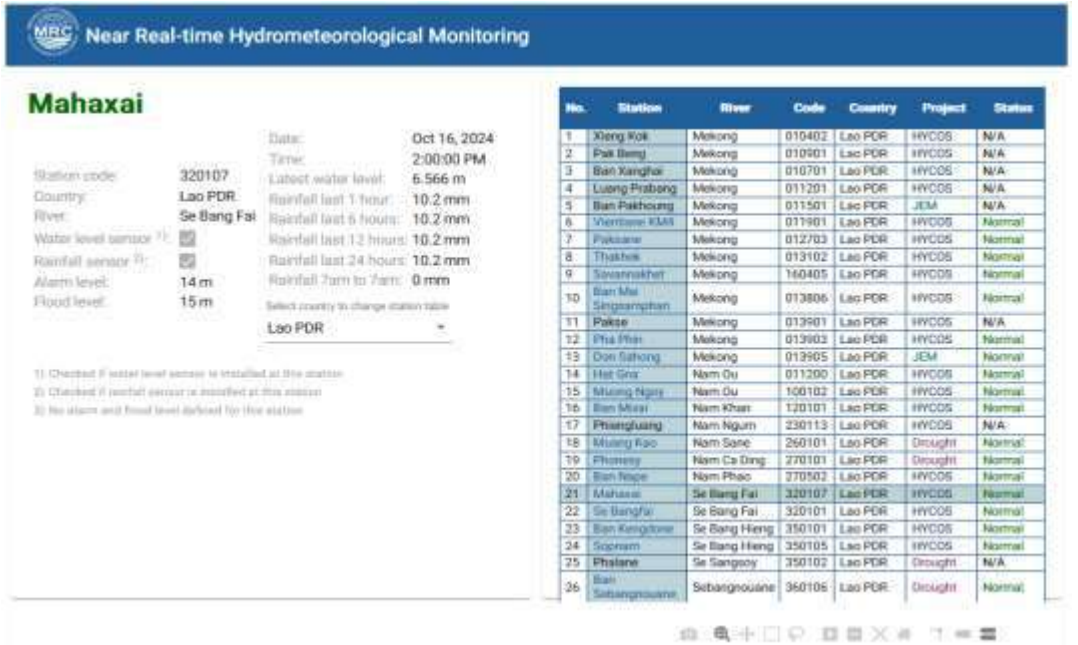
No.	Station	River	Code	Country	Project	Status
1	Jinghong	Mekong	092600	China	China	N/A
2	Ma'an	Ma'an	092980	China	China	N/A
3	Xieng Kok	Mekong	010402	Lao PDR	HYCOS	Normal
4	Pak Beng	Mekong	010901	Lao PDR	HYCOS	Normal
5	Ban Xanghai	Mekong	010701	Lao PDR	HYCOS	Normal
6	Luang Prabang	Mekong	011201	Lao PDR	HYCOS	Normal
7	Ban Pakhoung	Mekong	011501	Lao PDR	JEM	Normal
8	Vientiane KM4	Mekong	011901	Lao PDR	HYCOS	Normal
9	Paksane	Mekong	012703	Lao PDR	HYCOS	Normal
10	Thakhek	Mekong	013102	Lao PDR	HYCOS	N/A
11	Savannakhet	Mekong	013401	Lao PDR	HYCOS	Normal
12	Ban Mai Singsamphan	Mekong	013806	Lao PDR	HYCOS	Normal
13	Pakse	Mekong	013901	Lao PDR	HYCOS	Normal
14	Pha Phin	Mekong	013903	Lao PDR	HYCOS	Normal
15	Don Sahong	Mekong	013905	Lao PDR	JEM	Normal
16	Hat Gno	Nam Ou	011200	Lao PDR	HYCOS	Normal
17	Muong Ngoy	Nam Ou	100102	Lao PDR	HYCOS	Normal
18	Ban Mixai	Nam Khan	120101	Lao PDR	HYCOS	Normal
19	Muang Kao	Nam Sane	260101	Lao PDR	Drought	Normal
20	Phonesy	Nam Ca Ding	270101	Lao PDR	Drought	Normal
21	Ban Nape	Nam Phao	270502	Lao PDR	HYCOS	Normal
22	Mahaxai	Se Bang Fai	320107	Lao PDR	HYCOS	Normal
23	Se Bangfai	Se Bang Fai	320101	Lao PDR	HYCOS	Normal
24	Ban Kengdone	Se Bang Hieng	350101	Lao PDR	HYCOS	Normal
25	Sopnam	Se Bang Hieng	350105	Lao PDR	HYCOS	Normal
26	Khongsedone	Nam Sedone	390102	Lao PDR	Drought	Normal
27	Ban Veunkhen	Se Kong	430106	Lao PDR	HYCOS	Normal
28	Chiang Saen	Mekong	010501	Thailand	HYCOS	Normal
29	Chiang Khan	Mekong	011903	Thailand	HYCOS	Normal
30	Nong Khai 2	Mekong	012002	Thailand	HYCOS	Normal
31	Bueng Kan	Mekong	012702	Thailand	HYCOS	Normal
32	Nakhon Phanom	Mekong	013101	Thailand	HYCOS	Normal
33	Mukdahan	Mekong	013402	Thailand	HYCOS	Normal
34	Amnat Chareon	Mekong	013601	Thailand	HYCOS	Normal
35	Khemarat	Mekong	013501	Thailand	HYCOS	Normal
36	Khong Chiam	Mekong	013801	Thailand	HYCOS	Normal
37	Mae Chan	Nam Mae Kok	050107	Thailand	HYCOS	Normal
38	Thoeng	Nam Mae Ing	070103	Thailand	HYCOS	Normal
39	Wang Saphung	Nam Loei	150101	Thailand	HYCOS	Normal
40	Ban Had Paeng	Nam Songkhram	290113	Thailand	HYCOS	Normal
41	Ban Tha Kok Daeng	Nam Songkhram	290102	Thailand	HYCOS	Normal
42	Koh Key	Mekong	014003	Cambodia	HYCOS	Normal
43	Stung Treng	Mekong	014501	Cambodia	HYCOS	Norm
44	Kratie	Mekong	014901	Cambodia	HYCOS	N
45	Kompong	Mekong	019802	Cambodia	HYC	

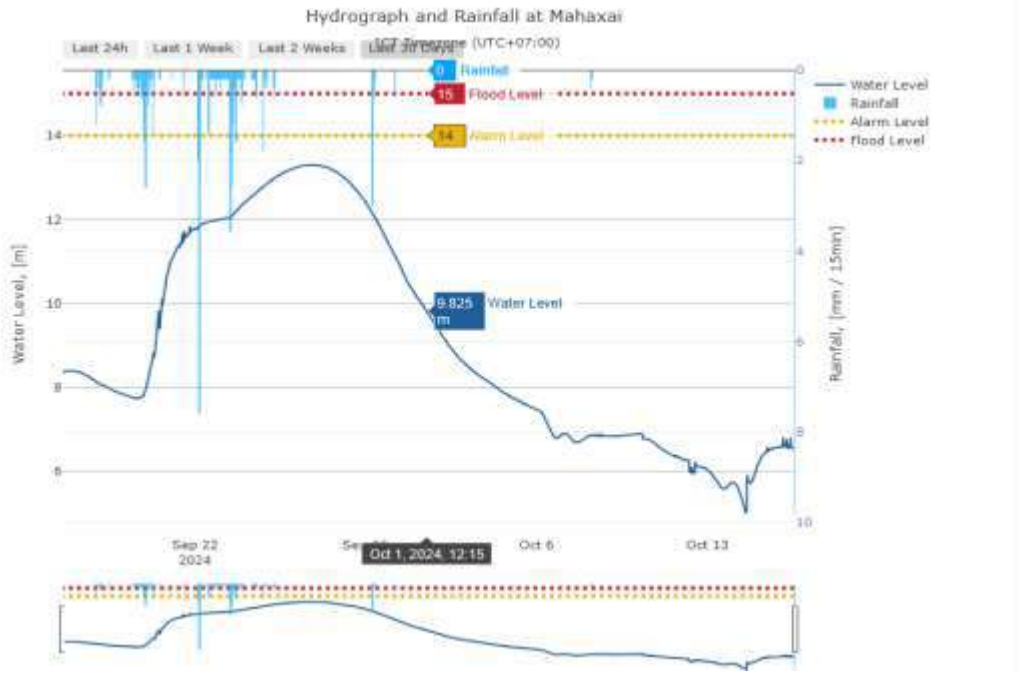
MRC Near Real-Time Monitoring and Data QA/QC Services

https://monitoring.mrcmekong.org

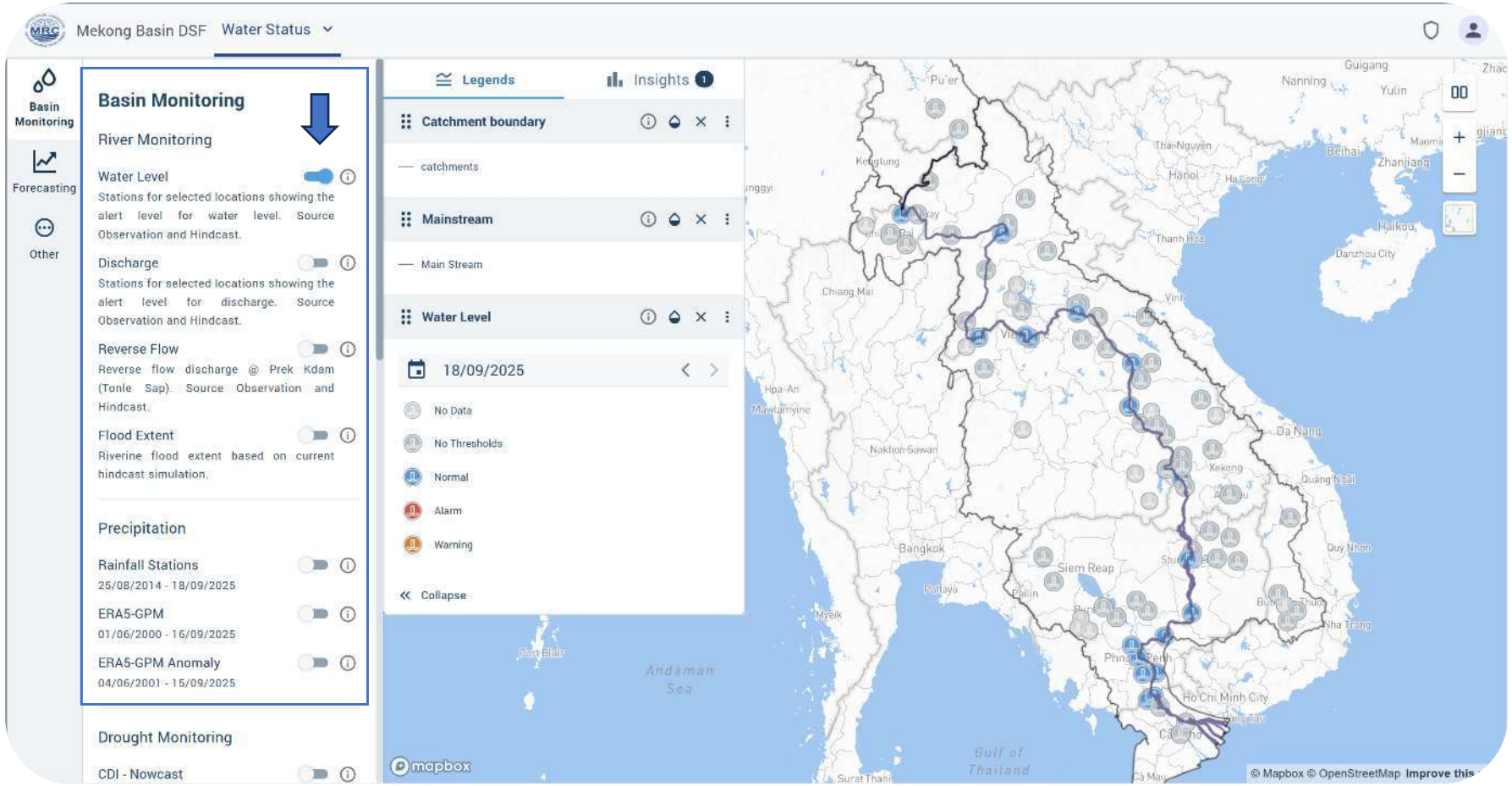






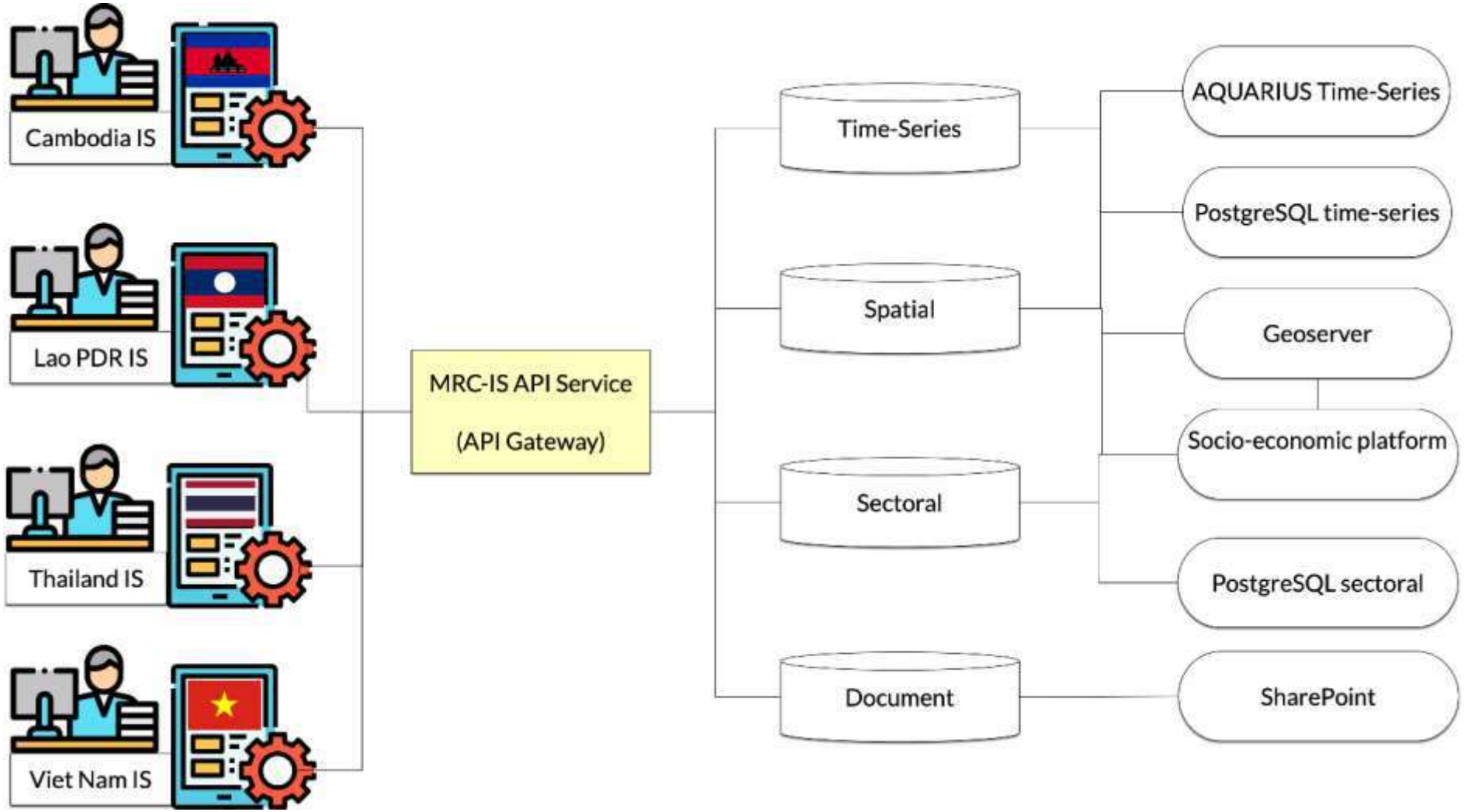


Water Status Dashboard

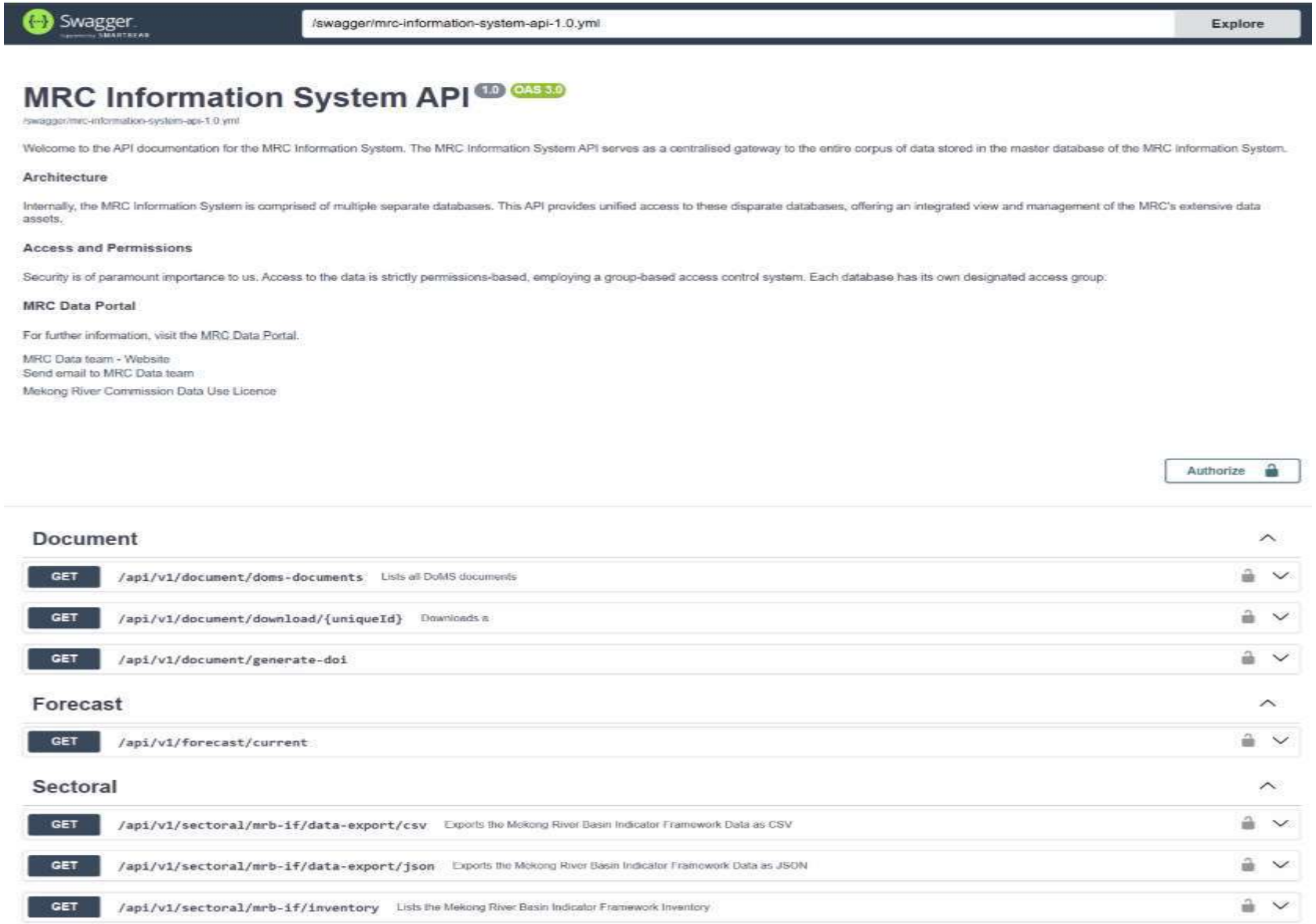


WSD (internal use) can be further explored via https://dsf.mrcmekong.org/

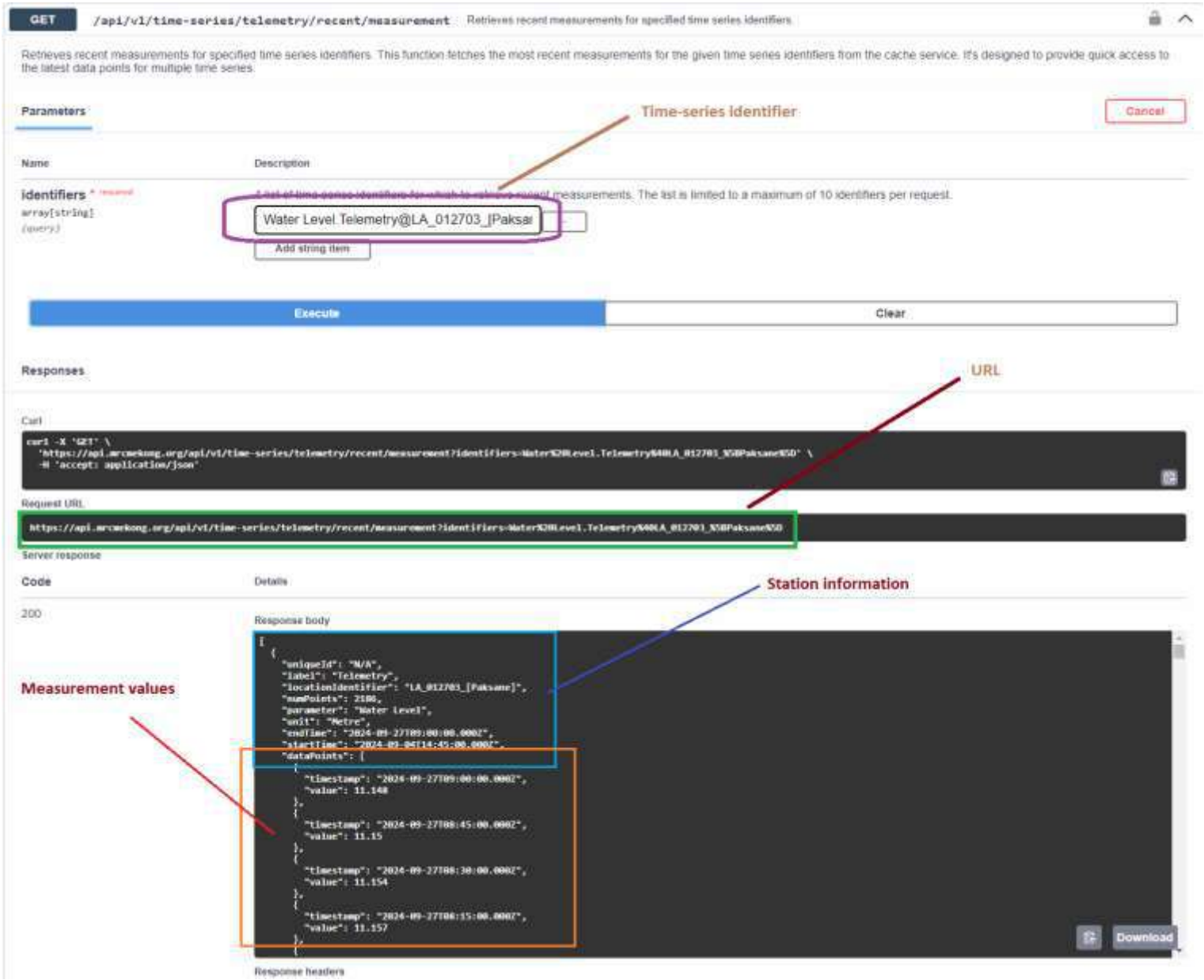
MRC-IS API Databases
(on AWS-Cloud and Premises)



MRC-IS Web Service Swagger-Interface



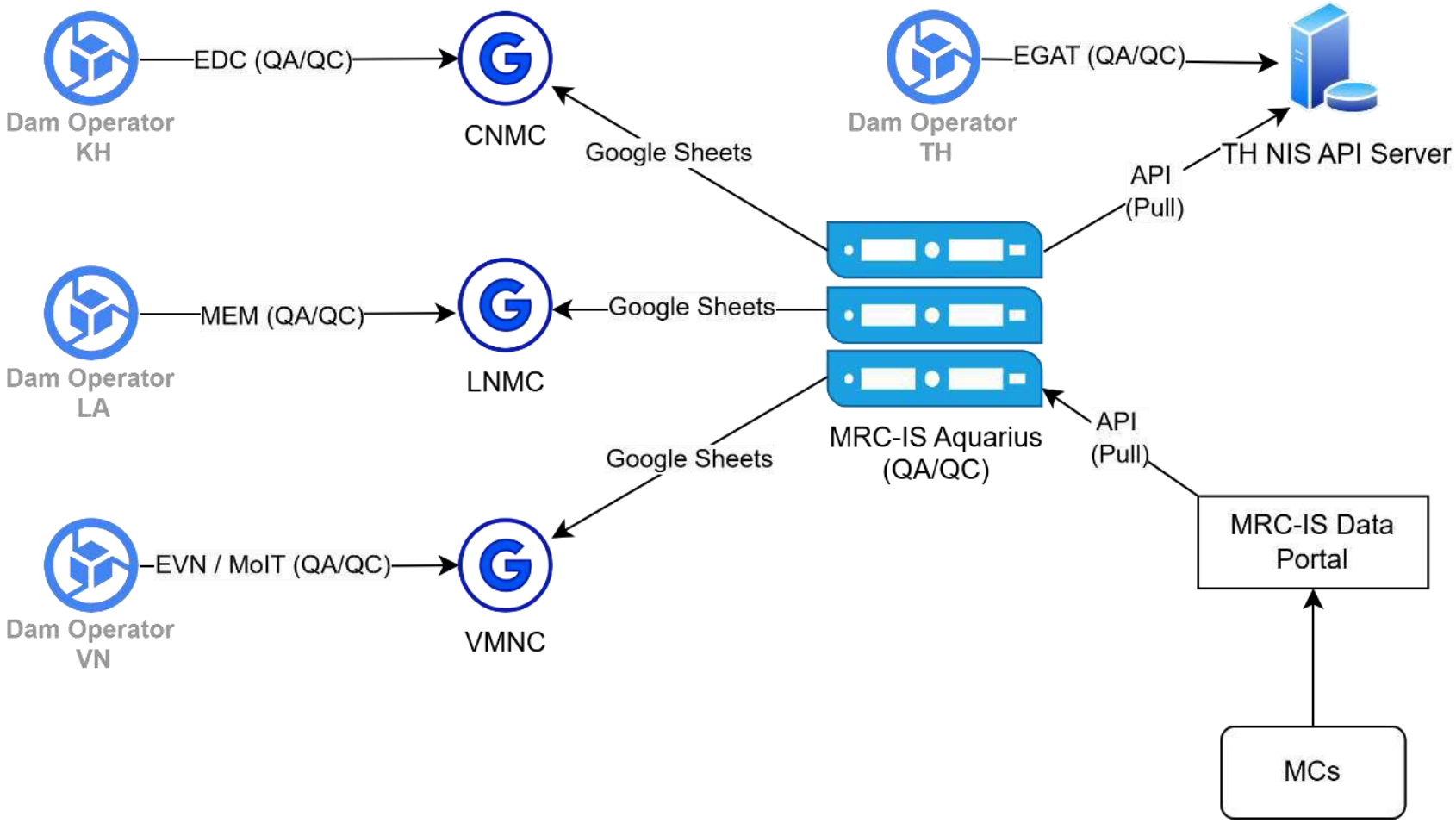
MRC-IS End-Points API Data Structures





04 MRC Dam Operational Data Sharing

Phase I Lower Mekong Dam Operational Data Sharing Flow



Dam Operational Data Source (Phase I : Google Sheets Links "Internal Use")

Country	Google Sheets	API
Cambodia	✓	✗
Lao PDR	✓	✗
Thailand	X	✓
Viet Nam	✓	✗

Below are the shared data links for each country (for reference and internal use):

- Cambodia:
  - https://docs.google.com/spreadsheets/d/1g9r20kM11XgSIO31BMa-i1YPUuS0V8fPnJAD6P-UL8I/edit
- Lao PDR:
  - https://docs.google.com/spreadsheets/d/1S46sC2Vlt4yPNjtED7wm-wa4P1apybPgwmKCe3rCsBw/ec
- Thailand (API converted to Google link for simplified tracking):
  - https://docs.google.com/spreadsheets/d/1Ien-thuyjr5ubIFLazbKX7Xq6RBQbIMdfZd12Ogf1KM/edit?
- Viet Nam:
  - https://docs.google.com/spreadsheets/d/10xyiJie9iKUrJ8kK7Cd3Nyoir7y6fE0YZ7FoRD3uE_E/edit?g

THAILAND: Data for Pak Mun Dam to be retrieved from API server endpoint https://api.tnmc-is.org/v1/dam/pakmun

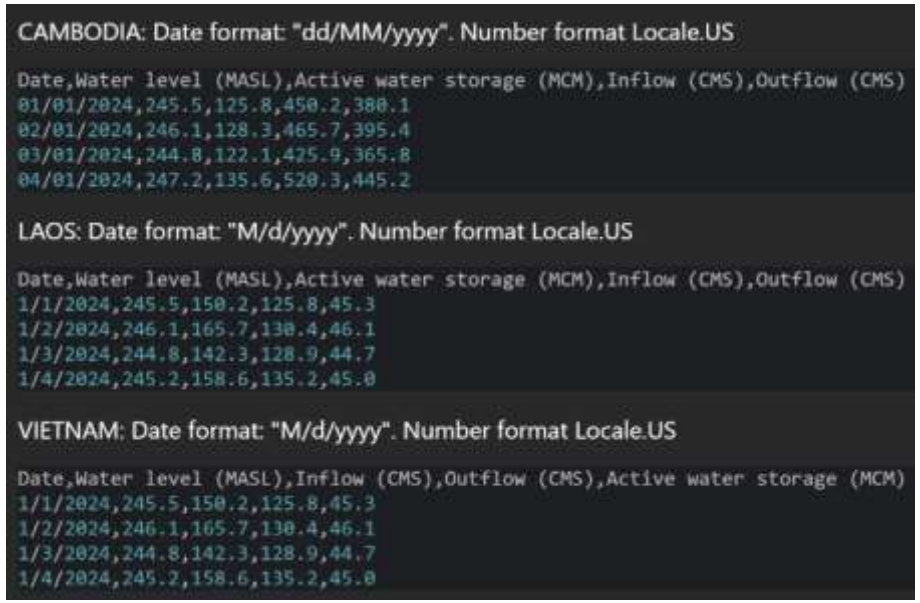
Example of Data Returned from Thailand API Server (JSON Format)


```
{
  "id": 1,
  "name_th": "เขื่อนปากมูล",
  "name_en": "PAK MUN DAM",
  "department": "EGAT",
  "dam_lat": "15.2820463275",
  "dam_lon": "105.4682167824",
  "timeseries": [
    {
      "id": "9244476c-617c-44c3-a13a-2a1953755358",
      "measure_time": "2025-10-02T00:00:00",
      "water_level": 102.98,
      "tailwater": 102.93,
      "inflow": 0,
      "released": 0,
      "spillway": 343.29,
      "update_at": "2025-10-02T02:30:11.789426"
    },
    {
      "id": "57ec73fc-0fe5-4e89-ba98-137c650aa6f8",
      "measure_time": "2025-10-01T00:00:00",
      "water_level": 102.78,
      "tailwater": 102.73,
      "inflow": 0,
      "released": 0,
      "spillway": 336.25,
      "update_at": "2025-10-02T02:30:11.789426"
    },
    {
      "id": "225d15be-0349-4fbe-9cc9-bccaa1e8c7a3",
      "measure_time": "2025-09-30T00:00:00",
      "water_level": 102.59,
```


THAILAND: Data for Pak Mun Dam to be retrieved from API server endpoint https://api.tnmc-is.org/v1/dam/pakmun

Phase I Dam Operational Data Sharing Lessons Learned

- Google Sheets Links for Cambodia, Lao PDR and Viet Nam
  - Manual processes (e.g., Google Sheets) caused inconsistencies, delays, and data gaps (e.g., weekends, holidays).
  - Daily rather than real-time/hourly data limited responsiveness.
  - QA/QC was inconsistent, with varying formats and incomplete automation: lack of data column format validation and lack of edit lock or audit trail



CAMBODIA: Date format: "dd/MM/yyyy". Number format Locale.US

```
Date,Water level (MASL),Active water storage (MCM),Inflow (CMS),Outflow (CMS)
01/01/2024,245.5,125.8,450.2,380.1
02/01/2024,246.1,128.3,465.7,395.4
03/01/2024,244.8,122.1,425.9,365.8
04/01/2024,247.2,135.6,520.3,445.2
```

LAOS: Date format: "M/d/yyyy". Number format Locale.US

```
Date,Water level (MASL),Active water storage (MCM),Inflow (CMS),Outflow (CMS)
1/1/2024,245.5,150.2,125.8,45.3
1/2/2024,246.1,165.7,130.4,46.1
1/3/2024,244.8,142.3,128.9,44.7
1/4/2024,245.2,158.6,135.2,45.0
```

VIETNAM: Date format: "M/d/yyyy". Number format Locale.US

```
Date,Water level (MASL),Inflow (CMS),Outflow (CMS),Active water storage (MCM)
1/1/2024,245.5,150.2,125.8,45.3
1/2/2024,246.1,165.7,130.4,46.1
1/3/2024,244.8,142.3,128.9,44.7
1/4/2024,245.2,158.6,135.2,45.0
```

- Lack of a Standardized Data Format: Each country uses its own structure—column names, date formats, decimal formats, and conventions vary widely.
- Uncontrolled Data Editing: Countries treat Google Sheets as a draft workspace, editing data post-submission.
- No Change Tracking or Audit Trail: There's no mechanism to track who changed what and when.
- Cultural and Regional Format Differences: Decimal and date formats vary by country (e.g., 1,000.50 vs 1.000,50; MM/DD/YYYY vs DD/MM/YYYY).
- Lack of Data Validation Before Submission: Data is often incomplete, incorrectly formatted, or inconsistent.

Phase I Dam Operational Data Sharing Lessons Learned

- As you can see, there is no common format. Ideally, moving forward, there should be one agreed CSV template. Please note that column names, date formats, decimal formats—everything—must be very strictly specified. For example, there are differences between US and UK decimal formats, and the countries are not using these formats consistently.
- All MCs should use the same date format, the same decimal number format, consistent column naming, uniform values for missing data, and a shared convention regarding whether all fields are mandatory and how to handle blank values.
- Another issue that has already arisen is that countries are editing data directly in the Google Sheet, unaware that the data cannot updated in Aquarius. Once data is retrieved, it becomes final on the Aquarius side. Therefore, only final data should be published in the Google Sheet. However, countries are treating the Sheets as a temporary form and continue to edit the data without providing any proper means of tracking changes.



05 Key Messages

Takeaways

- ☑ MRC Procedures improve interoperability and efficiency.
- ☑ Data integration architecture should combine databases, file exchange mechanisms, APIs, and standardised services.
- ☑ Effective governance is essential for sustainable data integration.
- ☑ Clear access control and data-sharing arrangements balance openness with security.
- ☑ Metadata and data documentation remain critical for long-term usability.



06 Discussion and Questions

Questions

1. Data Description and Metadata

- How do you currently document and describe existing datasets?

2. National Procedures for Data Access

- What procedures currently facilitate data access at the national level?

3. Governance and Security

- What are the main barriers to data sharing?

Thank you!



