

Decision Support System for

Integrated Water and Crop Management



Decision Support System Goal

01

**Integrated
Planning**



02

**Water
Budgeting**

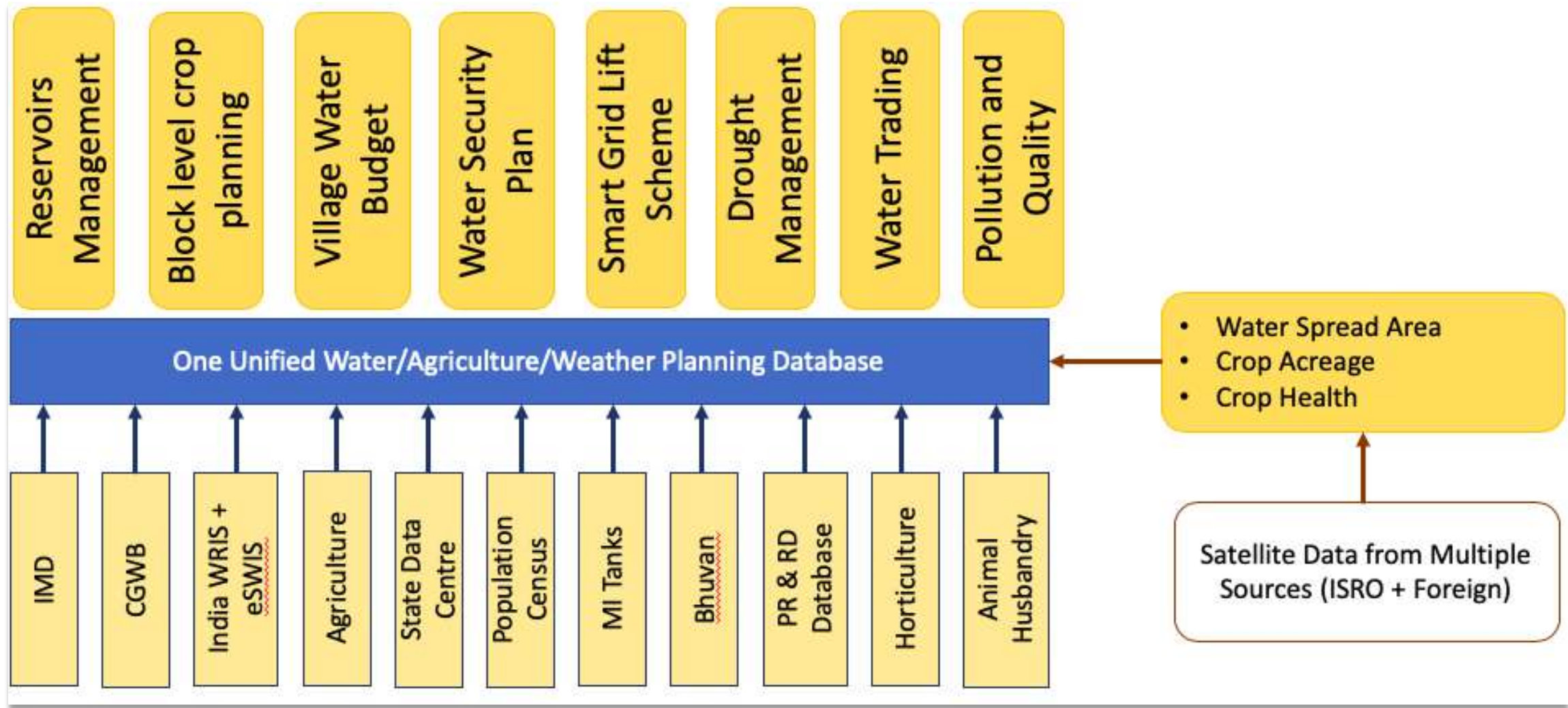


03

**One
Authoritative
System**



Decision Support System Overview



Reservoir Module

Reservoir Demands:
Irrigation, Flood,
E-flows, Hydro-power



Water Sharing Policies
And Its Compliance

Water Audit,
Accounting and
Allocation



KPIs: Water Use
Efficiency, Water Duty

Reservoir Module - Benefits



Gain Visibility on Water Demand and Supply across the season.

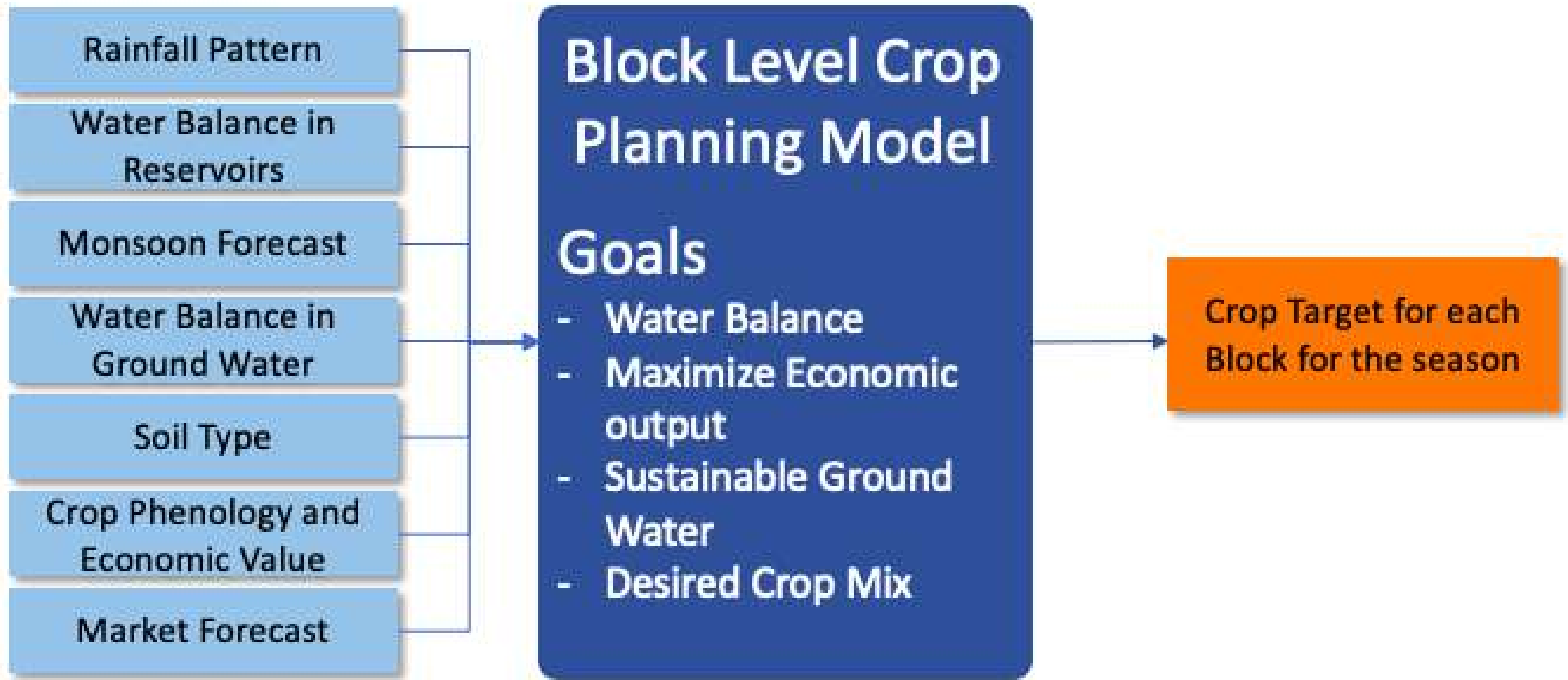


Minimize Deficit and Flooding



Better Water Allocation, and improve water use efficiency.

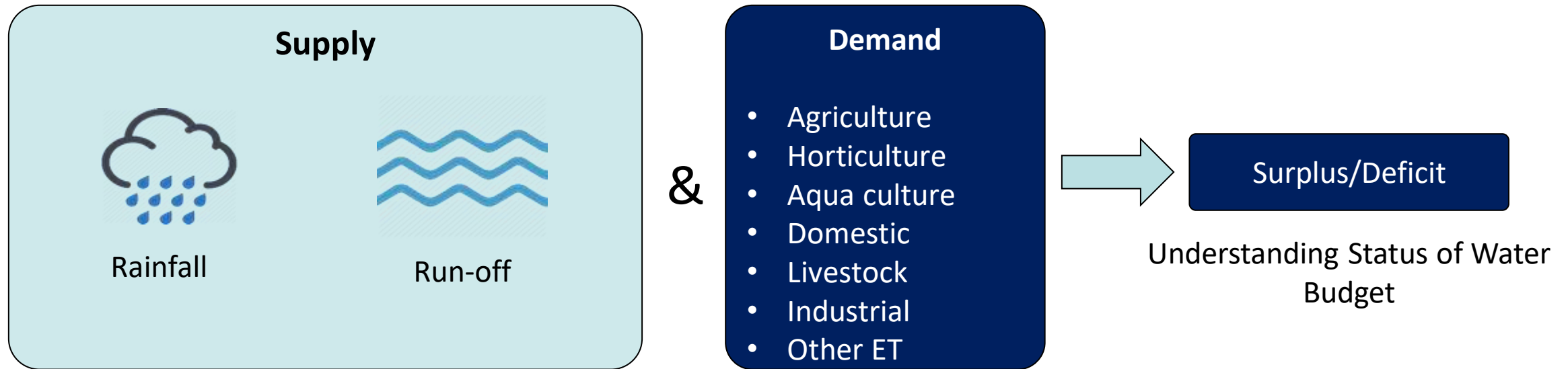
Crop Planning Module



Crop Planning - Benefits



Village Water Budgeting Module



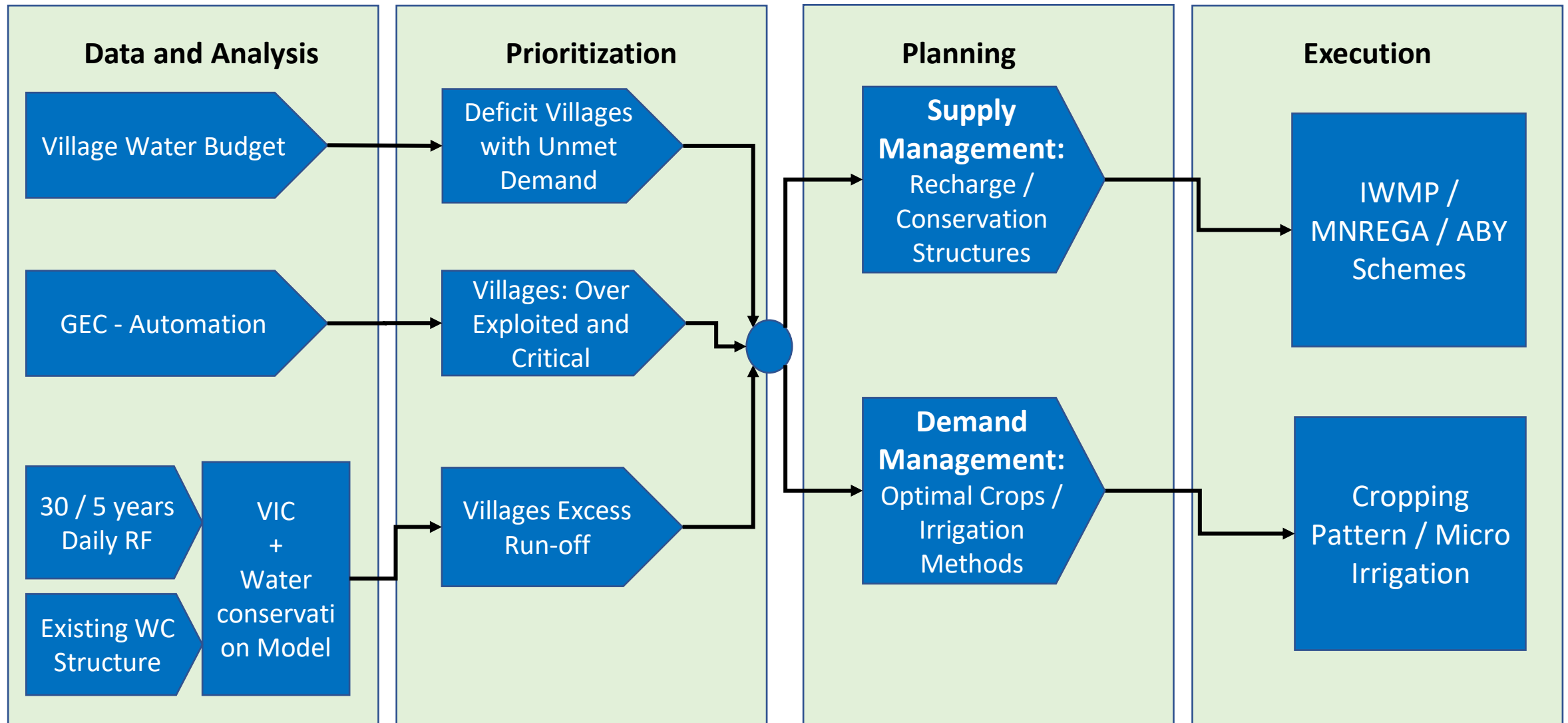
If deficit conditions prevail, interventions can be made

- Supply Side (Addition of new Water Conservation Structures etc.)
- Demand Side (Crop planning to choose less water thirsty crops etc.)

Village Water Budgeting - Benefits

- Helps in understanding the net water surplus or deficit at each Village
- Helps in planning of cropping season
- Easy identification of focus areas that needs lift schemes and/or canal distribution
- Identifies ground water status and areas of focus to replenish the same
- Provides a base for water security plan

Water Security Plan Module



Water Security Plan - Benefits

- Understand which village has how much available run-off
- Predict good zones for various surface water conservation and ground water recharge.
- Understand run-off availability at different dependability
- Help Prioritize surface and ground water conservation activities at village level
- Provides an integrated approach to water conservation activities

Smart Grid Lift Scheme Module

Reservoir and River– 30
yrs Data

- CWC
- State

Smaller Water Bodies

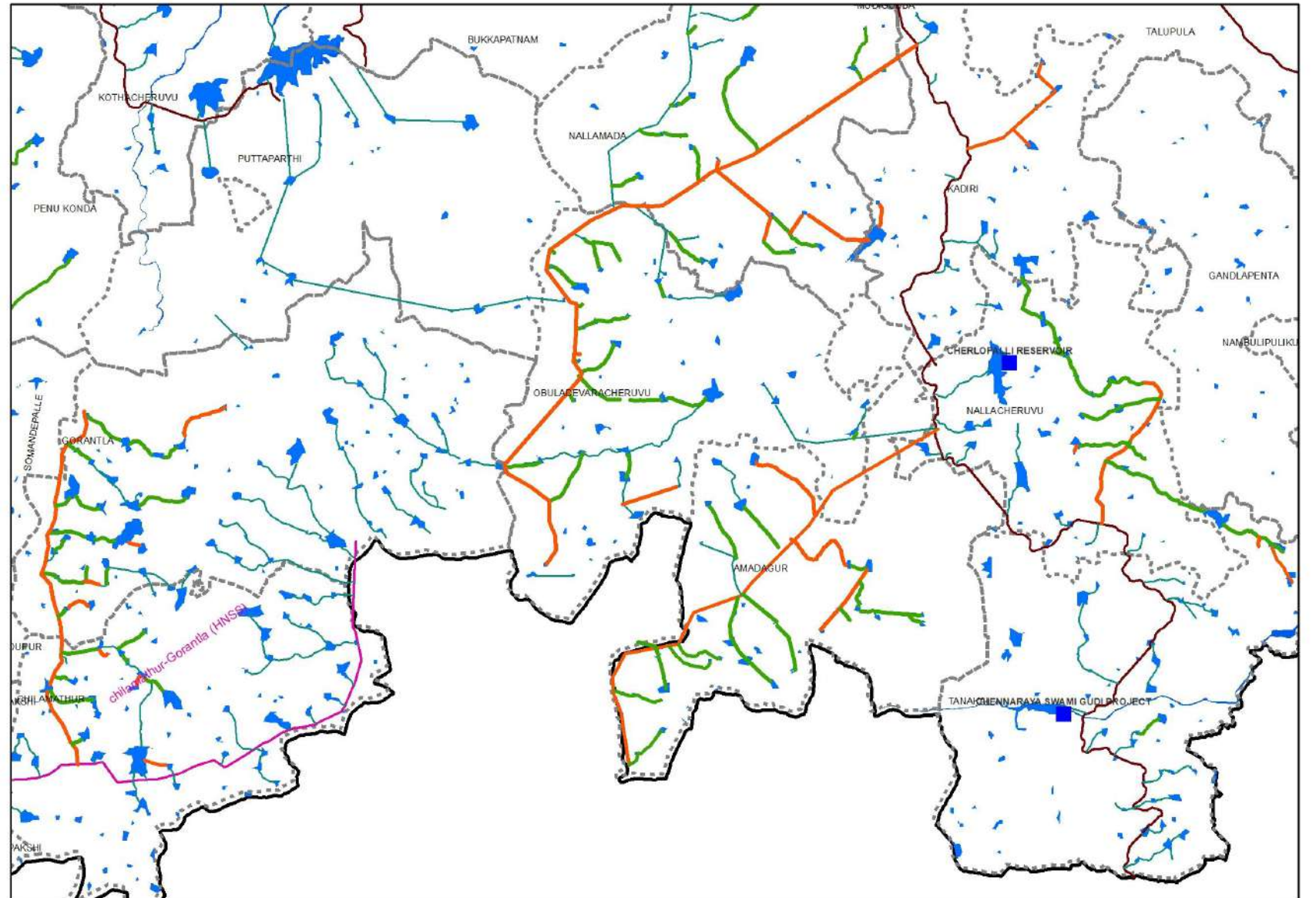
- MI Tanks
- Check Dams

Water conveyance

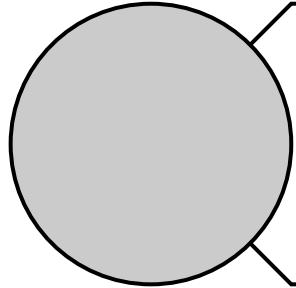
- DEM
- Existing Canals, and
PDN

Project Demand

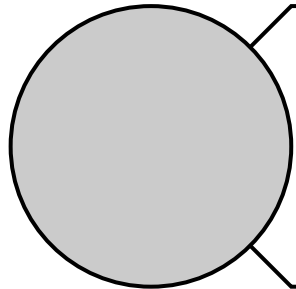
- Irrigation
- Drinking
- Industrial



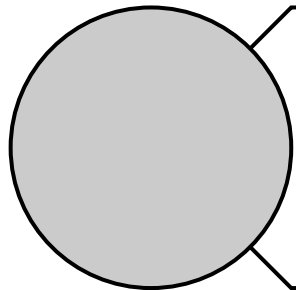
Smart Grid Lift Scheme - Benefits



Understand Which Smaller Water Bodies can be used in Dry spell events



Find the least cost path to transfer water



Understand the GAP in water conveyance network

Agriculture Drought



Use of Meteorological, Agriculture and Water Resources data in real-time to generate drought indices:

- Rainfall Indices: SPI and Dry Spell
- Hydrology: SFI/ RSI/SGWI
- Remote Sensing based Vegetation Indices
- Crop Situation Related Indices: Area under Sowing and Soil Moisture Based Indices



Drinking Water stress

- **Water Demand:** calculated based on the village population and live stock
- **Available Water:** calculated from available Surface Water and Ground Water
- **Water Stress:** calculated as the difference between the Water Demand and Supply

Drought Management - Benefits



Guides state to monitor and mitigate the drought activities

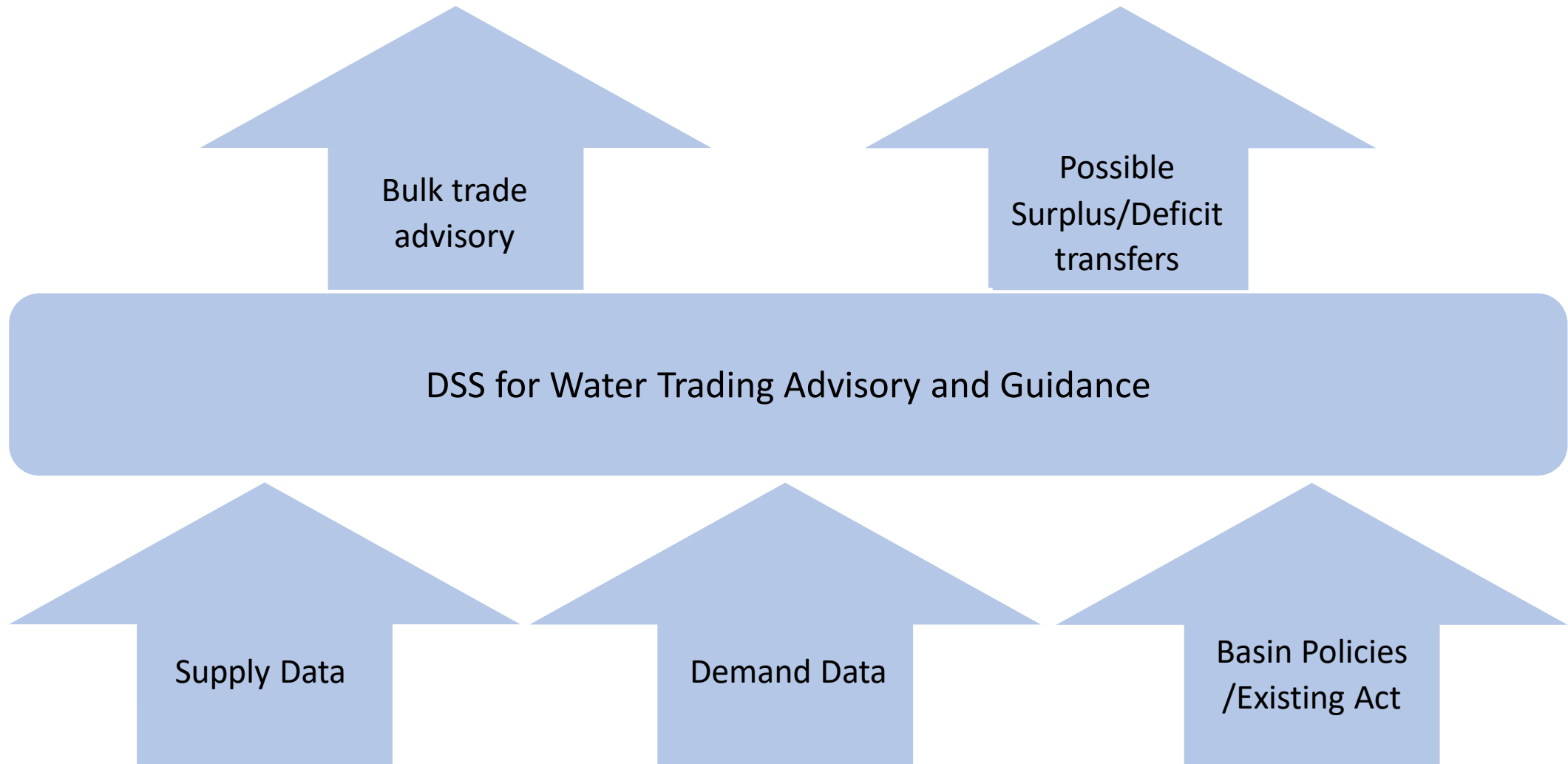


Assists state in generating drought severity index which will help to seek NDRF funds in time



Provides sound basis for longer-term adaptation to climate change

Water Trading Module



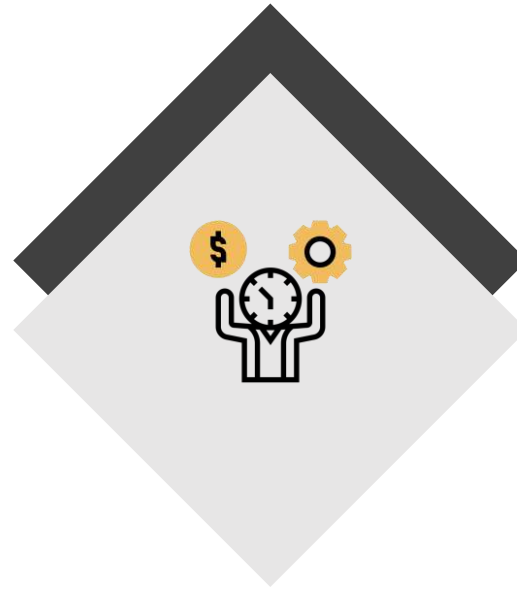
Water Trading - Benefits



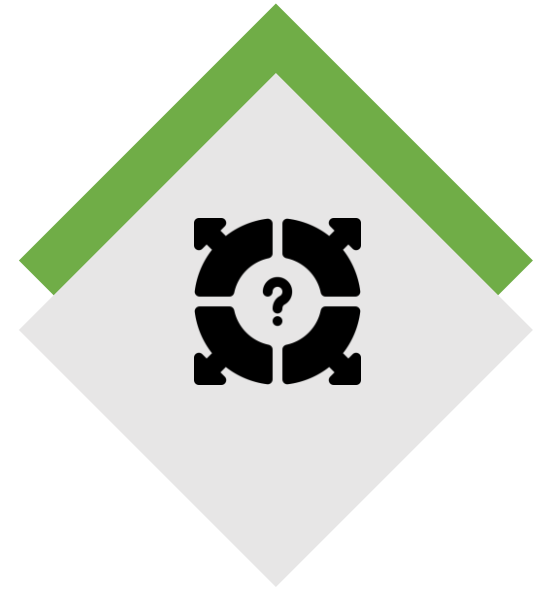
Provides data about surplus and deficit basins and sub-basins to provide decision support for trade in water



Provides advise on the amount of water that can be transferred for a permanent and temporary water trade



Cost effective for parties involved in trade



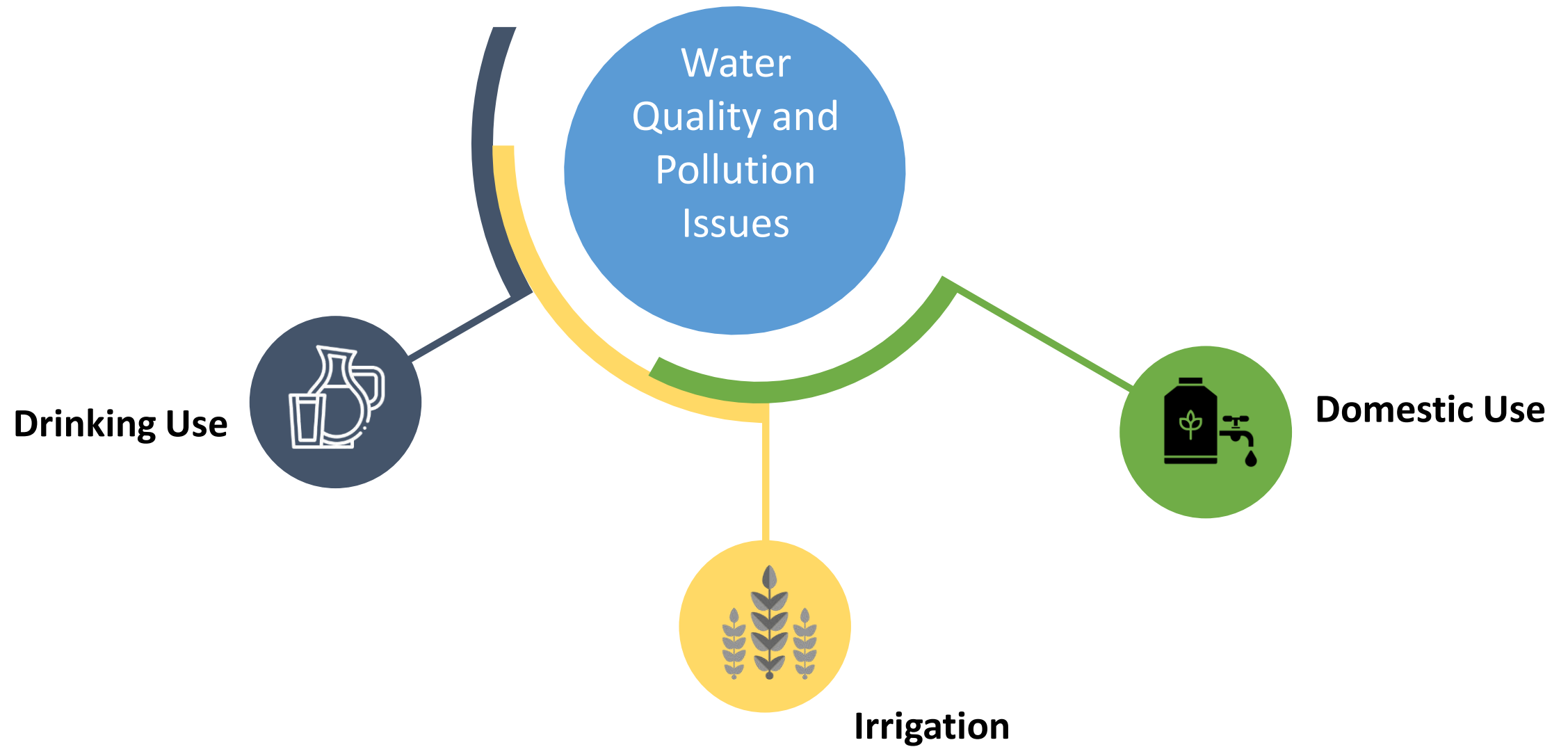
Show different possibilities for water trading/transfer with rating of different options

Pollution and Quality Module



System should classify water based on mandates/thresholds given by Central Pollution Control Board for each category of water

Pollution and Quality - Benefits



Data Requirement

Historical and Current Water

- Current Rainfall, Ground Water, River Gauge points
- Water inflows and outflows in Reservoirs and Canals
- MI Tanks and Water conservation Structures

Agriculture

- Agricultural data (Crop Wise at Village level)
- Horticultural data (Crop Wise at Village level)

Drinking, Domestic & Industry

- Population data at village level in Digital format
- Industrial Water Requirement at Block level
- Livestock Population data at village level

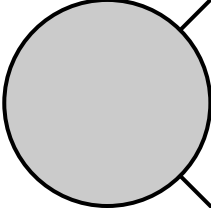
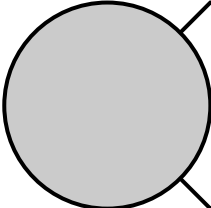
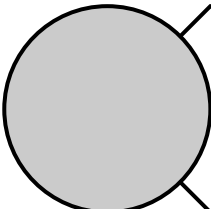
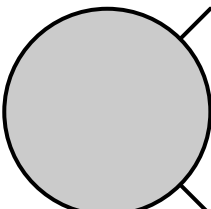
Spatial Data

- Admin, Hydrological, Command area shapefile
- Cadastral Maps, Canal Shapefiles
- Land use Land Cover, Soil Data

Weather Current and Forecast

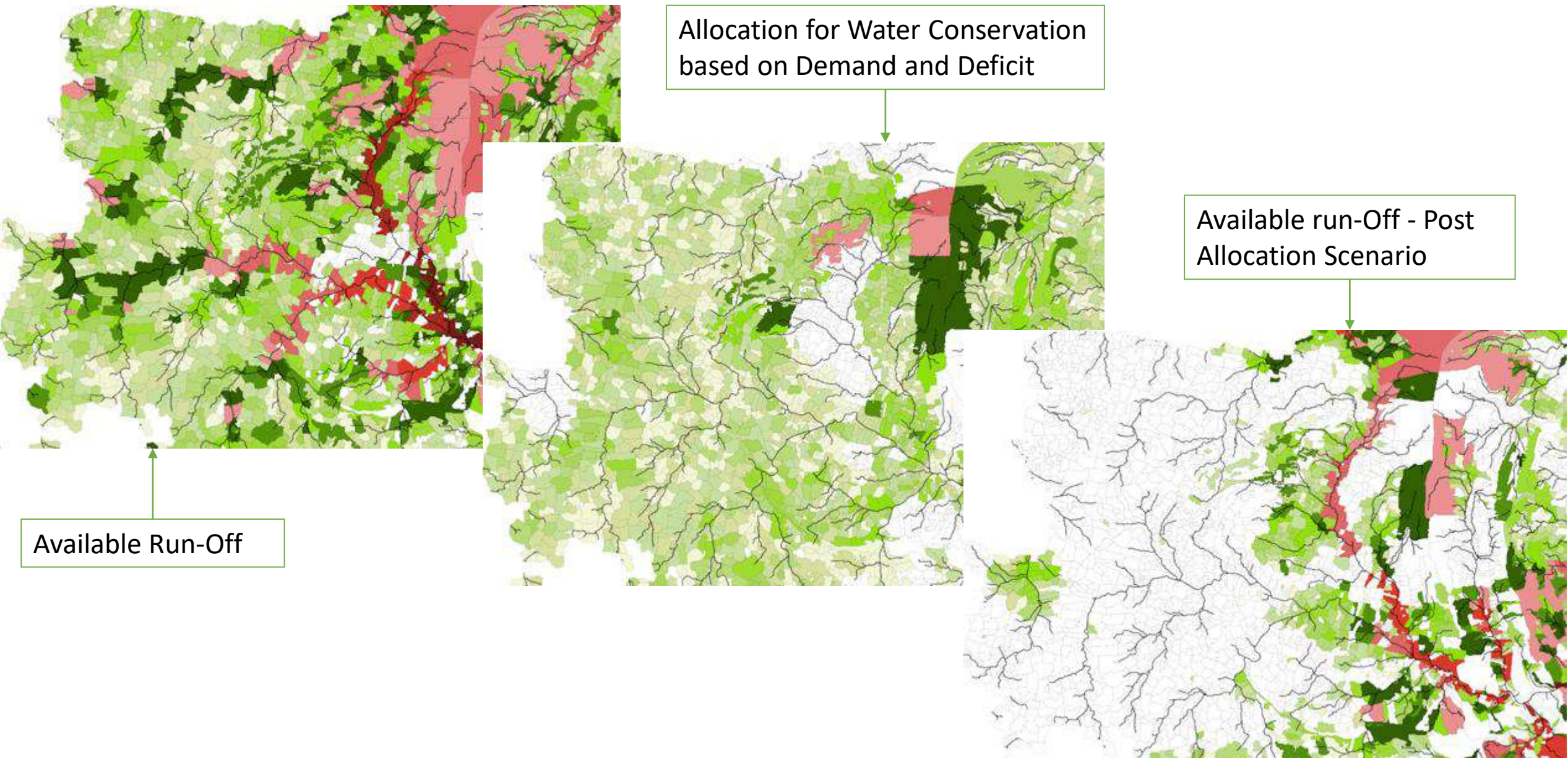
- Temperature, Rainfall, Humidity, Wind Speed and Wind Direction

Way Forward

-  Digitize and Collate Data in expected format
-  Assign a nodal team to own, and operate the system
-  Participate in development of a unified Decision support system
-  Timeline: 24 month for development

Thank You

Water Conservation - Allocation



Available Run-Off

Allocation for Water Conservation based on Demand and Deficit

Available run-Off - Post Allocation Scenario

Agriculture Drought Module

Input

Rainfall & Weather

Reservoir and Rivulets

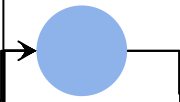
Soil Moisture

Ground Water Levels

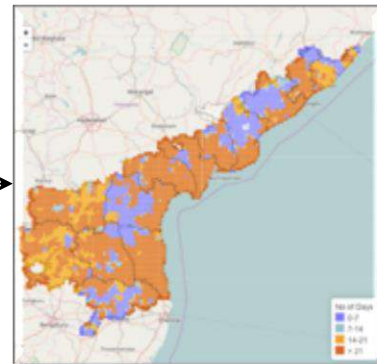
Crop sown data

MAI

NDVI and NDWI



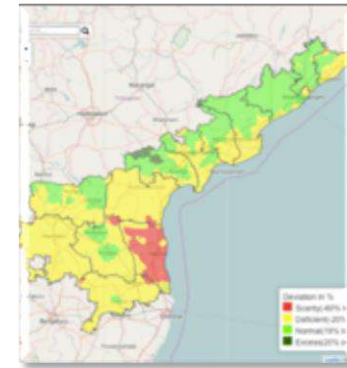
Output



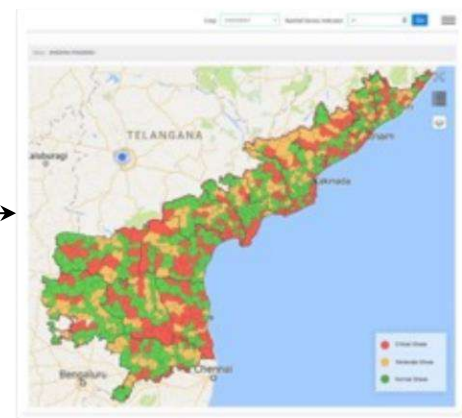
RF Dry Spell



PASM



RF Deviation



MAI based Stress

S.No	District	Total No. of Villages in Key Stage	Soil Moisture Stress ⁽¹⁾		Pest and Disease alerts (%)	Root zone(30cm) ASM ⁽¹⁾⁽²⁾			Rainfall Stress ⁽¹⁾ (%)
			Critical	Moderate		ASM > 40%	40%-ASM > 20%	20%-ASM	
1	DRAKULAM	36	23	9		54	153	1474	441
2	VIZIANAGARAM					-	27	1332	976
3	VISAKHAPATNAM	12	9	3		89	300	2885	1005
4	EAST GODAVARI	5	5			43	173	1487	564
5	WEST GODAVARI					54	126	787	693
6	KRISHNA					154	140	759	876
7	GUNTUR					21	101	633	667
8	PRAKASAM	2		1		207	947	560	529
9	NELLORE	5		5		507	629	83	1072
10	CHITTOOR	13		13		121	990	480	672
11	KADAPA	8	4	4		25	243	737	691
12	ANANTAPUR	35	30	5		7	20	931	535
13	KURNOOL	12	12			7	45	897	617
Summary		128	83	45		1238	5292	13465	9,338

Drought MIS

- Block Level assessment of Drought
- Near Realtime Availability of Drought Status
- Understand the extent of Drought

Drinking Water Stress Module

Input

Drinking Water Needs

Reservoir and Smaller Water Bodies

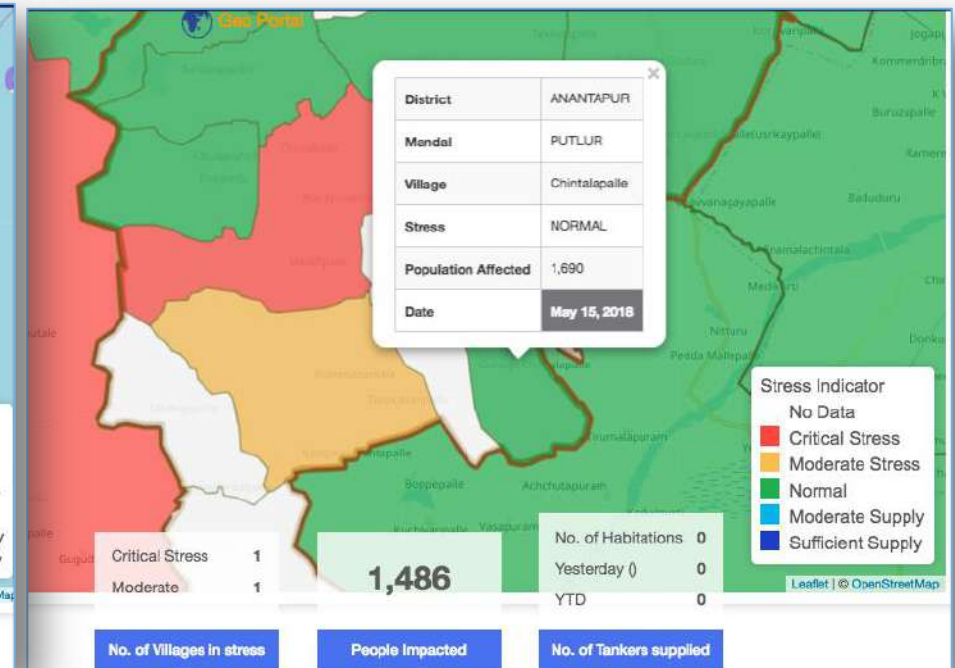
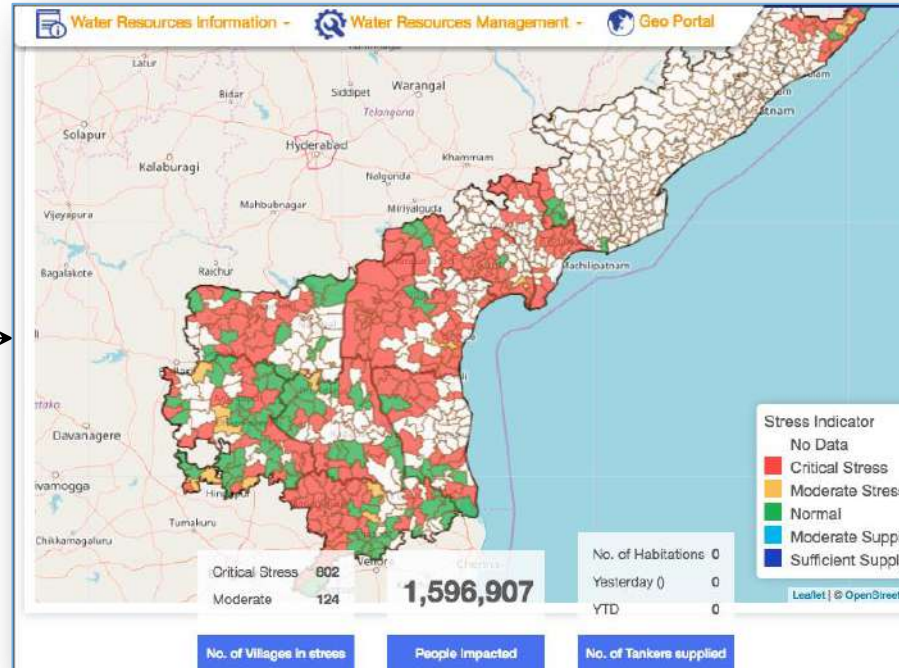
Historical Data

Ground Water Levels

Rehabilitation (Tanks)

Crowd Sourcing

Output



- Predict onset of Drinking Water Stress at villages in Advance of 1 week.
 - Use real-time Ground Water level and surface water to track when it is going below minimum drinking water availability threshold.
 - Provide GIS and MAP Interactive Dashboard to see places with critical / semi critical stress.
 - Integrate rehabilitation like Tanker supply data to highlight Areas where stress mitigation is done.