SWIC

स्वीयजलं अवैहि
NWIC

SWIC

Concept Note

on

State Water Informatics Centre (SWIC)

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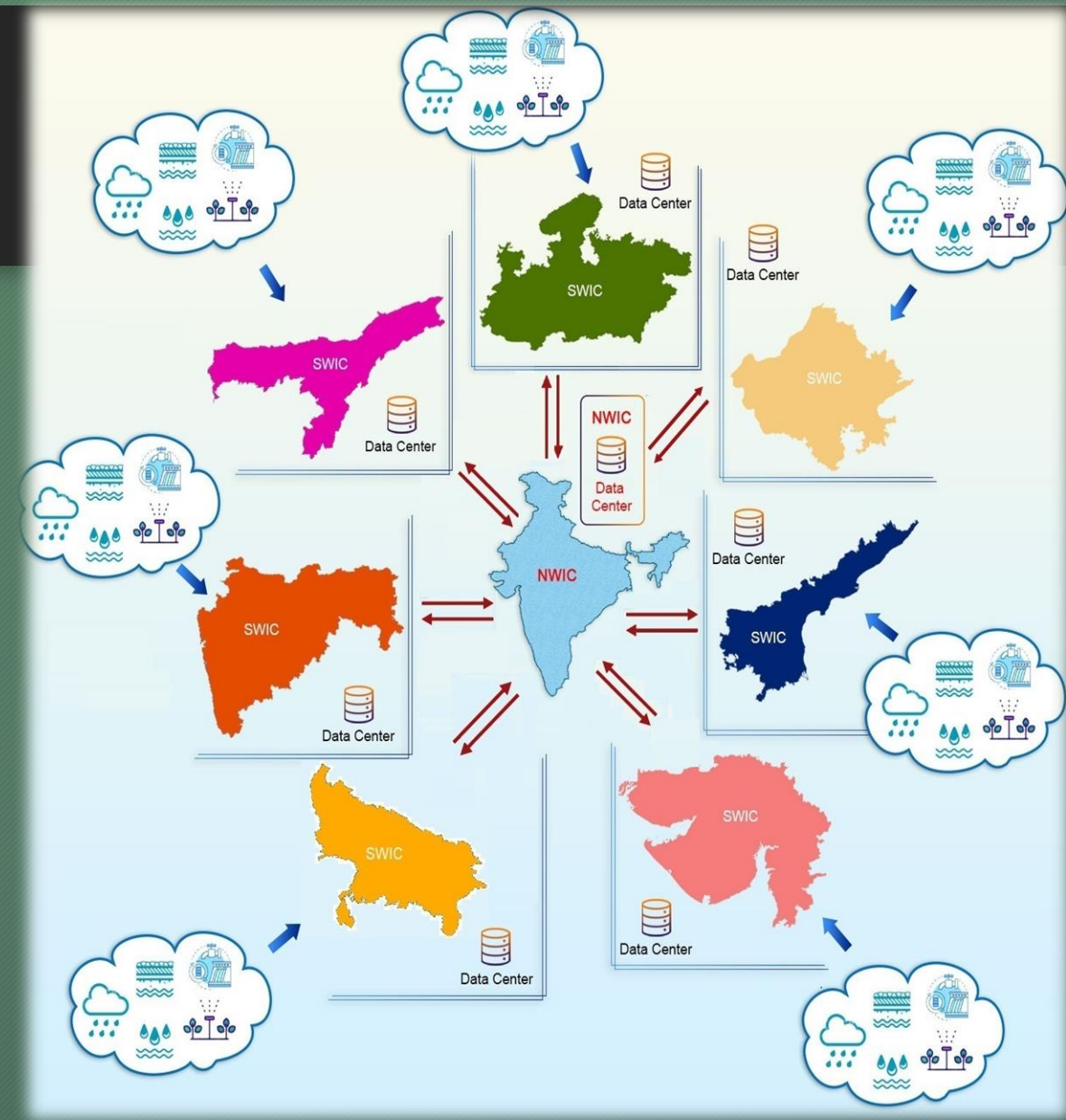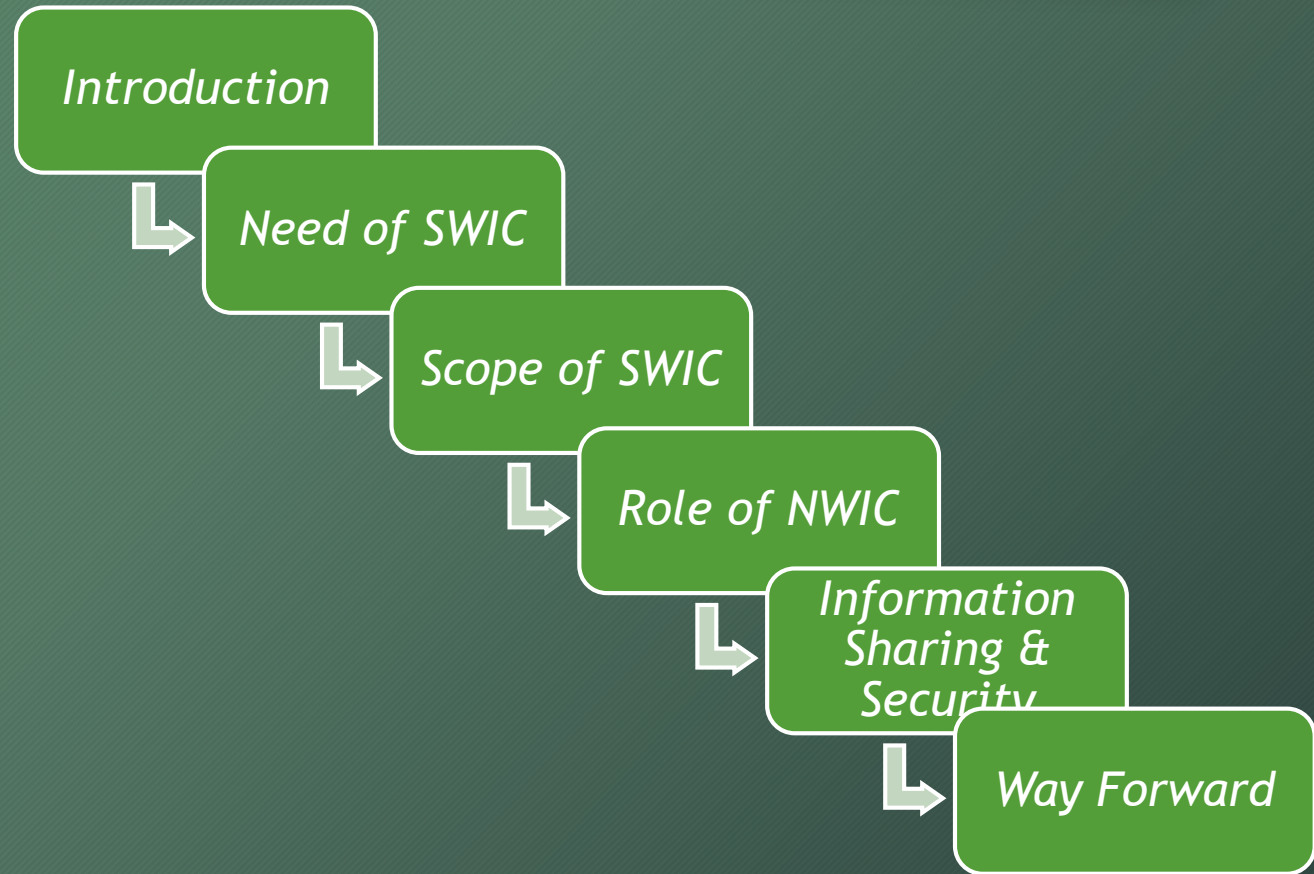
1. Introduction

- National Water Policy (2002 & 2012)

>need of effective and economical management

>by intensifying research efforts in the use of remote sensing technologies

>develop a standardized national information system with a network of data banks and databases

>integrating and strengthening the existing central and state agencies and improving the quality of data and the processing capabilities

>free exchange of data among various agencies

>bring all hydrological data, in the public domain

1.1 NWIC

- Established on 28th March 2018 under the ministry of Jal Shakti
  - To collect, collate and process Hydrologic data regularly from all over the country, conduct the preliminary processing, and maintain in an open and transparent manner on a GIS platform
- NWIC manages and handle
  - India WRIS (www.indiawris.gov.in)
    - single window solution for all water resources data and provides information in a standardized national GIS framework
  - WIMS (https://india-water.gov.in)
    - web enabled water resources data entry system for both surface and ground water resources.

Water Resources Data

Collect

Collate

Process

Publish

Maintain

1.2 India-WRIS modules

NWIC

Dynamic Modules

- Rainfall (mm)
- Reservoir (Level)
- River Monitoring (Level & Discharge)
- Ground Water Level (BGL Meter)
- Water Quality – Groundwater
- Water Quality – Surface water
- Evapotranspiration (mm)
- Soil Moisture (%)
- Minor Irrigation Tanks

Semi Dynamic Modules

- Groundwater Resources
- Snow-Glacial Lake
- Reservoir- Sediment studies
- Water Resources Project
- Minor Irrigation Census
- LULC
- Wasteland
- Land Degradation
- Flood Inundation
- Drought affected areas
- Reported Extreme Temperature, Rainfall & Earthquake Events
- Artificial Recharge Structure -Viewer

Static Modules

- Exploration Details/Litholog
- Aquifer-2D
- Surface Water Bodies
- River Information
- Socio Economic Census
- Groundwater Prospects
- Region-Agro-Climatic / Agro Ecological
- Soil Type
- Water Logging & Soil Salinity
- Wetlands
- Inland Navigation Waterways
- Inter-Basin Transfer Links
- Storm Surge Study

Tools + Utilities

- Online Web Editor
- Artificial Recharge Structure-Data Entry
- Data / Report Download
- Data Availability
- Geo Viewer
- WRIS WIKI
- Metadata
- District at a glance
- Probable Maximum Precipitation Atlas
- Surface Water Audit

1.3 WIMS

User Management

Network Monitoring Management

Flood Forecast Module

Water Quality Module

Sediment Module

Telemetry Management

Ground Water Exploration

Geophysical investigation

Pumping Test

Master Module

2. Need of SWIC

- States collect enormous micro level data and the data is collected by various departments

- No dedicated body to
    - → act as a single data repository
    - → formulate policy towards uniform data acquisition, standardization, validation, analysis and dissemination
    - → establish a mechanism for coordination among data generating organizations, users, planners, academicians and all other stake holders.

- To achieve real improvement in water resources management

- Data will be available to all the stakeholders at a single platform
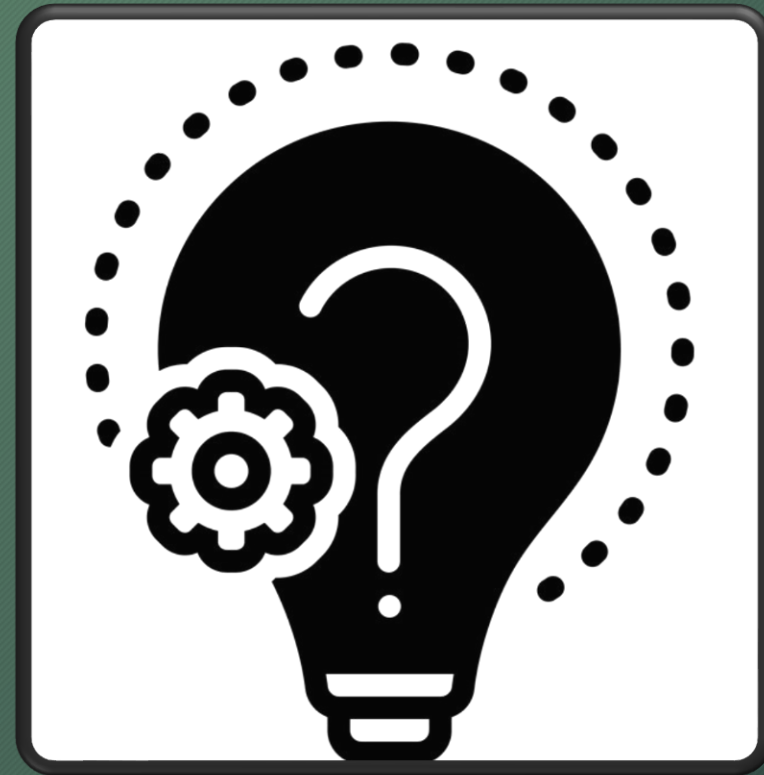
2.1 Challenges in setup of SWIC

- Domain specific bodies collects, monitors, consolidate the data related to their respective jurisdictions
  - lack of coordination among the domain specific bodies

- Data aggregation from different organization is humongous task
  - non-uniformity in data collection, data format, attribute identification, frequency of data collection etc. thus causing difficulties for data conversion, validation, integration and consolidation at one platform.

- Overlapping of data

- Lack in technical expertise since development of IT enabled GIS platforms have not been the core functions of water resources department conventionally

- No defined funding mechanism

- Lack of state level strategy for IWRM and allied themes

2.2 Benefits

Standards & Policy

Quick Deployment

Reusable & Interoperable

Knowledge Centre

Cost-Effective

Ease of Access

2.3 Proposed Solution

Status of Establishment at States					Time Series		Spatial data		Software Selection		Telemetry Data	Environment	Hosting
	Case	DBMS	GIS	Portal	Parameters in WIMS	Parameters not in WIMS	Layers in NWIC	Layers not in NWIC	Database	GIS	Sensor Integration	Development	Platform
Model 1 (States in the process of developing IT Systems/ State-WRIS)	I	×	×	×	Station management and data entry in NWIC-WIMS.	Station management and data entry in State WIMS on standard and uniform schema prepared by NWIC	Use India-WRIS layers.	NWIC will create new layer with standardize schema	Postgres (Free & open-source software)	ESRI-ArcGIS NWIC shall procure additional ArcGIS Enterprise licenses as per need. However, ArcGIS desktop licenses shall be procured by States	Telemetry sensors shall be integrated with NWIC-WIMS up to Mongo-DB and thereafter, NWIC-WIMS parameter will go to NWIC-WIMS (Postgres) and rest will go to State-WIMS	Shall be provided by NWIC	Same cloud as being used by NWIC for hosting of India-WRIS & NWIC-WIMS
	II	✓	×	×									
	III	✓	×	✓									
	IV	×	✓	×			Integrate State data in India-WRIS layers and use India-WRIS GIS data						
	V	✓	✓	×									
Model 2 (States Online)	VI	✓	✓	✓	Station management and data entry in NWIC-WIMS	Station management and data entry in State platform. Align schema as per National standards	Can use India-WRIS layers through API whenever required	Follow the schema by NWIC.	As per State policy	As per State policy	State can use existing platform or chose NWIC platform	State shall arrange its own	As per State policy

2.3.1 Model1 (Case I to V)

- A. Database Setup
  - I. Temporal Data
    - a) Parameters hosted in NWIC-WIMS
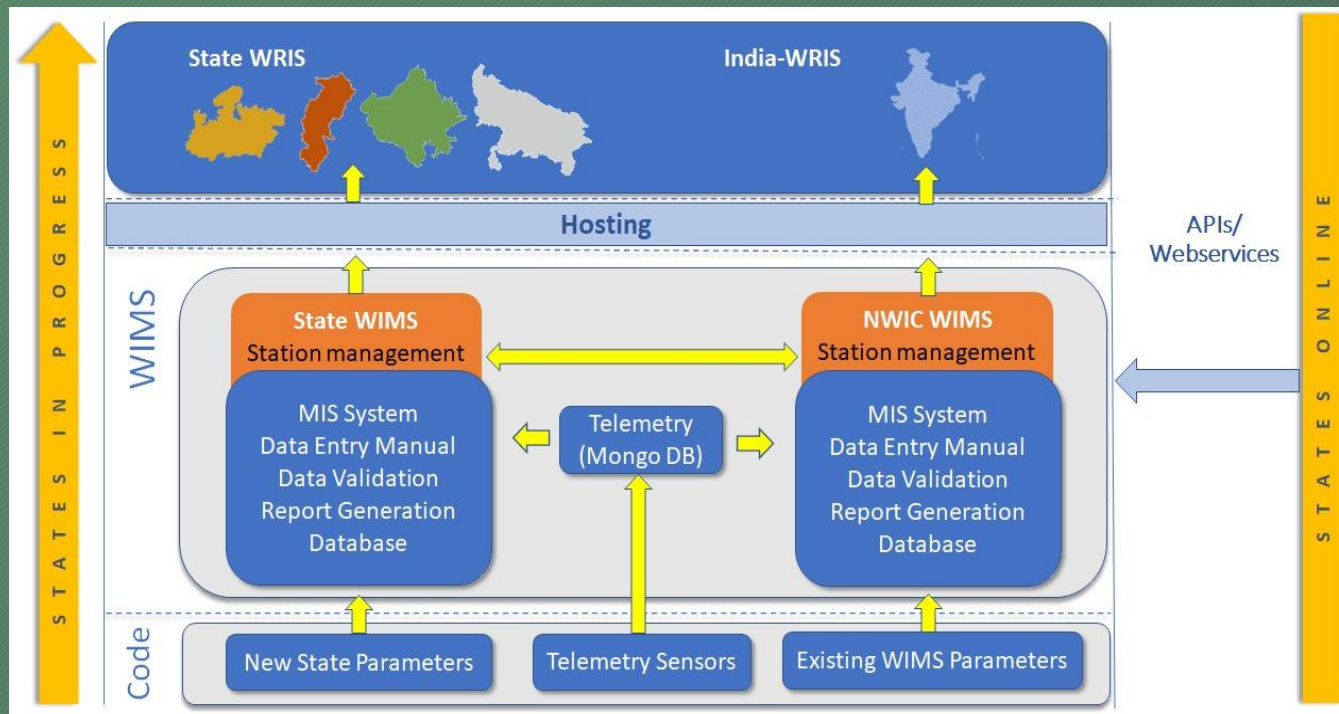
S. No.	Parameter available in WIMS
1	Evaporation
2	Humidity
3	Atmospheric Pressure
4	Rainfall
5	Solar Radiation & Sunshine
6	Atmospheric Temperature
7	River Sedimentation
8	Snow parameters (Snow Stake, Snow water equivalents & Snowfall
9	Surface Water Quality parameters
10	Wind direction & speed
11	River & Spring discharge
12	Ground water level
13	Reservoir Evaporation
14	Reservoir Water level
15	Reservoir Storage
16	Reservoir Inflow
17	Reservoir Outflow
18	Diff. inflow & losses
19	Ground Water Quality parameters

Parameters available in WIMS would continue to be hosted on WIMS irrespective of whether data generation cost is funded by Centre/State or nature of data generating agency i.e., central/State Government.

- Parameters not captured in NWIC-WIMS
  - States inform such parameters to NWIC
  - NWIC will create a standard schema
  - Parameters shall be stored in database created exclusively for state.
- Each state would have state level WIMS similar to NWIC-WIMS.
- Schema prepared by NWIC→ shared across all State-WIMS
  - to maintain uniformity of standards
  - To help in interoperability and reusability of applications developed by states.
- Each Station shall have a unique ID created & mapped into both NWIC-WIMS and State WIMS. Whenever data is generated by any station, it shall be updated in the respective platform.
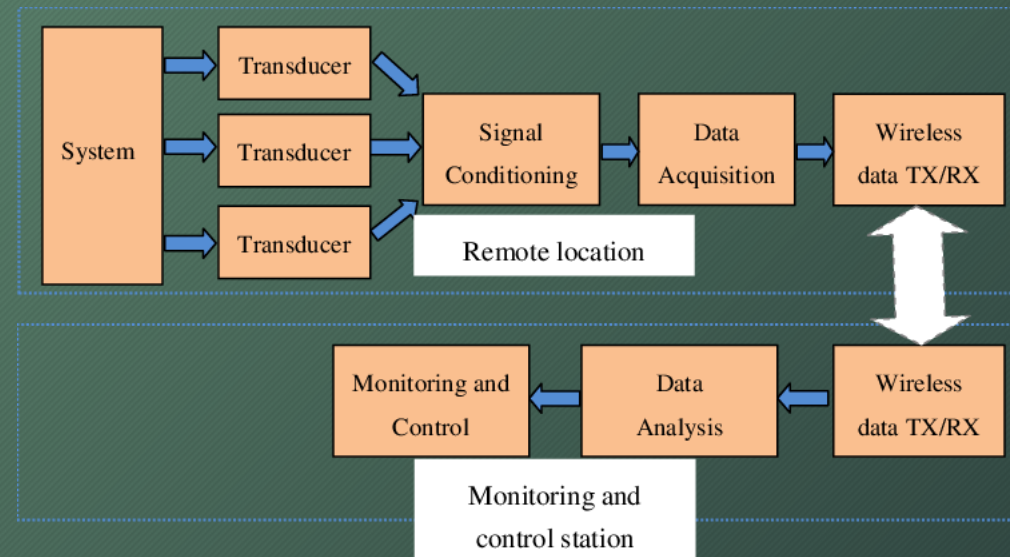
STATE-WIMS

II. Spatial Data
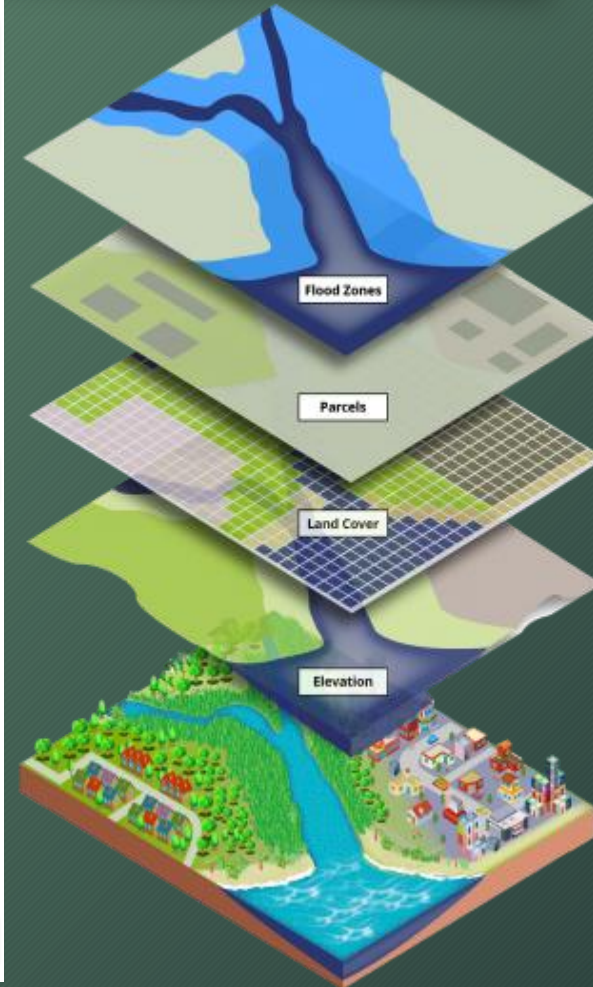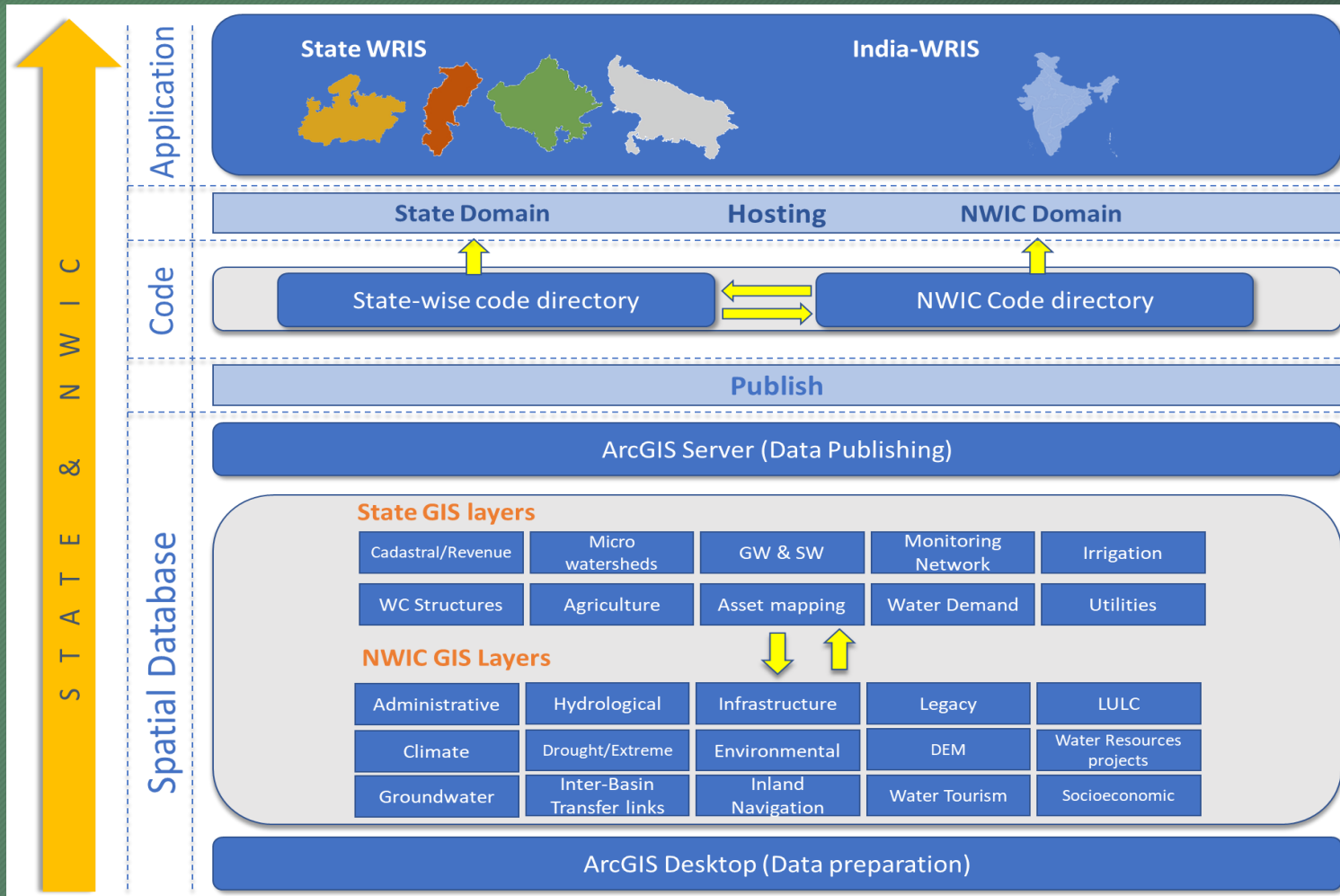
- Data shall continue to be received at MongoDB database of NWIC-WIMS and shall be stored in the NWIC-WIMS or State-WIMS as the case may be.

- Benefit→ complex mechanism→ already in place and functional

- CWC has setup ERS at 3 locations

B. Software selection & C. Hosting Platform

NWIC

> DB: Postrgres for spatial and time series data

> GIS: ESRI ArcGIS Enterprise version & Desktop version

> Front-end & Backend: update with newer technologies and relevancy of various options fulfilling our changing needs

> IT platform: Server & Storage for production environment by NWIC

> Website: States have to register domain name <statename>-wris.gov.in

D. Development Environment

- Separate for each state shall be provided by NWIC
- State can develop their own code if required
- Centralized Code Directory
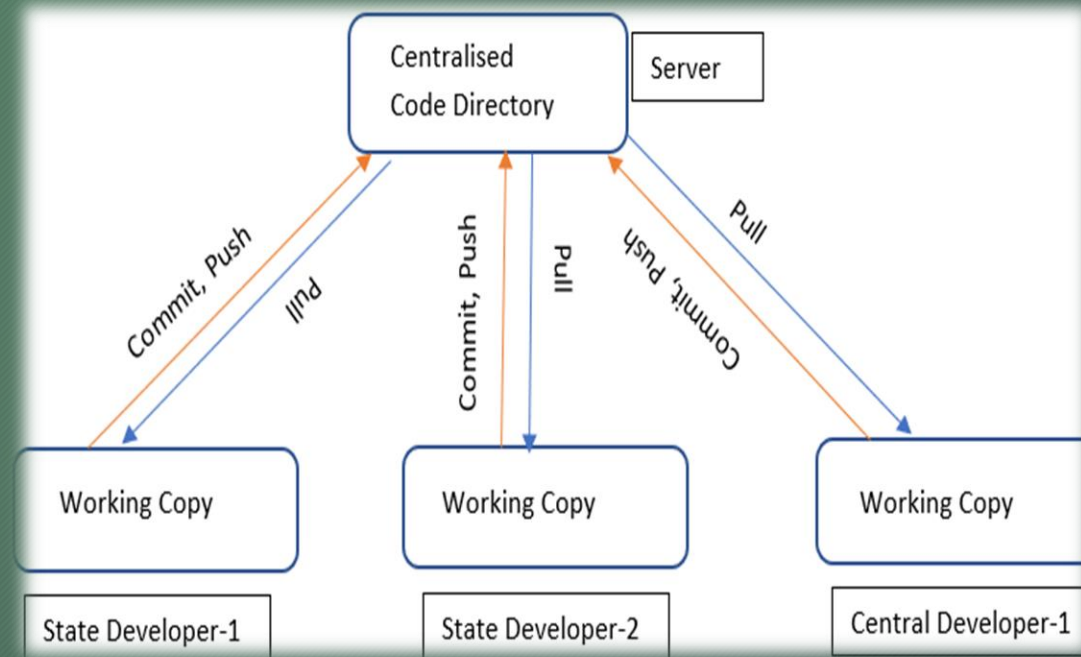
2.3.2 Model 2 (Case VI)

States can continue with their setup for the State-WRIS

Sharing of information across NWIC and SWIC shall be by means of APIs, Map services (WMS/WFS), and other modes of data sharing mechanisms, as needed from time to time.

States have the option to switch over to Model 1 anytime in future.

3. Scope of SWIC

- Act as a

  nodal agency for integration of water resources data within the state

  repository for state-wide water resources data and will be responsible for maintaining, updating, collation and dissemination of data and information

  single-point solution for regional and micro-level water resources data amalgamation and its dissemination

List of Activities for Model 1 & 2

S.No.	Activities	Model 1	Model 2
1	Preparation of inventory for water resources parameters and units available with state departments	✓	✓
2	Collection of available water resources data from various state departments and academic institutions, all across the state	✓	✓
3	Creation of database	By NWIC	By concerned States
4	Monitoring, consolidation and organisation of data from state level departments	✓	✓
5	Collection and compilation of Geo-spatial data available with different state departments/ institutions/ State Remote Sensing Centres/ Environmental Information System (ENVIS)	✓	✓
6	Framing of Policy towards uniform data acquisition, standardization, validation, analysis and dissemination	Adopt NWIC & coordinate for new data set	Align policy towards national standards

List of Activities for Model 1 & 2

S. No.	Activities	Model 1	Model 2
7	Establishment of a mechanism for coordination among state/ other organizations generating and using data	✓	✓
8	IT infra management: Hardware/Software/Geo-spatial data except Office desktops and peripherals	By NWIC	By concerned States
9	Providing technical support to state level organizations	✓	✓
10	Coordination with the State agencies and NWIC	✓	✓
11	Coordination with any central & state level organization for geo-spatial data on allied themes e.g., SOI, NRSC, SRSC SLUSI, ENVIS etc.	Mainly by NWIC	By concerned States
12	Sharing information by means of APIs, Map services (WMS/WFS), and other modes, as needed from time to time	✓	✓

3.1 Collection of Water data (Micro level)

- 3.1.1 Consolidation of the existing data

Available with various departments in multiple formats

Multiple modes like hardcopy reports, CD/ DVD, spreadsheets etc

Maximum stored in PC of various branches/field offices/ planning wing offices etc

Mostly micro level data in hard copy form

All these data need to be harmonized, with a defined schema and format as schema proposed by NWIC

Collection and standardizing these data would be the major task
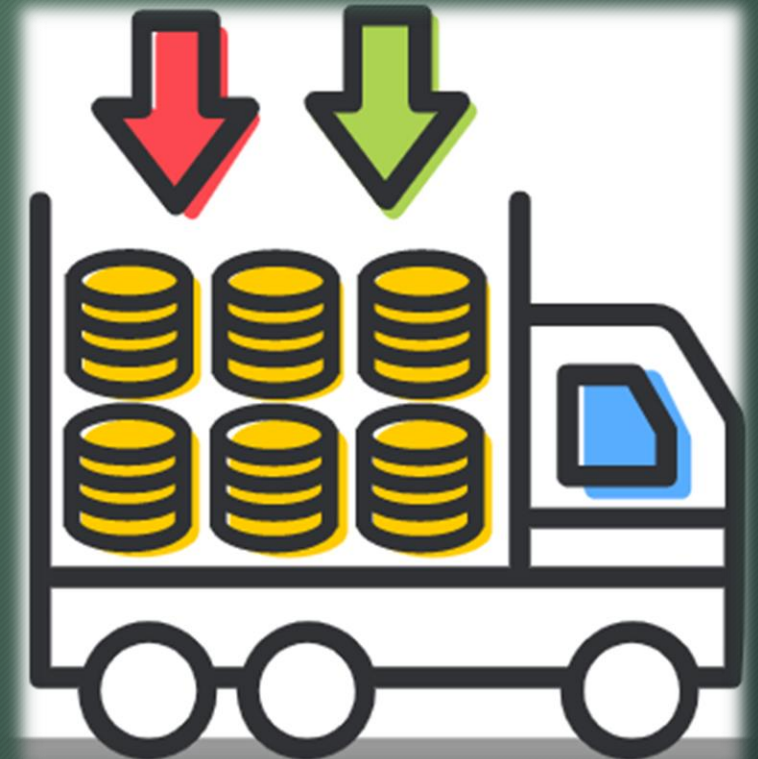
3.1 Collection of Water data (Micro level)

- 3.1.2 Setting up regular mechanism

For collection of periodic data generated by the multiple state departments

Creation of a data entry form or data input screen on web portal for entering the manual data collection

Integration of telemetry data with telemetry module of NWIC-WIMS & further storing it in State-WIMS.

User Management shall be created for authorizing field officers for data through web-portal

3.2 Data Validation

- Under work scope of SWIC
  - 2 level of validation
- Primary
  - May be based on minimum and maximum value of any parameter
- Secondary
  - In case where the input data is required from the nearby stations falling outside the boundary of the concerned states, it shall be done by NWIC
  - for rest of the cases, where the decision can be taken by the states, secondary validation shall be done by states itself.
  - States can use already developed tools developed by NWIC for parameters of NWIC-WIMS.

3.3 Additional Database & Geo-Spatial data creation as per state specific needs
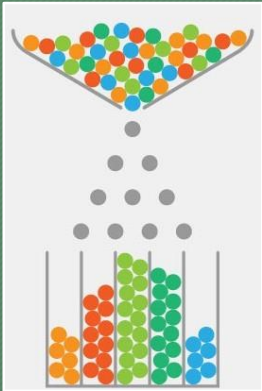
State shall follow the same database schema as maintained by NWIC for establishing the standardization of the data.

States may also share the additional time-series or geospatial data for the creation of standard schema which shall be followed by all other states in case of future additions

3.4 State-specific reports, Visualization & Dashboards

- Data analysis and visualization tools developed by NWIC will be shared with States / SWIC

- Same may be utilized for creation of state-specific reports, data visualization and dashboards

- thus saving time, resources and money on the fresh development of these features

- For any additional state-specific customization request, NWIC shall mentor and guide states to implement the same with the experts engaged by SWIC

3.5 State-specific Application & DSS

- Applications developed in NWIC can be customized with State-specific requirements for implementation of State-WRIS on the similar lines of India-WRIS.

- Scripts developed by NWIC for multiple applications shall be shared with States/ SWIC for further customization of State-specific representation and development at State end.

- New development of applications and DSS at NWIC shall have provision for customization at State level as well

4. Role of NWIC

4.1 Support

- NWIC shall handhold the states and provide technical guidance for effortless establishment and implementation of SWIC and development of State-WRIS and State-WIMS

## 4.2 Standardization of Data and GIS Layers

- NWIC, shall maintain and share the usage of common country schema for similar theme
- Geo-spatial layer data available with NWIC shall be shared with States for their respective areas to avoid duplicity of information and creation of multiple copies
- SWIC shall request to NWIC for creation of schema for data integration and standardization of any new parameter currently not available in NWIC and creation of new / additional geo-spatial layer in State-WRIS if so required

4. Role of NWIC

## 4.3 Sharing & Integration of data with states

- Data available in NWIC shall be shared with States following the hydro-meteorological data dissemination policy 2018
- Rights for data residing in State-WIMS shall be fully with states only and sharing shall be based on approval of state concerned
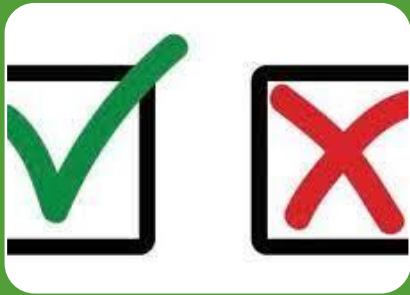
4.4 Common Validation tools

- NWIC shall develop the validation tools for the existing data parameters of NWIC-WIMS, which be commonly consumed across states.
- NWIC shall help SWIC team to develop validation tools for new parameters available with States & these tools shall also be shared with all other states.
- NWIC shall guide, train and handhold the states for validating of huge data collected/ to be collected on the different aspects of meteorology and water resources

4. Role of NWIC
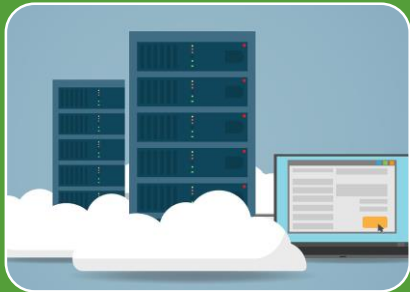
4.5 Hosting Platform

- NWIC hosting platform shall be used by the States for hosting State-WRIS and State-WIMS for Model 1 and Model 2, States can continue on their hosting platform or they have an option to migrate to the NWIC hosting platform
- SWIC shall arrange to procure internet connection for their establishment and field offices at their own cost. Local PC/ Printers /LAN network and other IT infra cost for the establishment of SWIC shall be borne by States

4.6 Common Licenses, software for GIS and databases

- Model 1: cost of licenses (other than those which are required by client-end side team like ArcGIS desktop) deployed on common platform and used by Central & State Agencies in shared mode shall be borne by NWIC for States
- Model 2: may continue with their setup for the State-WRIS and shall purchase the licenses if required any

4. Role of NWIC
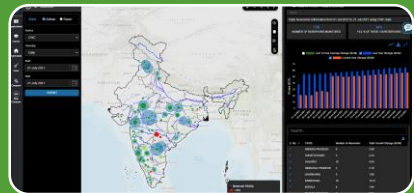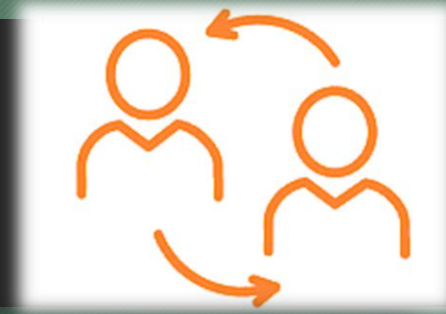
4.7 Development of generic reports, Visualization and Dashboards

- Drafting, development and standardization of reports, visualization and dashboards → by NWIC
- Commonly used by states and States can replicate the same and can further customize as per requirement

4.8 Development of generic applications and DSS

- Applications and DSS developed by NWIC
- commonly used by all States and States can replicate the same and customize further as per their specific need

4.9 Assistance to States for State-specific reports, applications and DSS

- NWIC shall guide, assist and mentor states for customization and development of State-specific reports, applications and DSS

5. Information Sharing & Security

5.1 Data Sharing Mechanism

Data is shared following the hydro-meteorological data dissemination policy 2018

access of data residing in State-WIMS shall remain under full administrative control of respective states

States may formulate hydro-meteorological data dissemination policy tailored to its specific objectives

5.2 Access Control Mechanism

For NWIC – WIMS database (Central DB), access control shall remain fully with NWIC and for State-WIMS Database, it shall be under full control of State.

To access the NWIC-WIMS application by State, a user credential shall be created and shared with the Nodal officer of SWIC. Using this credential, further users shall be created and roles shall be assigned by the state only for their jurisdiction

NWIC shall be able to access the state data

5. Information Sharing & Security

Data Centre	Agency	Roles	Edit	View	Download
NWIC (India-WRIS)	NWIC	Owner	✓	✓	✓
	Concerned State	User	✓	✓	✓
	Other States, Public Institutions & General Public	User	×	✓	✓
State-WRIS	NWIC	User	×	✓	✓
	Concerned State	Owner	✓	✓	✓
	Other States, Public Institutions & General Public	User	×	✓	✓
NWIC-WIMS	NWIC	Owner	✓	✓	✓
	Concerned State	Owner	✓	✓	✓
State-WIMS	NWIC	User	×	✓	✓
	Concerned State	Owner	✓	✓	✓

Note:
1. There is no editing facility for telemetry as the data flows into the system automatically.
2. NWIC-WIMS platform doesn't share the data directly with the public and the data is shared through various modules of India-WRIS. Similarly, State-WIMS data will be shared through respective State-WRIS.
3. Classified data of NWIC-WIMS is shared following the policy defined in Hydrometeorological Data Dissemination Policy 2018 and data sharing policy of classified data of State WIMS shall be decided by the concerned state.

6. Way Forward

- Chief Secretary of the State may have the prerogative to decide the lead department for setting up of SWIC where there are multiple departments dealing with water management.

- In case of small states having only one water resources department, the same may be declared as lead department for setting up of SWIC

- 6.1 **Approach towards implementation**
  - To setup the SWIC, following things are to be considered and finalized:
    - Location of the department e.g., State Capital or any other major town of State
    - Type of organization – separate department or attached office/ subordinate office of lead water resources department.
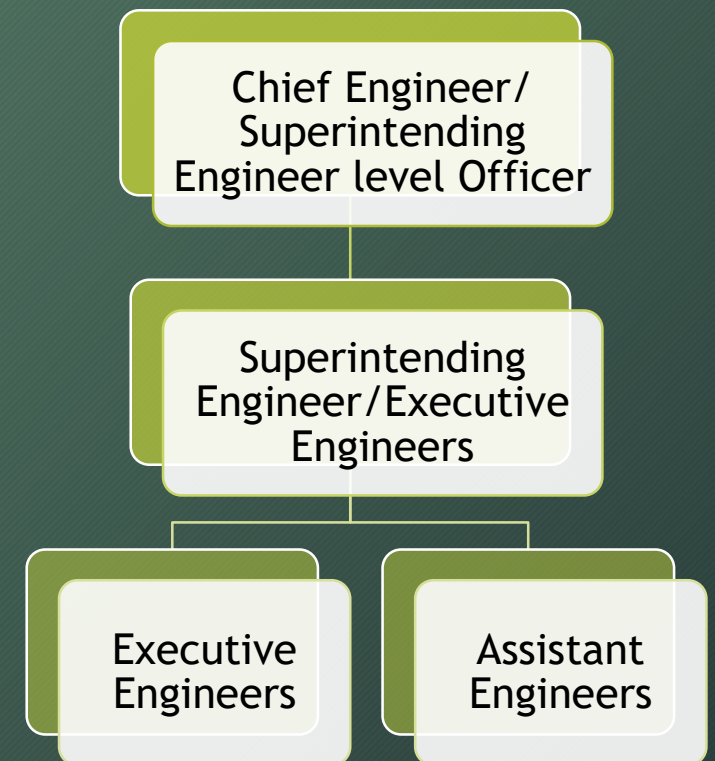   - Office Infrastructure- Space and other office infrastructure

6. Way Forward

- 6.2 Organization Composition
  - Recommended organogram is flexible to modify as per state local requirement
  - Administrative Staff
    - may comprise of Under Secretary, Section Officer, Assistant Section Officer, PS/PA, DEOs, Clerks/MTS etc
    - On deputation or recruited
  - IT Experts
    - comprise RS & GIS Experts, Software Developers (Front-end & Back-end knowledge), Database Experts & Hardware-Networking Experts
    - Preferably hired professionals

Large/Small States

Chief Engineer/ Superintending Engineer level Officer

Superintending Engineer/Executive Engineers

Executive Engineers

Assistant Engineers

6. Way Forward

- 6.3 Reporting Relationship
  - Head of SWIC shall report to Additional Chief Secretary/ Principal Secretary / head of the lead department
- 6.4 Cabinet **approval for constitution of SWIC**
  - Lead Department shall initiate and follow up for the approval of establishment of SWIC.
  - Note for approval of State Cabinet shall essentially contain
    1. Mandate
    2. Roles & Responsibilities
    3. Organization Composition
    4. Place of Setup
    5. Head of Organization
    6. Reporting Relationship
    7. Budgetary Provision

6. Way Forward

- 6.5 Monitoring & maintaining of SWIC for initial few years
  - During the initial phase of the establishment, it shall be done by lead department of the state.
    - Staffing: The requirement of staff for proper functioning of SWIC
    - Co-ordination issues with other water resources related state departments.
    - Infrastructure, office space, budget etc
- 6.6 **Works pertaining to development of State WRIS**
  - Before taking up any activity under this initiative, it would be prudent that the states discuss their requirement and plan of action with NWIC to ensure standardization, seamless integration with India WRIS and to remove duplication of efforts