Increasing Efficiency of Water Use in Major and Medium Irrigation Projects

JALMANTHAN – 2

22nd – 23rd Feb. 2016

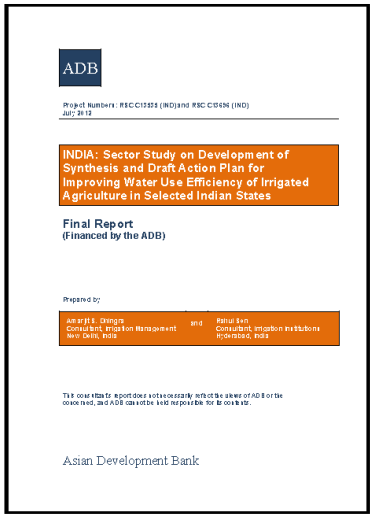
A S Dhingra

Commissioner (Retd.), MOWR

National Water Use Efficiency Support Programme

- **ADB's Water Operational Plan (2011) emphasizes:**
  - **Prioritizing deepening and expanding analytical framework**
  - **Strengthening ADB financial support to priority programmes**
  - **Core agenda on boosting WUE of Irrigation projects through improved water management and sustainable service delivery**

- **Study financed by Asian Development Bank**
- **Studies taken up by ADB:**
  - **Sector study on Development of Synthesis and Draft Action Plan for Improving WUE of Irrigated Agriculture in Indian States (DSDAP)**
  - **Scoping study for a National Water Use Efficiency Improvement Support Programme (NWUEISP)**
  - **Innovations for More Food with Less Water (MFLW)**


ADB

Project Numbers: RSCC13535 (IND)and RSCC13536 (IND)
July 2012

INDIA: Sector Study on Development of Synthesis and Draft Action Plan for Improving Water Use Efficiency of Irrigated Agriculture in Selected Indian States

Final Report
(Financed by the ADB)

Prepared by:

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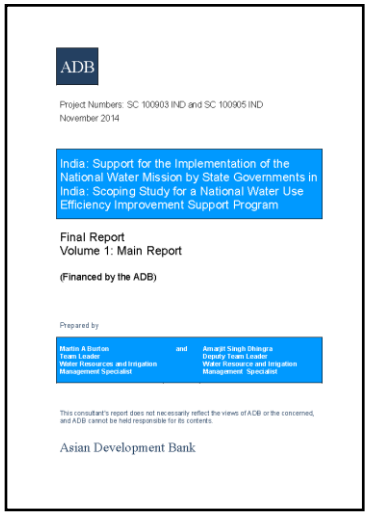
Asian Development Bank


ADB

Project Numbers: SC 100903 IND and SC 100905 IND
November 2014

India: Support for the Implementation of the National Water Mission by State Governments in India: Scoping Study for a National Water Use Efficiency Improvement Support Program

Final Report
Volume 1: Main Report

(Financed by the ADB)

Prepared by

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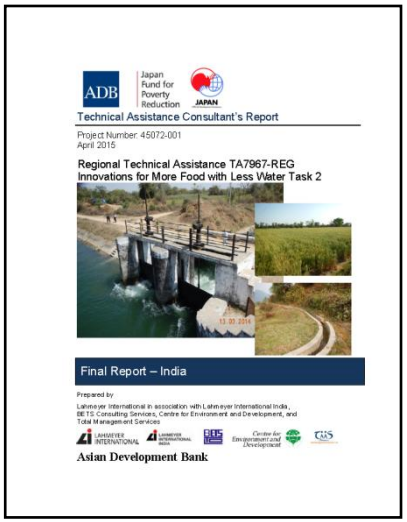
Asian Development Bank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Japan Fund for Poverty Reduction

JAPAN

Technical Assistance Consultant's Report

Project Number: 45072-001
April 2015

Regional Technical Assistance TA7967-REG
Innovations for More Food with Less Water Task 2

Final Report – India

Prepared by:

Lahmeyer International in association with Lahmeyer International India, BETS Consulting Services, Centre for Environment and Development, and Total Management Services

Asian Development Bank

- **Background**
  - **Present status, NWM and 12th FYP reform Agenda**

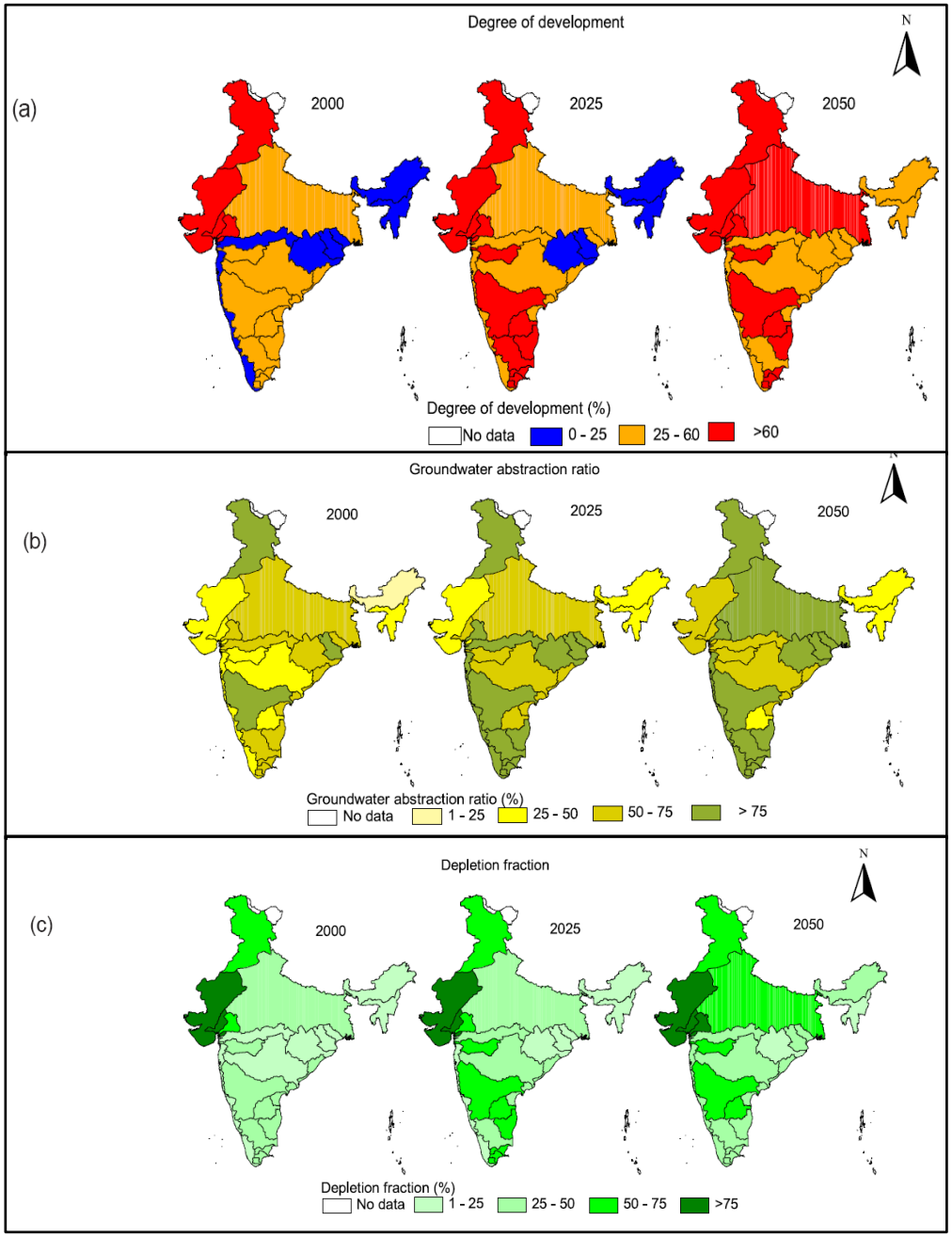
- **NWUEISP Framework to improve WUE of MMI projects**
- **Pilot Testing of the Framework on two MMI projects**

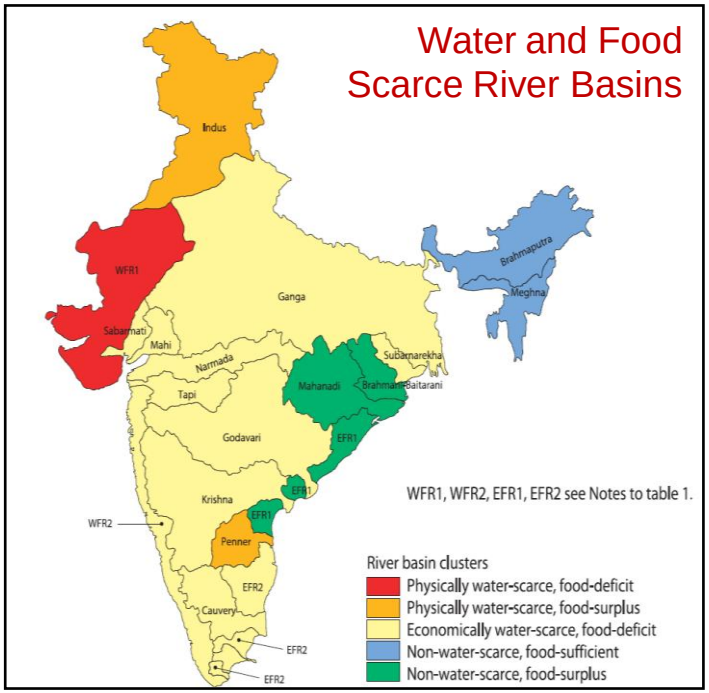
Background

"India faces a major crisis of water as we move into the 21st century. This crisis threatens the basic right to drinking water of our citizens; it also puts the livelihoods of millions at risk. The demands of a rapidly industrialising economy and urbanising society come at a time when the potential for augmenting supply is limited, water tables are falling and water quality issues have increasingly come to the fore."

Dr Mihir Shah,
Former Member for Water,
Planning Commission,
(January 2013).

Growing regional water scarcity by 2050





Options to reduce scarcity:

- Increase crop productivity per drop
- Increase ground water recharge
- Increase economic value of water
- Inter-basin transfer

Source: Amarasinghe et.al. 2007 (IWMI)

Current Status, NWM and 12th FYP reform agenda

- **Current Status of WUE under MMI**
  - **MMI constitute more than 80% of Government created schemes**
  - **Agriculture sector with draws about 80% of all withdrawal**
  - **Irrigation efficiencies very low (35-38%)**

- **NWM Reform Objectives**
  - **Improve WUE of MMI by 20% by 2017**
  - **Emphasize on improving irrigation performance**
  - **Need to increase crop per drop**

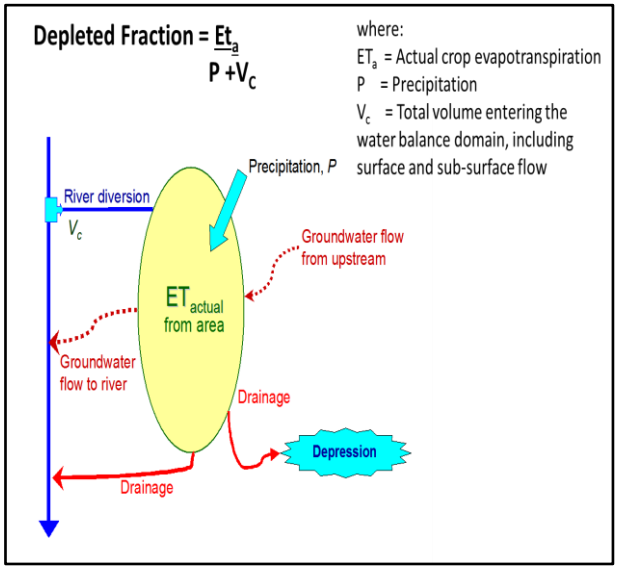
- **12th FYP Reform Agenda for MMI**

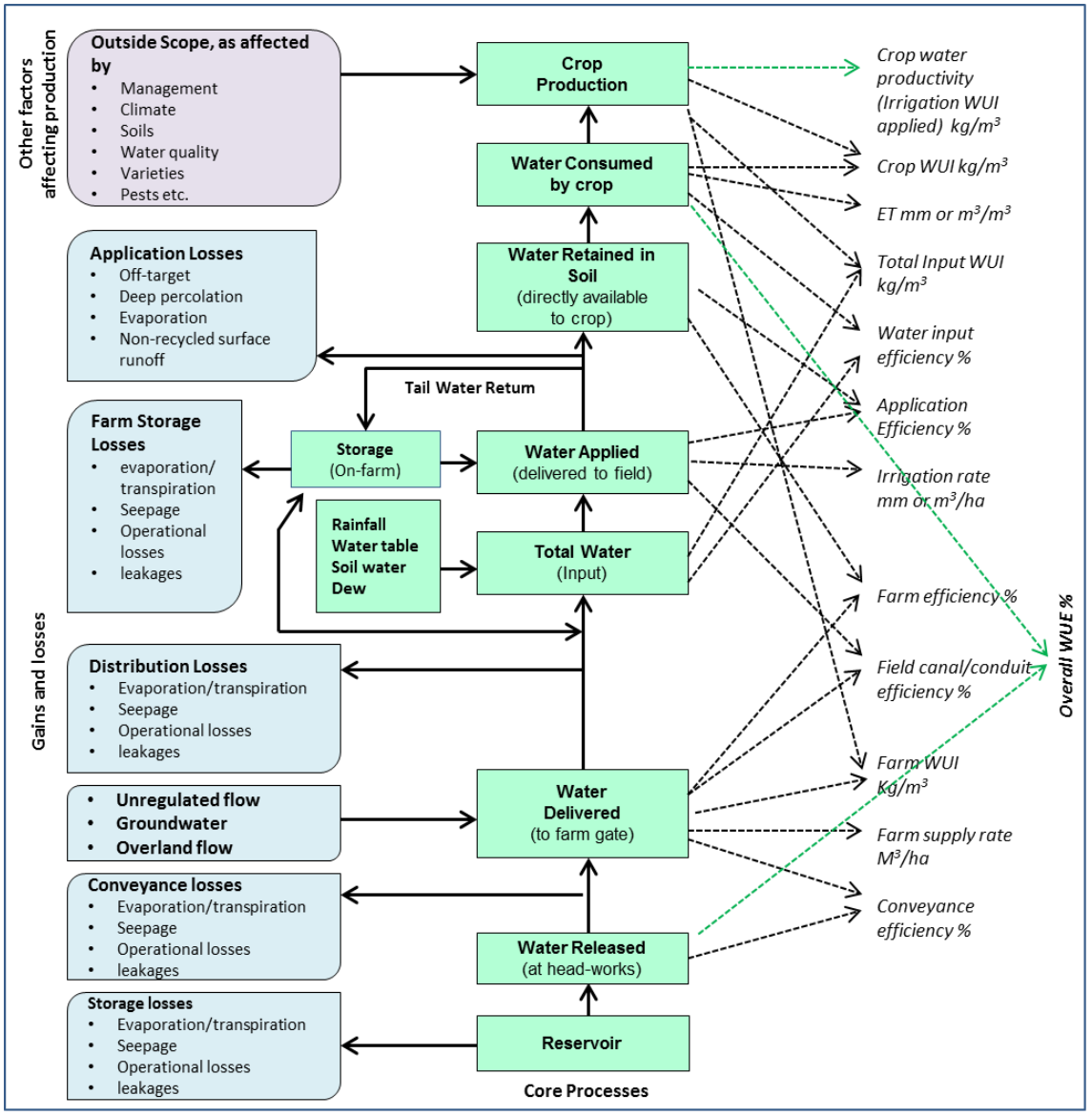
  IDs should: "move away from a narrow engineering-construction-centric approach to a more multi-disciplinary, participatory management approach for MMI schemes, with a focus on command area development and a sustained effort at improving water use efficiency" (para. 5.5,12th FYP)

- **Shift in management concept of Gap in irrigation potential creation and utilization versus performance achievements through improved WUE**

The term WUE

- **WUE Concept**
  - Traditional definitions
  - WUE boundaries
  - Multiple dimensions of WUE
  - ICID concept
  - WUE under NWUEISP
  - Benchmarking WUE and other indices
  - Quick assessment of ET to measure overall WUE





NWUEISP definition of WUE

- ***Water use efficiency for managing MMI schemes relates to the efficiency of delivering water from the intake of the irrigation system to the crop root zone for the purpose of beneficial crop evapotranspiration, taking account of any use or reuse of seepage or other conveyance, distribution or application losses as conventionally describe that might subsequently be used by farmers within the boundaries of the irrigation scheme.***

- ***WUE term thus relates to the fraction of irrigation water used for productive crop evapotranspiration within the boundaries of the scheme compared to the total volume of water diverted at the intake to the irrigation system.***

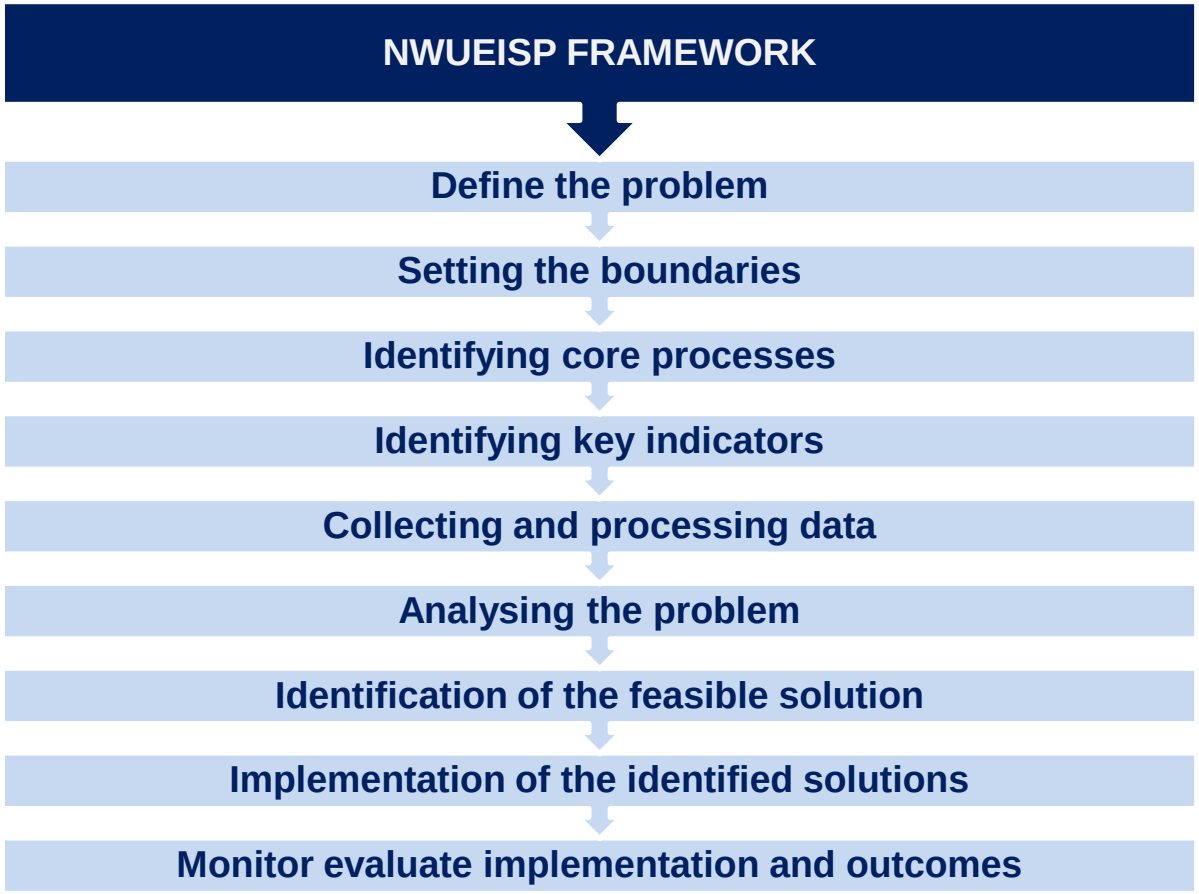
- ***For the purpose of clarification the use or reuse of conveyance, distribution or conveyance losses may relate to pumping from groundwater, direct use of seepage water, or other form of beneficial reuse within the boundaries of the scheme.***

- ***The improvement of the water use efficiency shall be measured against a baseline determined from a standardised survey of scheme performance, and subsequent seasonal and annual measurements as set out in the baseline survey protocol and report"***

NWUEISP Framework

NWUEISP Rationale and Framework

Rationale: To develop standardized pathway for sustainable irrigation supplies that improves WUE and boosts production of MMI projects in a holistic manner



WUE Perceptions

Defining the problem:

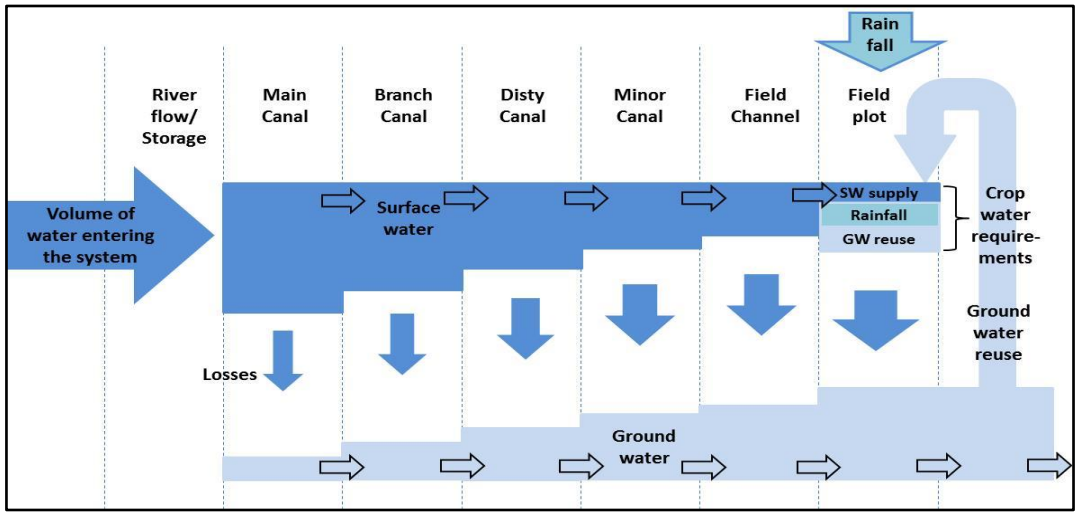
- Clear without ambiguity
- Problems being multi dimensioned people often have different perception
- Overall objectivity is improved productivity
- Need to define outcomes at this stage itself

Discipline	Main area(s) of interest (system)	Performance measures
Irrigation and drainage engineer	Irrigation and drainage system	• Conditions of infrastructure and volume, timing, quality and cost of water delivery
Irrigation agronomist	Irrigated agriculture system	• Crop production, soil condition and crop marketing
Agriculture economist	Agriculture economic system	• Economic and financial value of the crop production, crop and farm budget, farmer livelihood
Economist	Rural economic system	• Economic development, value of the rural production, community livelihoods and rural poverty
Political scientist/ Sociologist	Politico-economic system	• Employment, livelihood and rural poverty, social welfare, community participation/ engagement
Farmer	All systems	• Water delivery, agriculture production, livelihood, crop and farm budgets, market opportunities, sustainability and security of farming systems

Setting boundaries:

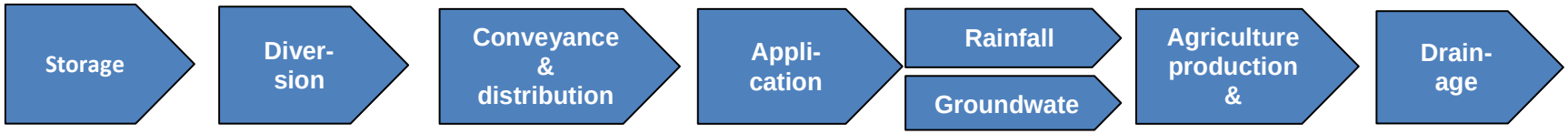
- Identify and fix boundaries
  - Physical system; spatial and temporal dimensions
  - Other; policy, institutional, social, economic, environmental, ecological
  - Stakeholders perspectives

Core Processes



Policy	Water resources; agriculture; livelihoods; environment; etc.						
Legislation	Irrigation Act; Environmental legislation; PIM Act; etc.						
Manage-ment organisation	Irrigation Dept.		WUA	Farmer	GW Board	Farmer	ID
Manage-ment processes	Monitor	Plan Allocate	Operate Maintain	Operate Maintain	Apply	Allow for	Transport Market	Main-tenance
Core processes	Storage	Diversion	Conveyance	Distribution	Application	Rainfall / Ground water	Agric. production and marketing	Drainage
Inputs	River flow Rainfall	Water	Water	Water	Water	Water	Land Water Labour Crop inputs	Water
Outputs	Stored water	Allocated water	Water	Timely water delivery	Filled root zone	Filled root zone	Agricultural production	Drained land Low water table
Performance indicators	Volume stored	Water diverted	Conveyance efficiency	Delivery performance ratio	Application efficiency	Volume used	Crop yield Crop production	Depth to GW

Core area key indicators



Performance Indicators

- Water allocation per unit area
- Water availability
- Water allocations

- Head regulator capacity
- Supply response to demand
- Etc.

- Conveyance and distribution efficiency
- Canal Capacity
- Etc.

- Application efficiency
- Etc.

- Rainfall
- Depth to GW
- GW quality
- GW application

- Crop yield
- Productivity (Kg/m^3)
- Fee recovery
- Etc.

- Depth to water table
- Salt balance
- Etc.

Outputs of each process stage

- Water allocations made

- Water diverted according to plan

- Water delivered (reliable , adequate, timely, equitable)

- Root-zone filled

- CWR met
- Root zone filled
- Area drained

- Crop produced
- Family food needs met
- Income generated
- ISF paid

- Excess water removed
- Safe depth to water table
- Salt content controlled

Scheme objectives and desired outcomes

- Crop production and productivity
- Water conservation and reuse
- Social equity
- Economic development and poverty alleviation
- Environmental sustainability

Data Collection and Analysis

Gathering baseline information (FAO-MASSCOT)

- Assessing system performance (RAP) through rapid system diagnosis
  - Systematically and quickly identify the key baseline indicators
  - Mobilize stakeholders to prioritize modernization improvements
  - Examine physical capacity and sensitivity of the irrigation structures to perform their functions of conveyance, control, measurement
- Assessing of and mapping the sensitivity of critical irrigation structures (offtakes and cross-regulators)
- Record the perturbations (water level fluctuations) – examine causes, magnitudes, frequency and options
- The networks and water balances of surface and ground water availability and use - gauge constraints
- Mapping the cost of O&M – current costs of operational techniques, services, core elements and processes, and also costs of improvements

Vision of service-orientated management and modernization of canal operation

- Mapping the service to users
- The management units performance
- The demand for operation and allocations required
- The options for canal operation improvements/units
- Integration of service-orientated management (SOM) options
- Vision for a modernization plan, M&E

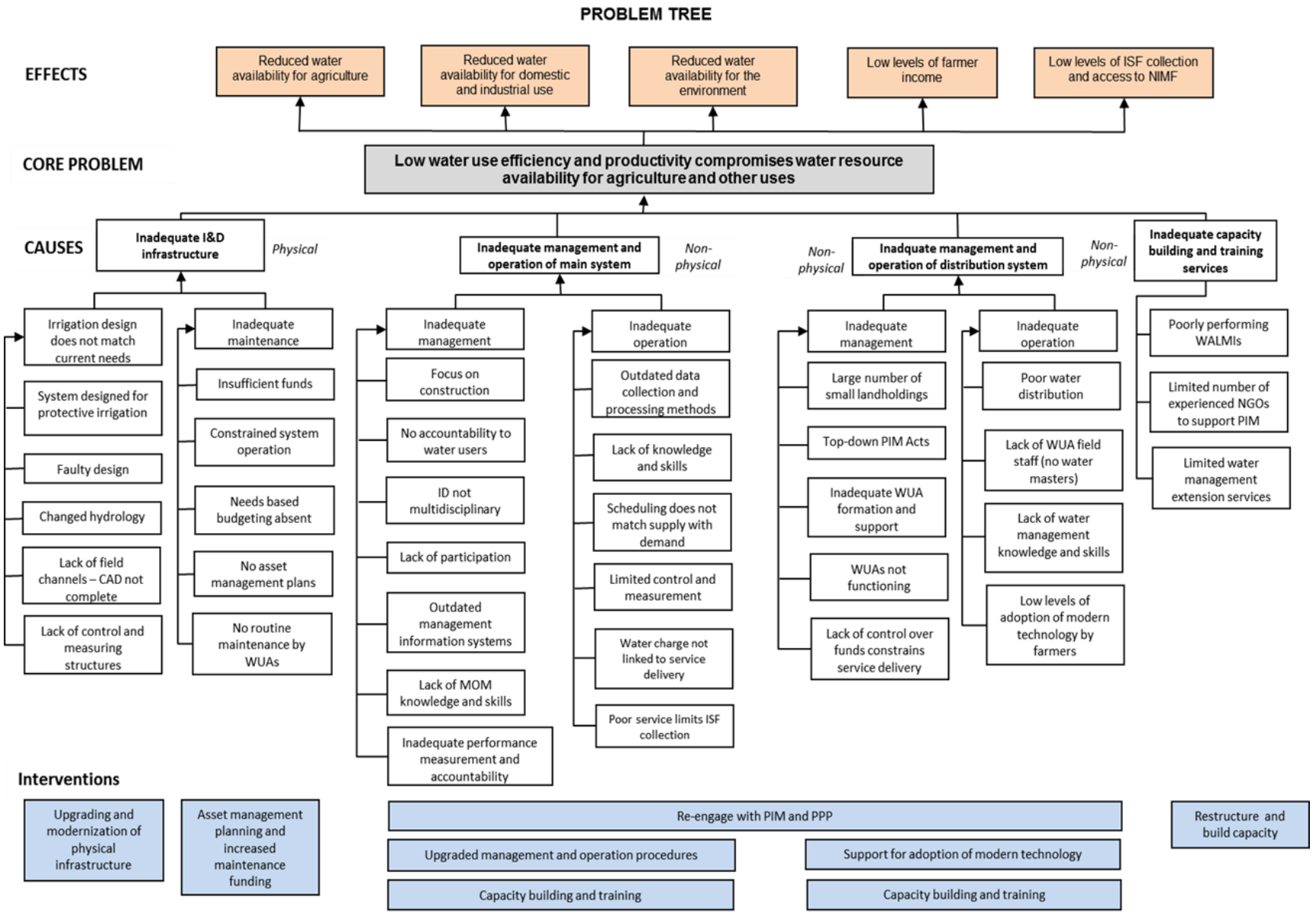
Suggested Analytical Tools

Benchmarking	Benchmarking based on FAO RAP approach
Focus Group Discussions (FGDs)	Quick non-quantitative assessment of current farming systems, constraints and indicative responses to possible initiatives
Participatory Rural Approach (PRA)	More detailed structured and detailed surveys including some quantitative assessment of constraints, issues and responses to possible initiatives
Sample area profiling	Semi-detailed studies in a sample areas including infrastructure, agriculture and social and institution as in conjunction with FGDs
Medium and detailed level remote sensing	Quick analysis of land-use from freely available medium resolution imageries over 5 schemes Pilot analysis over a selected area using high detail analysis to assess crop productivity
Sub-basin water balance	Scheme water balance of both surface and sub-surface sysems
Institutional and technical analysis	Compiling and integrating the outputs of RAP and PRA including costs
Improved water management	Prefeasibility plans to assess options and present proposals to improve water management and agriculture
Preliminary plans for water management	Preliminary plans for scheme modernization and increase efficiencies; Report

NWUEISP Framework – Analysing for concerns

Physical		
Inadequate Irrigation and Drainage Infrastructure	Irrigation design not matching current needs	Inadequate maintenance
	• Systems designed for protective irrigation • Faulty design; • Changed hydrology • Lack of or incomplete CAD works • Lack of control and measuring structures	• Insufficient funds • Constrained system operation • Need based budgeting not available • Asset management plans not adhered to • Routine maintainace by WUAs absent
Non-Physical		
Inadequate management and operation of <u>main system</u>	Inadequate management	Inadequate Operation
	• IDs focus on construction • IDs Non accountable to WUAs • IDs not multi-disciplinary • Lack of participation of stakeholders and users • Outdated and non-maintained records • Lack of MOM • Inadequate performance measurement and accountability	• Outdated data collection and processing methods • Lack of knowledge and skills • Demand-supply mismatch • No control on measurement • Water charges not linked to service delivery • Poor service fee collection
Inadequate management and operation of <u>distribution system</u>	Inadequate management	Inadequate operation
	• Large number of small holdings • Top-down PIM Acts need review • Inadequate WUA formation and support • Where formed WUAs not functioning • Lack or inadequate control over funds constraints service delivery	• Poor water distribution • Lack of WUA field staff (field masters) • lack of water management knowledge and skills • Low level of adoption o f modern technology by farmers
Inadequate capacity building and training services	Inadequate capacity building and training services	
	• Poor performing WALMIs • CADAs not functioning under I&Ds • Limited number of experienced NGOs • Limited water management extension services	

NWUEISP Framework – Identifying solutions

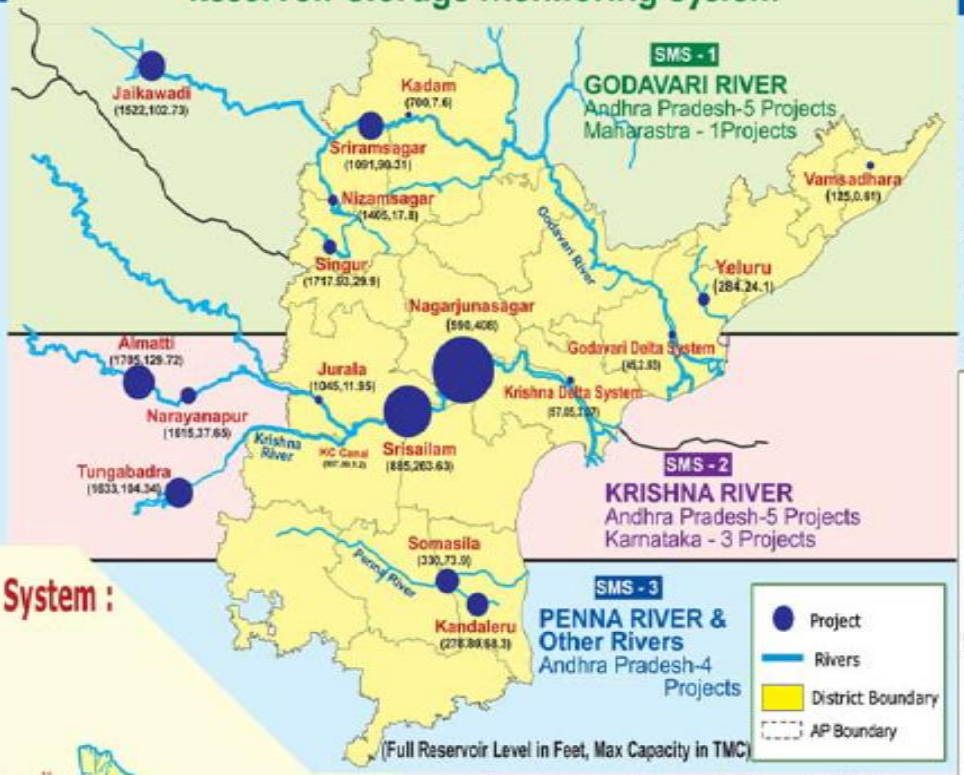


MOBILE BASED RESERVOIR LEVEL AND CANAL FLOW INFORMATION SYSTEM

Water Releases

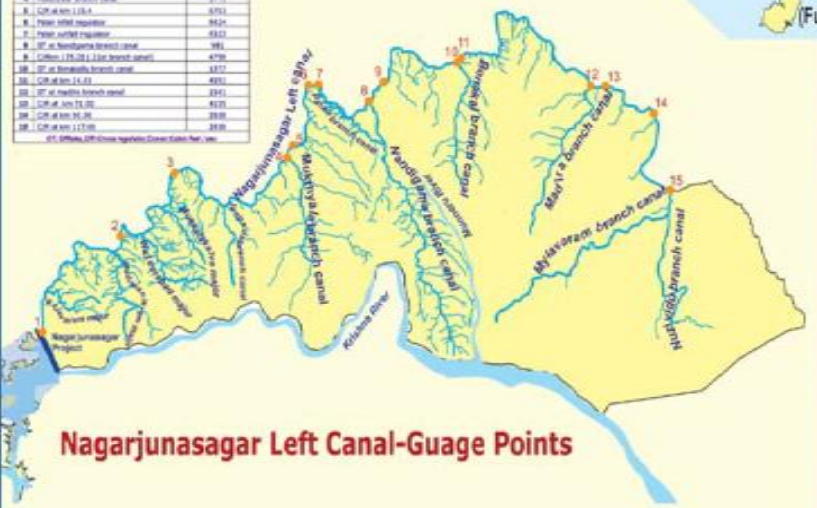
- **Resorvoir:**
  Reservoir Storage Monitoring System:
  65.5 lakh acres
- **Power Generation:**
  Hydel Power : 2674 MW
  Thermal Power : 3860 MW
- **Drinking water :**
  Municipalities:
  32(1.5 crore people)

Reservoir Storage Monitoring System



Canal Network Flow Monitoring System :

Area : 67lakh acres

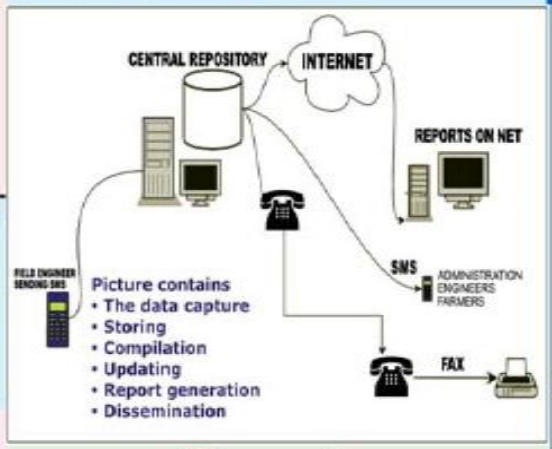


Persons Receiving SMS

- **Chief Minister Office :**
  Principal Secretary to CM
- **Secretariat, Andhra Pradesh :**
  Chief Secretary
  Principal Secretary (2)
  Secretaries (3),
  Special Secretary (2)
  Advisors to Government (3)
- **Command Area Development Authority :**
  Commissioner & Principal Secretary to Govt.
  Special Commissioner (I & CAD)
- **Disaster Management Unit :**
  Commissioner, Additional Commissioner
- **Irrigation & Command Area Department :**
  Engineer-in-Chiefs (3), Chief Engineers(4)
  Superintending Engineers(5),
  Executive Engineers(13)
- **Farmers Organizations :**
  Distributory Committee Presidents(46)

Procedure

- Design and development of Web based system
- Data capture through SMS from designated field engineers in pre-designed formats
- Data collection, updating and compilation in central database server
- Automated generation of reports, charts and spatial maps
- Automated data dissemination through SMS and Fax
- Website access to public

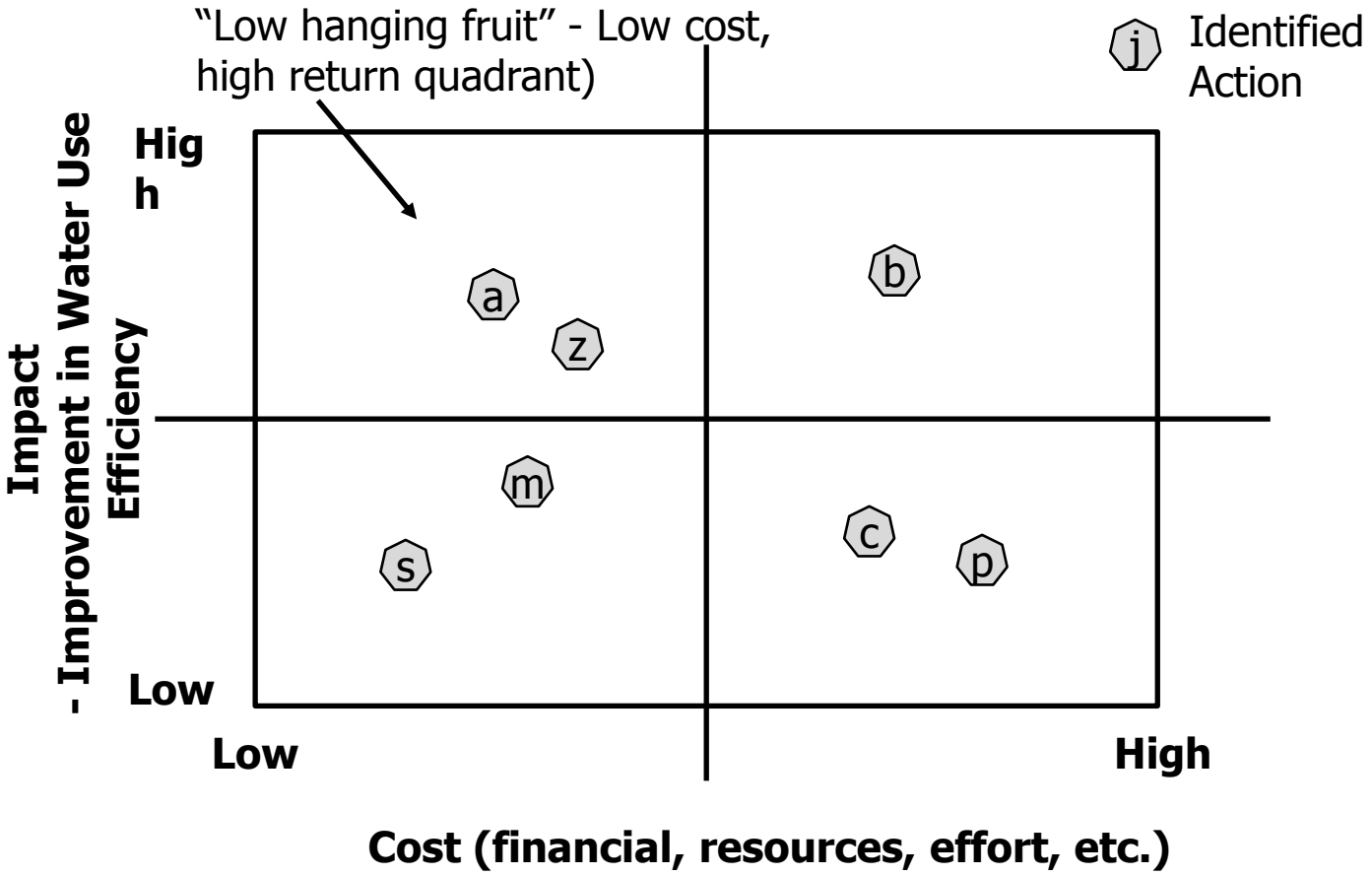


Reports

- **Web Based Report:**
  (http://cadarsms.cgg.gov.in, http://apcnfms.cgg.gov.in)
  - Daily consolidated and project specific reports
  - Comparision reports and graphs Analysis graphs
- **Fax:**
  - Automated Fax
  - Ondeamnd Fax
- **SMS:**
  - Automated SMS
  - Ondemand SMS

  Procedure: Send Project Code to **'99635 50620'**
  Example: Type "NSP" Send to **'99635 50620'**

NWUEISP Framework – Implementing identified solutions

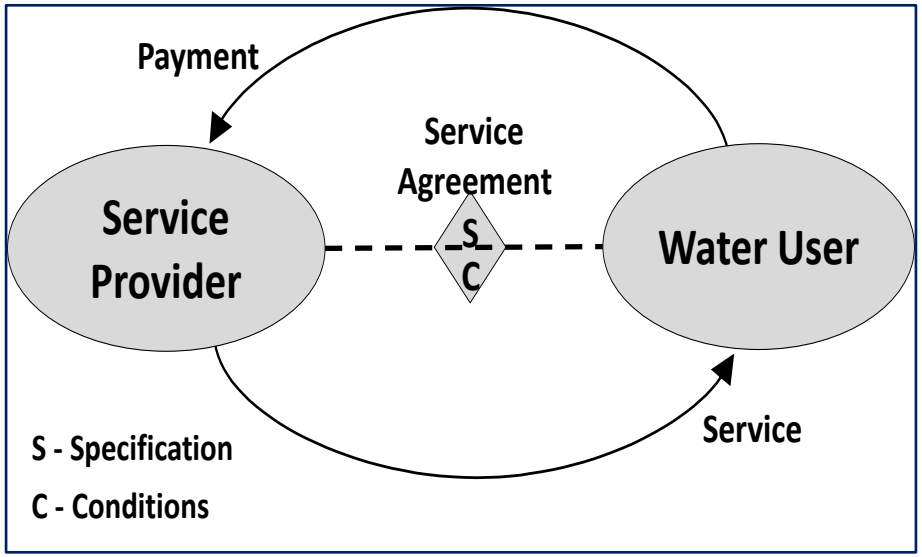


Identify cost effective measures

Sustainability of operations – Improving Service Delivery

Concept encompasses:

- **ID/private player responsible for service delivery and scheme performance**
- **Focus on productive irrigated agriculture**
- **Improved scheduling to match supply and demand**
- **Linking service delivery to fee collection**
- **Using modern technology – Remote sensing for crop area and ET, GIS, MIS, SMS linked to web pages, etc.**



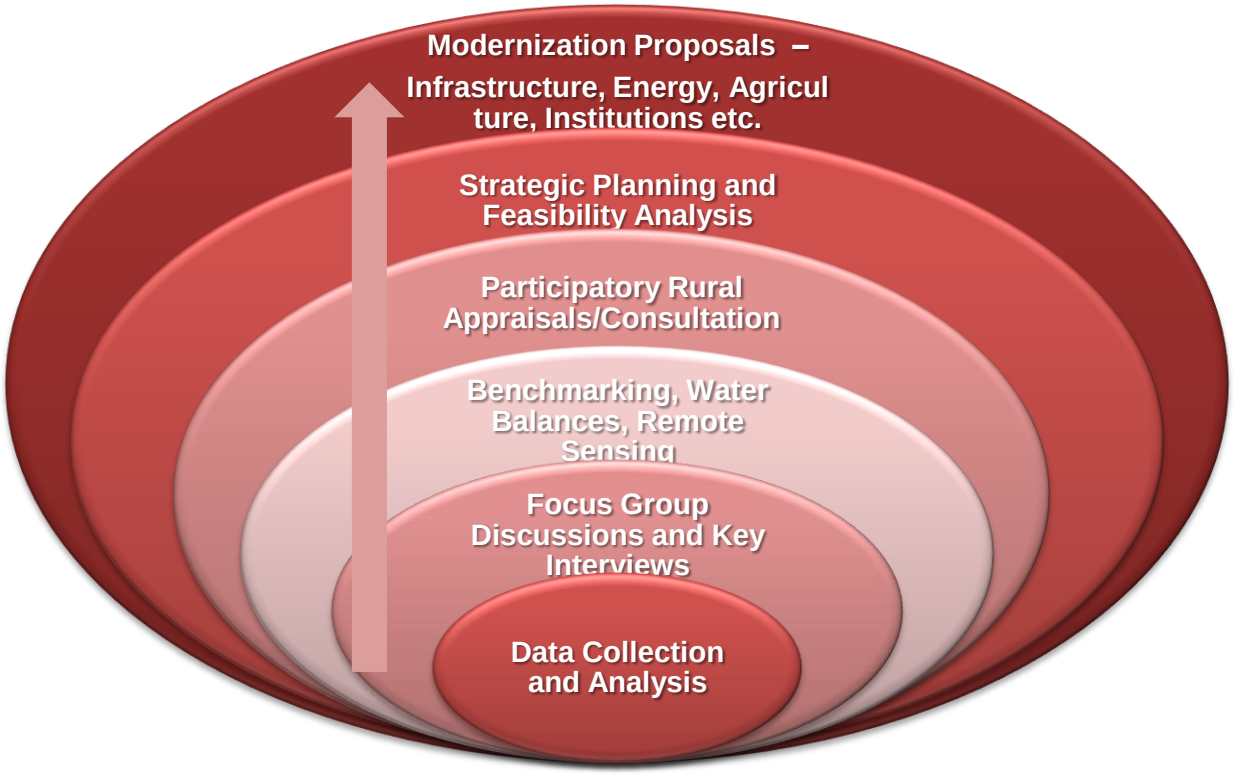
- **SCADA followed by DSS**
- **Improved control and measurement (linked to scheduling)**
- **Adequate maintenance budget (linked to service delivery)**
- **Partnership with water users (through WUAs)**
- **Plan and manage for conjunctive use**
- **Supported by effective education and training**

Economic viability, Cost, EIRR, B/C

Pilot Testing of the Framework

Pilot testing the framework

- **Frame work tested on Dharoi (Gujarat) and Sanjay Sarovar (MP) irrigation projects**



Analytical approach for pilot testing

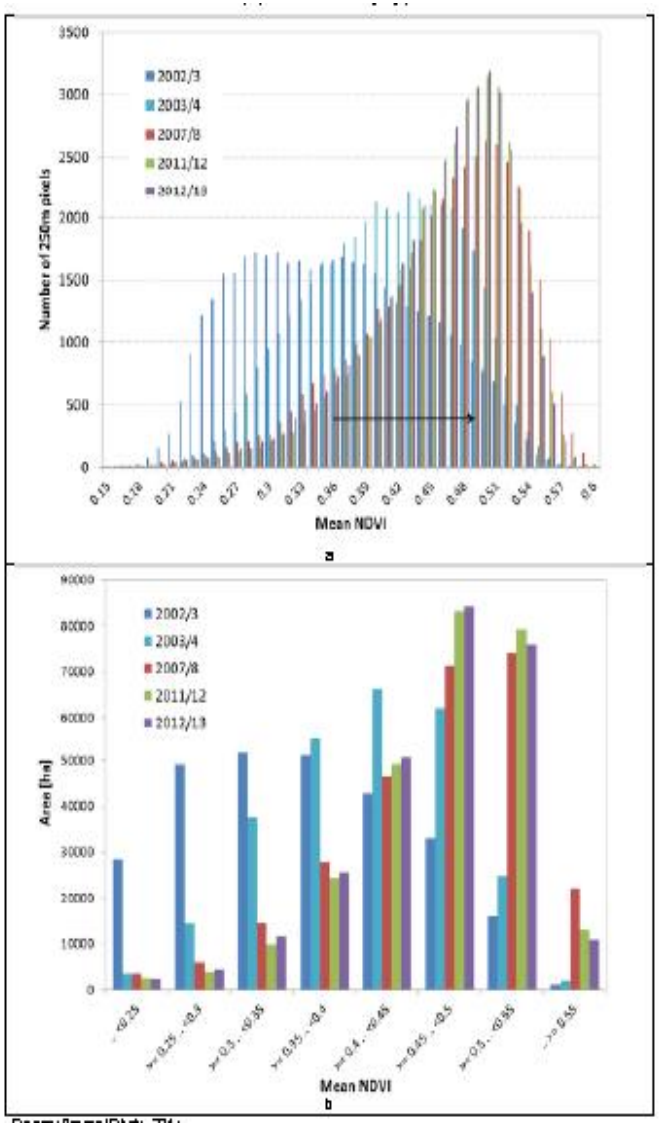
Estimating Productivity of Water

Data Collection and Analysis

- GIS mapping and assessment of command area, crop area and crops sown
- Assessment of surface and ground water resources and water diverted
- Assessment of productivity of water through remote sensing for different crops under branch canals

Productivity of Water - can be expressed as total biomass production or crop yield per unit of water"

'Surface Energy Balance Algorithm for Land' (SEBAL) is used with high resolution Landsat Imagery as input and observed for a full season.

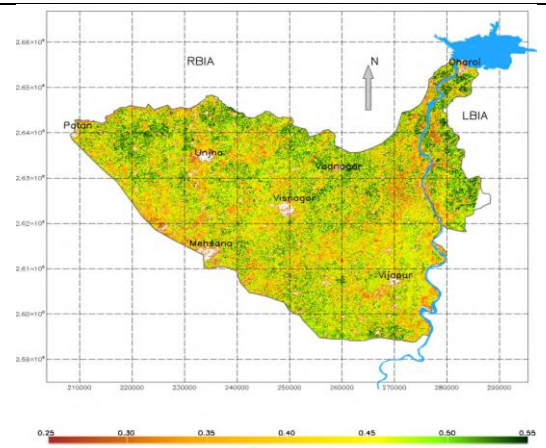


Histograms of mean NDVI and surface area per NDVI class

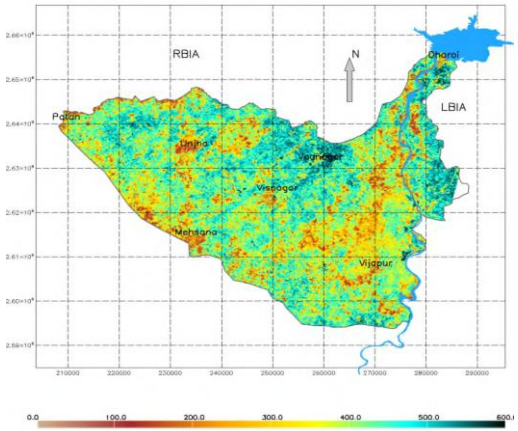
NDVI – Normalized Difference visible Index

Estimating Productivity of Water

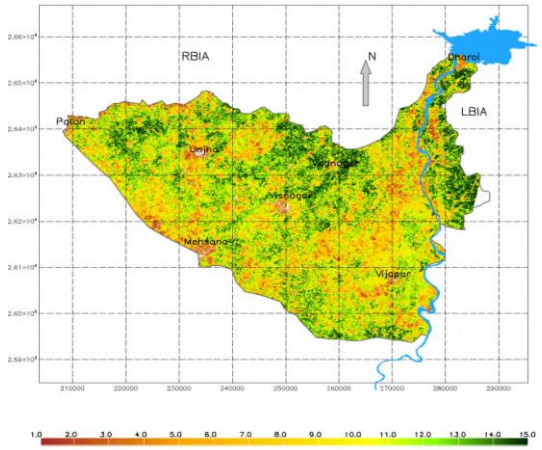
Dharoi irrigation Project



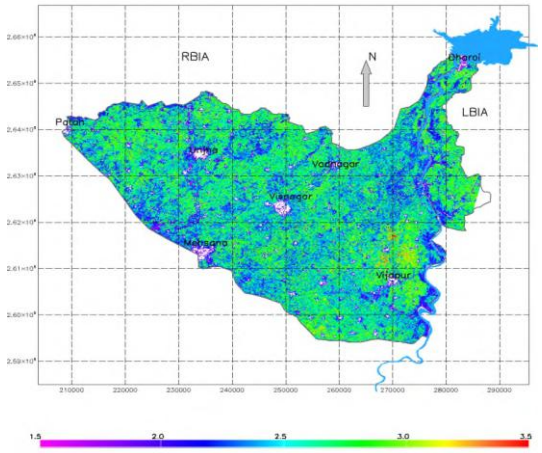
Mean NDVI



Total ET (mm)



Total Biomass (ton/ha)



POW-biomass (kg/m^3)

Estimating Productivity of Water

Key performance indicators	DIP	SSIP
Wheat productivity of water (POW) (kg/m^3) (World avg. 0.6 -1.9 kg.m^3)	0.9	0.8
Average wheat yield (ton/ha)	3.05	2.9
Paddy productivity of water (POW) (kg/m^3) (World avg. 0.5 -1.1 kg.m^3)	-	0.88
Average paddy yield (ton/ha)	-	4,5
Bhimgarh Br. wheat productivity of water (POW) (kg/m^3) (World avg. 0.6 -1.9 kg.m^3)	-	>0.9
Bhimgarh Br. average wheat yield (ton/ha)	-	3.5
Tail-end Wheat productivity of water (POW) (kg/m^3) (World avg. 0.6 -1.9 kg.m^3)	-	0.7
Main canal level total water consumption Mm^3 (Mm^3/day)	0.9 (6.4) (LBMC) 930.6 (5.8) (RBMC)	304 (1.9)TBS 289 (1.6) DS
Cotton (seed +lint) productivity of water (POW) (kg/m^3)	0.9	-
Cotton (seed +lint) average yield (ton/ha)	2.95	-
Fennel seed productivity of water (POW) (kg/m^3)	0.8	-
Fennel (seed) average yield (ton/ha)	2.5	-
Castor oil (seed) productivity of water (POW) (kg/m^3)	0.8	-
Castor oil (seed) average yield (ton/ha)	3.95	-
TBS: Tilwara Branch Scheme and DS: Dhuty Scheme under SSIP and LBMC: Left Bank Main Canal; RBMC: Right Bank Main Canal under DIP		

Baseline internal indicators

Data collection and analysis

- RAP results for performance benchmarking

Main Canal	DIP	SSIP
Cross regulator hardware (main canal)	2.4	0.9
Turnouts from the main canal	2.8	1.5
Regulating reservoirs in the main canal	0.0	0.0
Communications for the main canal	2.9	2.5
General conditions for the main canal	2.3	1.2
Operation of the main canal	2.4	1.9
Second-level Canals		
Cross regulator hardware (second-level canals)	2.3	1.4
Turnouts from the second-level canals	2.5	1.3
Regulating reservoirs in the second-level canals	0.0	0.0
Communications for the second-level canal	3.0	2.6
General conditions for the second-level canals	1.7	1.2
Operation of the second-level canals	2.4	1.6
Third-level Canals		
Cross regulator hardware (third-level canals)	-	-
Turnouts from the third-level canals	1.3	1.0
Regulating reservoirs in the third-level canals	0.0	0.0
Communications for the third-level canals	2.7	2.5
General conditions for the third-level canals	1.8	1.3
Operation of the third-level canals	2.7	1.0

Indicators assigned to a scale of 0 to 4:

- **0 for least desirable &**
- **4 for most desirable**

Baseline external indicators

Key Indicator*	DIP	SSIP
Service delivery parameter		
Annual project delivery efficiency %	67	41
Annual field irrigation efficiency%	44	51
Total annual volume of irrigation water delivery (Mm3/year)	443	391
Annual irrigation water delivery per unit command area (m^3/ha)	6498	5521
Annual irrigation water delivery per unit irrigated area (m^3/ha)	4825	5111
Maim system water delivery efficiency%	85	75
Annual relative water supply	2.62	5.01
Annual relative irrigation supply	1.68	2.79
Water delivery capacity	1.48	2.31
Cropping intensity %	1.35	108
Security of entitlement supply %	100	100
Financial		
Cost recovery ratio	0.06	0.11
Maintenance cost to revenue ratio	5.05	0.57
Total O&M cost per unit area (US$/ha)	66	19
Total cost per person employed on water delivery (US$/person)	1307	1220
Revenue collection performance	0.85	0.60
Staffing number per unit area (persons/ha)	0.009	0.0113
Average revenue per cubic meter of irrigation water supplied (US$/$m^3$)	0.0009	0.0005
Productive efficiency		
Total gross annual agricultural production (tons)	833, 580	248,150
Total annual value of agriculture production (US$)	340,283,333	80,576,667
Output per unit service area (US$/ha)	3574	853
Output per unit irrigated area (US$/ha)	2654	790
Output per unit irrigated supply (US$/ha)	0.436	0.155
Output per unit water consumed (US$/ha)	0.662	0.243

Participatory Appraisals

DIP	SSIP
System recently partially restored	Entire system needs major restoration • Canal lining, gates, controls and locks need attention
20% of farmers generally satisfied in agriculture sector • Women reported drudgery and health issues • Younger generation not interested in agriculture • New initiatives in agriculture required	Head reach farmers using more water • Majority of farmers want integrating all resources • Rules on water allocation, scheduling & warabandi need review • Insufficient water for Rabi • GW practiced in lower commands
WUAs not sustainable • 80% farmers practice uncontrolled conjunctive use • Want equitable allocations • Want surface and groundwater to be controlled conjunctively • Buried pipelines suggested • Interested in micro irrigation if subsidized	WUA in namesake • Equity issues • O&M grant insufficient • I&D maintains records; WUAs lack information on all aspects • Training and awareness lacking • Farmers favour measurements • Favour coordinated allocation on conjunctive use

Focus group discussions and Participatory rural appraisal

Feasible Options

	DIP	SSIP
Canal Infrastructure	• Technical and financial assistance needed for repairs and fully functional canal operations	• Currently LBC area is under expansion – 15% canal efficiency savings to be diverted here • Technical and financial assistance needed for repairs and fully functional canal operations
Area under surface irrigation	• Expansion of CCA caused stress on resources – allocations need revision	• Expansion of area suggested from savings through improved efficiencies
Ground water irrigation	• Abstraction from deep aquifer is key issue – needs changes in abstraction strategies	• Upper area has limited scope on GW use – savings to be used in the lower left area
Pumped irrigation	• Pumping costs are high – use of prepaid meters suggested • Micro irrigation is recommended to partial area	• Micro irrigation planned in partial area
Water User Associations	• WUAS need and willing to manage all resources – training and capacity building is a concern area • Possibility of PP management systems at and below tertiary level to be examined • Parallel farmers organizations suggested	• WUAs never had or allowed adequate governance – insufficient funds for O&M • Parallel farmers organizations suggested
Agriculture	• Very high level of disillusion in traditional agriculture- newer initiatives needed to increase agricultural viability	• Crop failure is common - Farmers need support in upper area to develop low water intensive Rabi crops
Water Management	• Surface water delivery is poor (BM score 2 out of 4) – conserving and controlled GW use is the key solution	• Systematic recharge and conjunctive use essential to introduce Dhuty LBS expansion
Energy Management	• Metered energy is key to control GW supplies – micro irrigation will enhance energy requirements	• Solar power plant would be needed to enhance the energy demand due to micro irrigation and conjunctive use
O&M costs	• Increased financial resources required – need to change future funding strategies	• Increased financial resources required – need to change future funding strategies
Management Agreements	• Conjunctive water resource management an essential requirement for long-term sustainability	• Significant upgrade in the management capacities is required

Proposals & investment options

Proposals for modernization of DIP and SSIP

- **Three scenarios examined**
  - **Current scenario**
  - **Upgraded Scenarios**
    - ***Option-1: Modernization of surface water system including improved surface water management***
    - ***Option-2: Modernization of surface and ground water together with increased cultivation, conjunctive use management and partial piped and micro-irrigation***
- **Innovations and investment plans examined**
  - **Data collection and examination, including monitoring**
  - **Infrastructure upgradation including SCADA**
  - **Piped and micro irrigation with prepaid metering**
  - **O&M costs**
  - **Agriculture support and extension**
  - **Pilot recharge for GW management**
  - **Proposal for solar energy including solar power plants**
  - **Reviewed institutional and management framework**
  - **Training and awareness**
- **Economical and financial analysis**
  - **EIRR and sensitivity of results**

Pilot testing of the framework – Recommended interventions

Interventions recommended for modernization of DIP and SSIP

- **Use of low cost remote sensing for water management applications and high resolution for bio-mass productivity assessment**
- **Upgrade physical system to achieve high levels of WUE of canal system**
- **Expand and integrate ground water use**
- **Necessary schedules for surface and ground water joint use**
- **Introduce energy management for control and management of ground water; insist pre-metering**
- **Cost recovery to be based on ground water use through hours of pumping**
- **Outsource management functions and establish long term financially sustainable irrigation management organizations; improve institutional capacities**
- ***IDs to take nodal lead; effective IMO to manage project activities***
- **Wherever possible involve private players, NGOs, WUAs**
- **Water allocation against demands and sustainable service delivery to be the main feature of the project**
- **Integrate sustainable agriculture support services in the entire agriculture chain**
- **Intensive training and awareness programmes for stakeholders**
- **Coordinated and effective management of various management levels through irrigation coordinated committees with support of local communities, agriculture department and extension, law enforcers, WUAs and IMO**

Conclusions

"While NWUEISP framework emphasized importance of performance assessment through WUE indices and bench marking as a management tool for boosting productivity of MMI, its pilot testing demonstrated effectiveness and replicability of the NWUEISP framework; interventions identified and economic analysis carried out"

Likely WUE improvements

		Current	SW interventions	SW & GW interventions
DIP	CCA (ha)	80426	148520	163500 +25000 under micro irrigation (MI)
	WUE %	44%	51%	56%
SSIP	CCA (ha)	45300	53300	58000 with diversion to new area + MI
	WUE (%)	40%	46%	61%

Thanks for Patient Listening