

Water Management in India: Options for Change

Dr Martin Burton

Outline of presentation

- Background to the presentation
- Overview of water resources in India
- Options for change. Three levels:
 - i. Water resources
 - ii. Main system
 - iii. On-farm
- Conclusions and recommendations

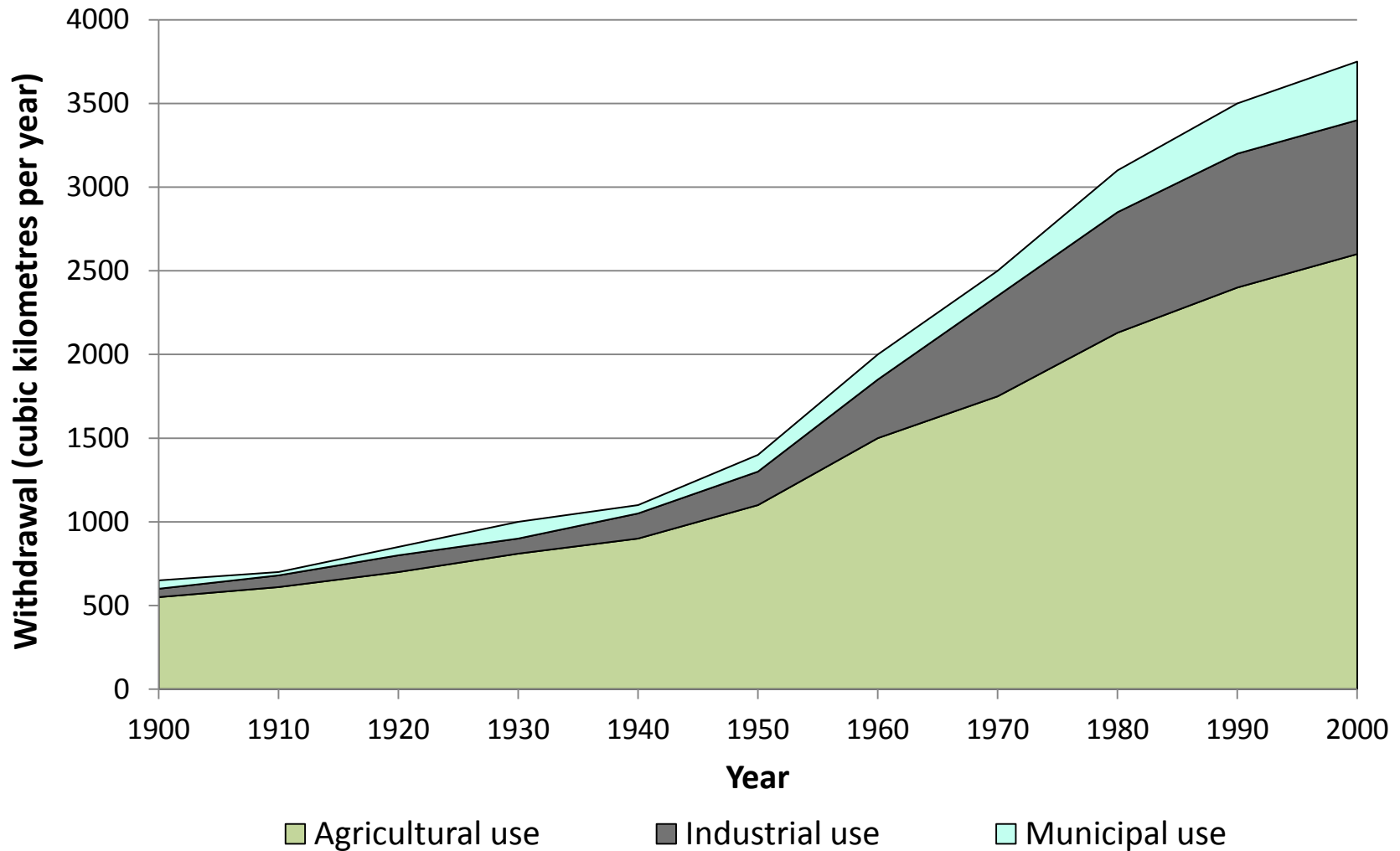
Background to the presentation

- World Bank study in 1998:
 - Identified areas of concern and proposed action
 - Established Water Sector Restructuring Projects in Maharashtra, Madhya Pradesh, Rajasthan, Tamil Nadu, Andhra Pradesh
- World Bank SDWUAs study 2009/2010:
 - Identified problems with:
 - participatory programmes
 - main system management
 - water resources management
- National Water Resources Framework Study 2011
 - Funded by International Finance Corporation, on behalf of the National Planning Commission
 - Assisting in preparation proposals for the 12th 5-Year Plan
- WB missions to Madhya Pradesh, Odisha (2010, 2011)

The situation in India

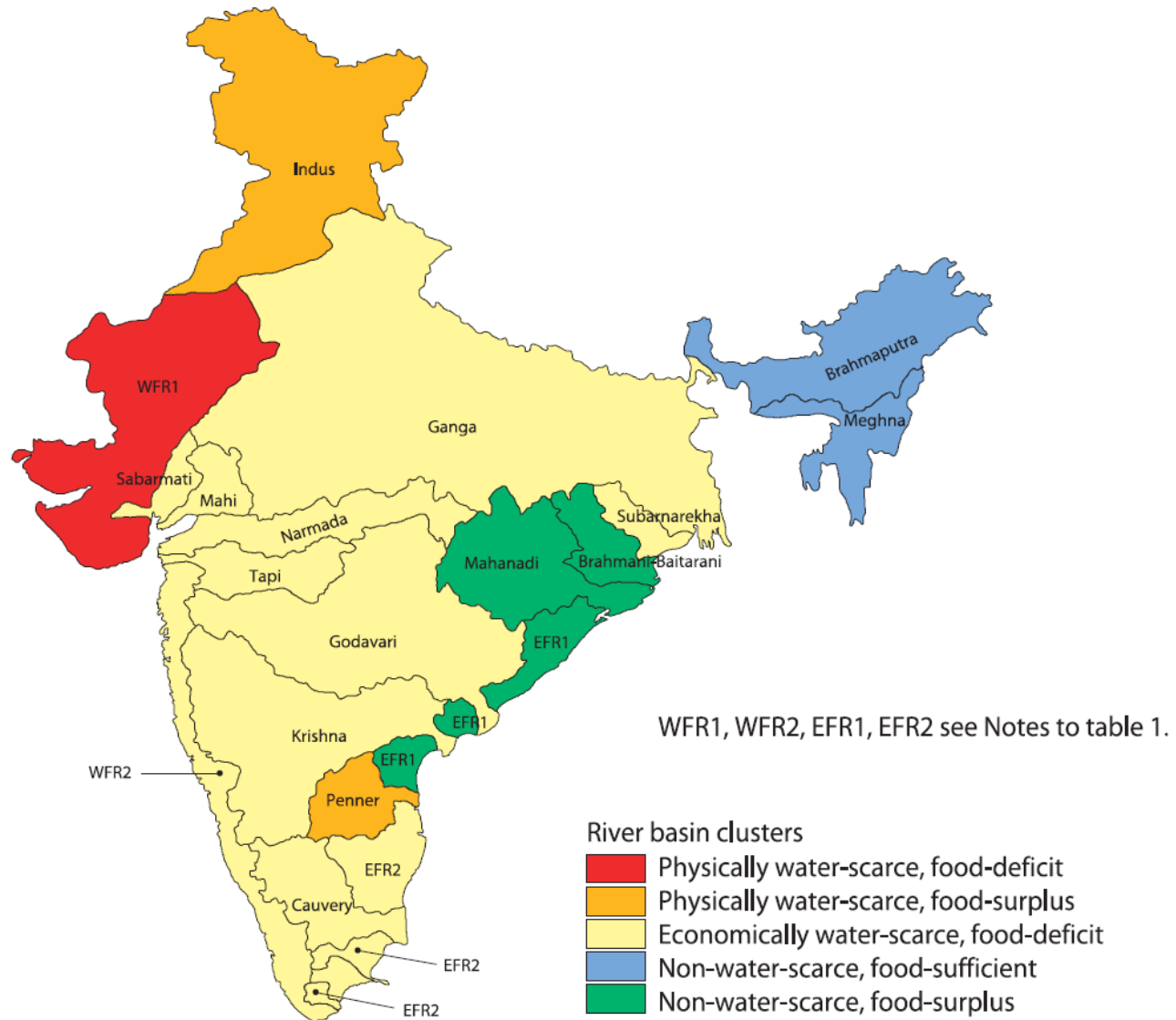
- Agriculture - 28% of GDP, 67% of employment
- Irrigation - higher incomes, more secure livelihoods, reduces poverty
- Irrigated area totals 90 million ha - surface water 39%, groundwater 47%, other sources 14%
- Growing demands for domestic and industrial water supply
- Increasing water scarcity - 9 out of 20 river basins deemed to be water scarce ($< 1000 \text{ m}^3$ per capita per year)
- Groundwater table declining in many states
- Gross irrigated area not rising despite continued investment
- Actual irrigated area not matching developed area
- Poor performance of I&D schemes
- Condition of I&D systems deteriorating, area reducing
- Conflicts over water increasing
- WUAs established but not performing

Growth in water withdrawals worldwide, 1900-2000



Source: IWMI, 2006, after Shiklomanov, 2000

Water and food scarcity in India



Source: Amarasinghe et al, 2004

Key data for selected states (2001 data)

| State | Total land area (mha) | Gross cultivated area (mha) | Total ultimate irrig. potential (mha) | Created irrig. potential (mha) | Utilized irrig. potential (mha) | Ult.IP/ Pot. GC (Col.4/ Col.3) | Total Utilized/ Total created (Col. 6/ Col.5) | Remain- ing to develop (Col.5 – Col.4) |
|----------|--------------------------|--------------------------------|--|-----------------------------------|------------------------------------|-----------------------------------|--|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| AP | 27.51 | 12.76 | 11.26 | 6.69 | 6.09 | 88% | 91% | 41% |
| Bihar | 9.42 | 7.9 | 10.89 | 7.64 | 5.61 | 138% | 73% | 30% |
| Gujarat | 19.6 | 10.73 | 6.1 | 4.25 | 3.73 | 57% | 88% | 30% |
| H'yana | 4.42 | 6.32 | 4.51 | 3.83 | 3.48 | 71% | 91% | 15% |
| M'shtra | 30.77 | 22.38 | 8.95 | 6.55 | 4.96 | 40% | 76% | 27% |
| Punjab | 5.04 | 7.99 | 5.97 | 6.00 | 5.88 | 75% | 98% | 0% |
| Raj'than | 34.22 | 20.8 | 5.13 | 5.33 | 4.9 | 25% | 92% | 0% |
| TN | 13.01 | 6.23 | 5.53 | 3.7 | 3.69 | 89% | 100% | 33% |
| UP | 24.09 | 25.82 | 29.64 | 32.39 | 25.68 | >100% | 79% | 0% |
| W. B'gal | 8.88 | 9.78 | 6.92 | 5.78 | 4.86 | 71% | 84% | 27% |

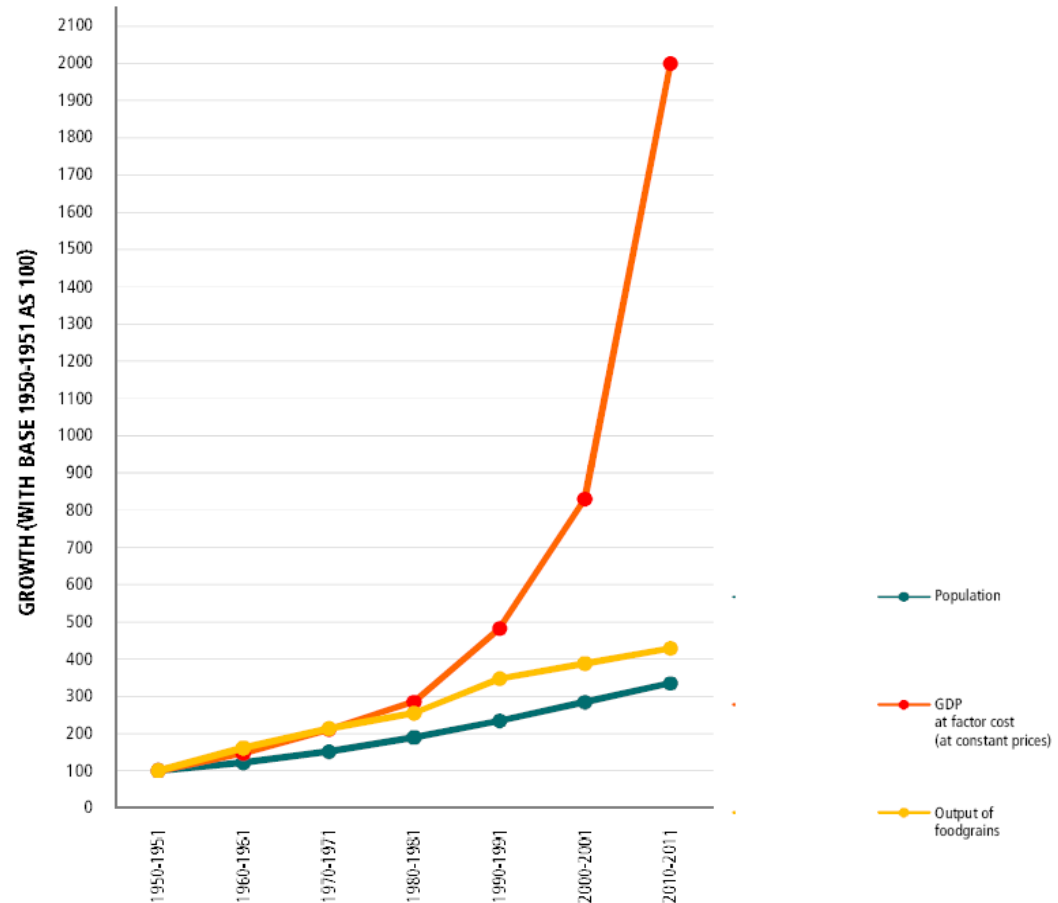
Source: Planning Commission and Central Water Commission, Gol

Population growth, GDP and foodgrain production, 1950/51-2010/11

Growth of population, GDP and foodgrain production,
India: 1950-1951 to 2010-2011

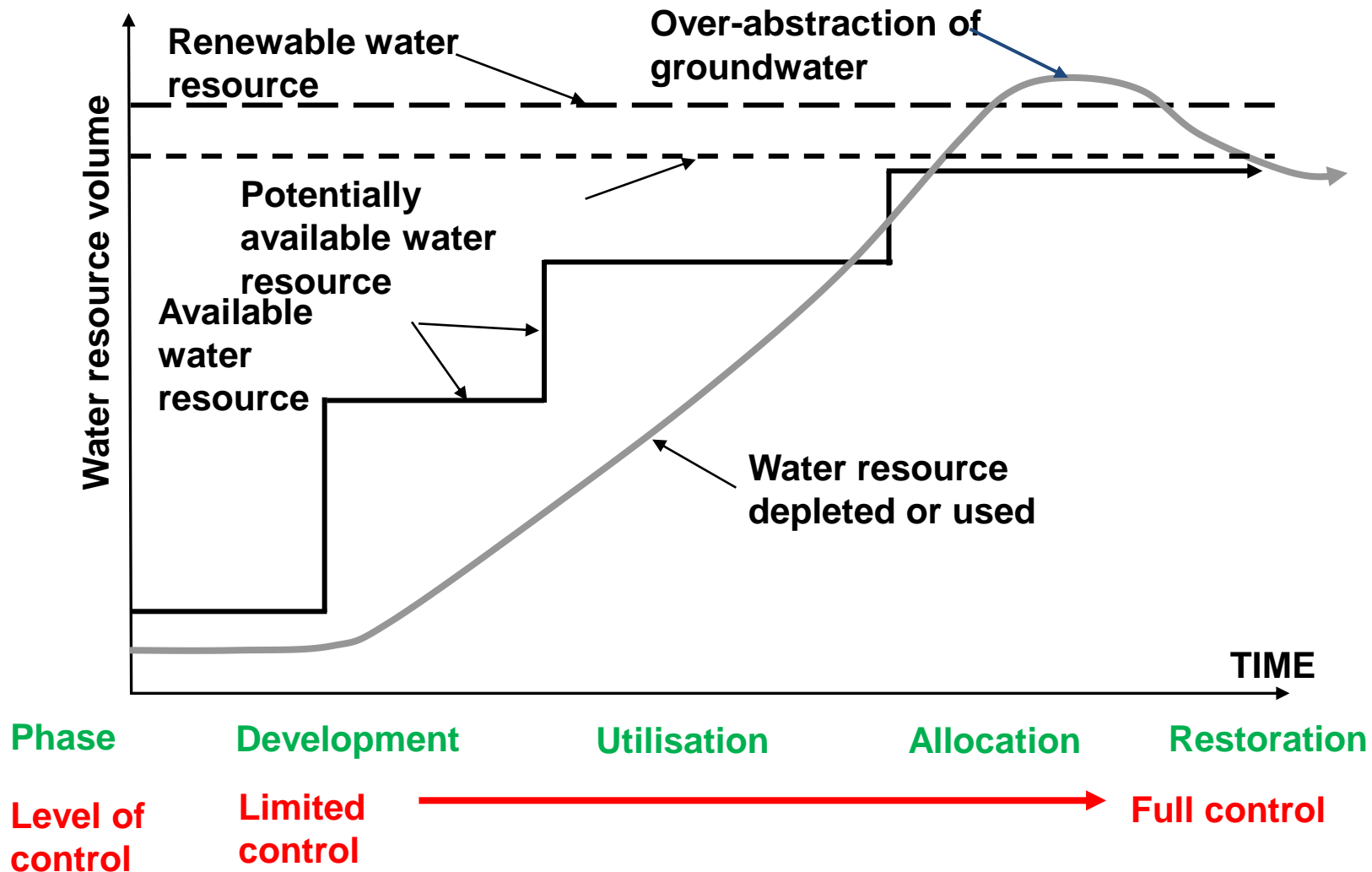
Notes

1. See notes 1 to 6 below Statement 2
2. Source: GDP and Output of foodgrains from Economic Survey, 2010-11. GDP (quick estimate) and foodgrain production (4th advance estimate) correspond to 2009-2010



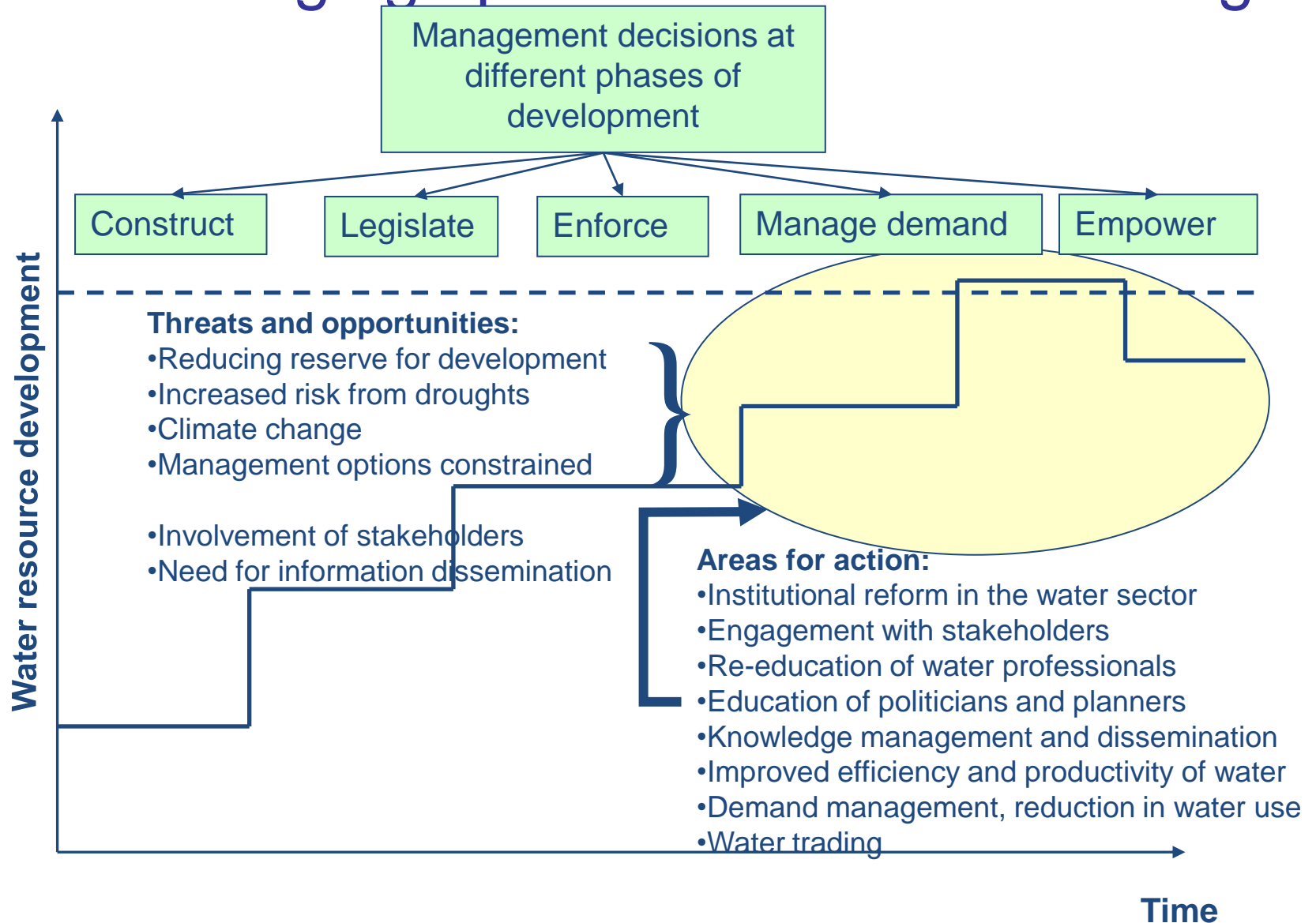
Source: Office of the Registrar General & Census Commissioner, India, Government of India, Ministry of Home Affairs, 2011

Phases of river basin development

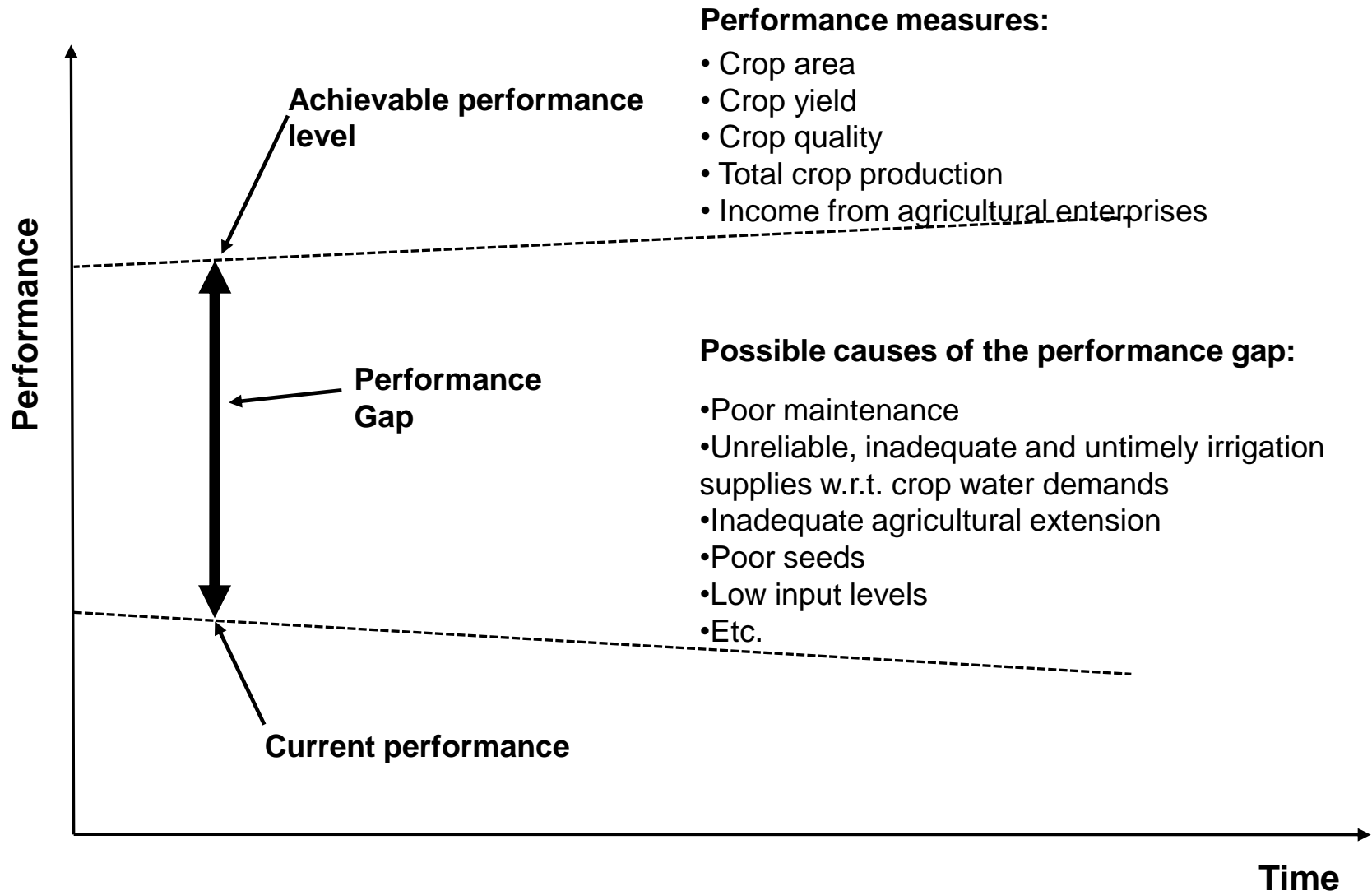


Source: Modified from Molden et al, 2001

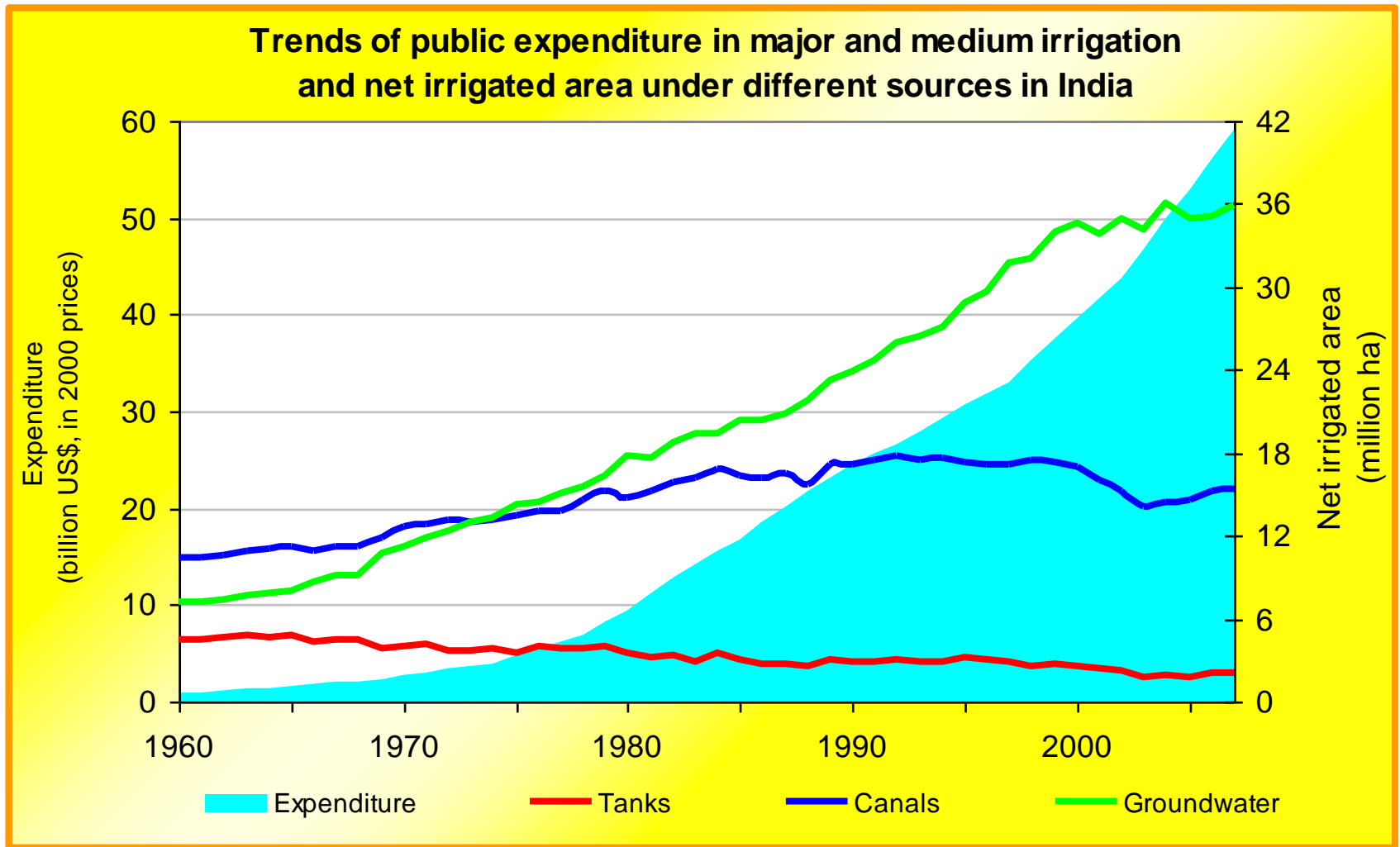
Changing options for decision making



Performance gap in irrigated agriculture



Irrigation development 1960-2007





Part I - Water resources management reform

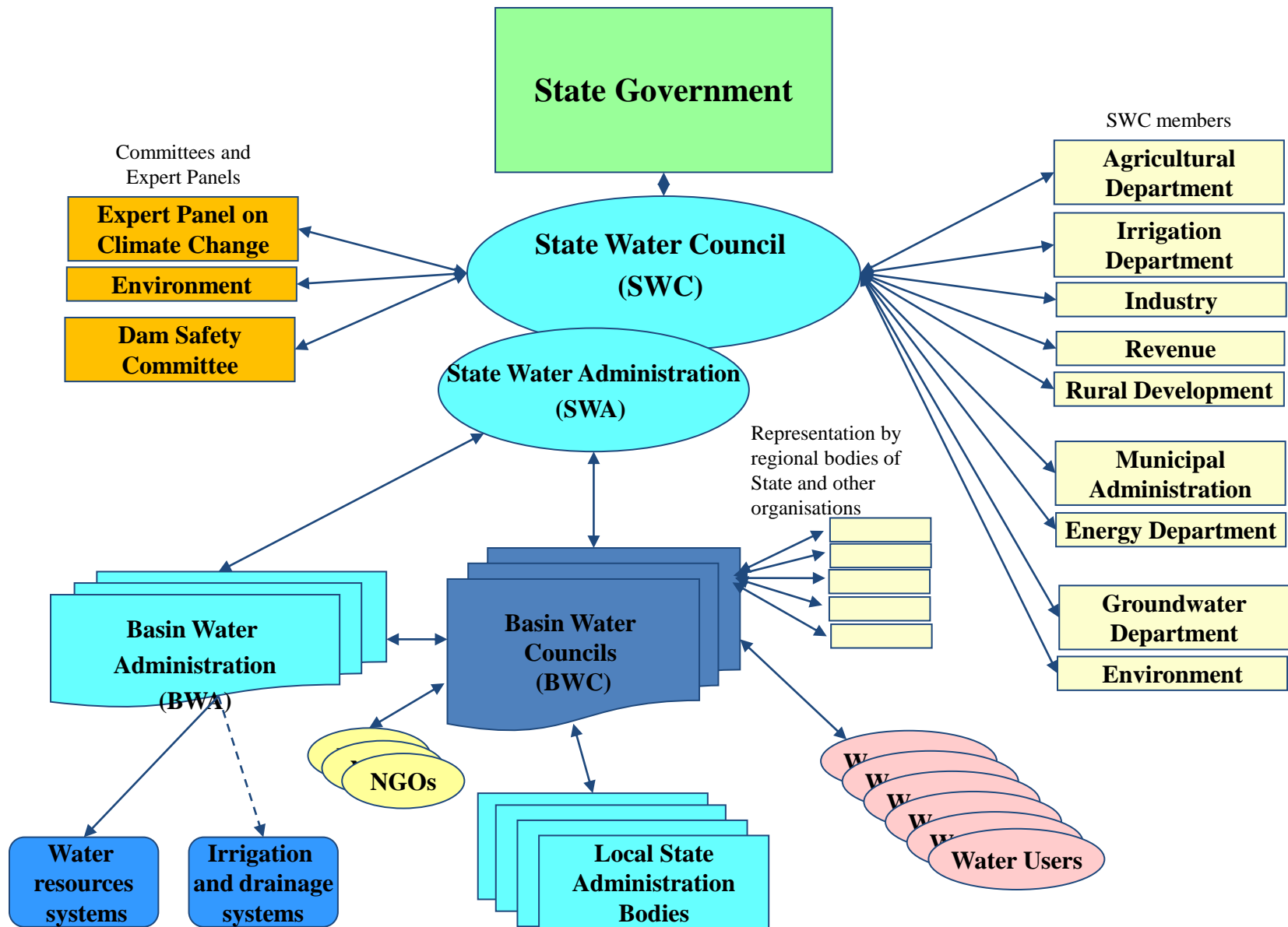
Current issues in WRM

- Historically water resources development has been carried out by the Irrigation Department
- Irrigation has dominated the WR development agenda
- ID not equipped for WRM - wrong focus, few WRM staff, etc.
- No holistic view - Different agencies have different responsibilities for elements of WRM
- Industrial and domestic demands increasing but allocations controlled by another user – the ID
- How to “cut the cake” – river basin or State?
- Little, if any, regard for the environment

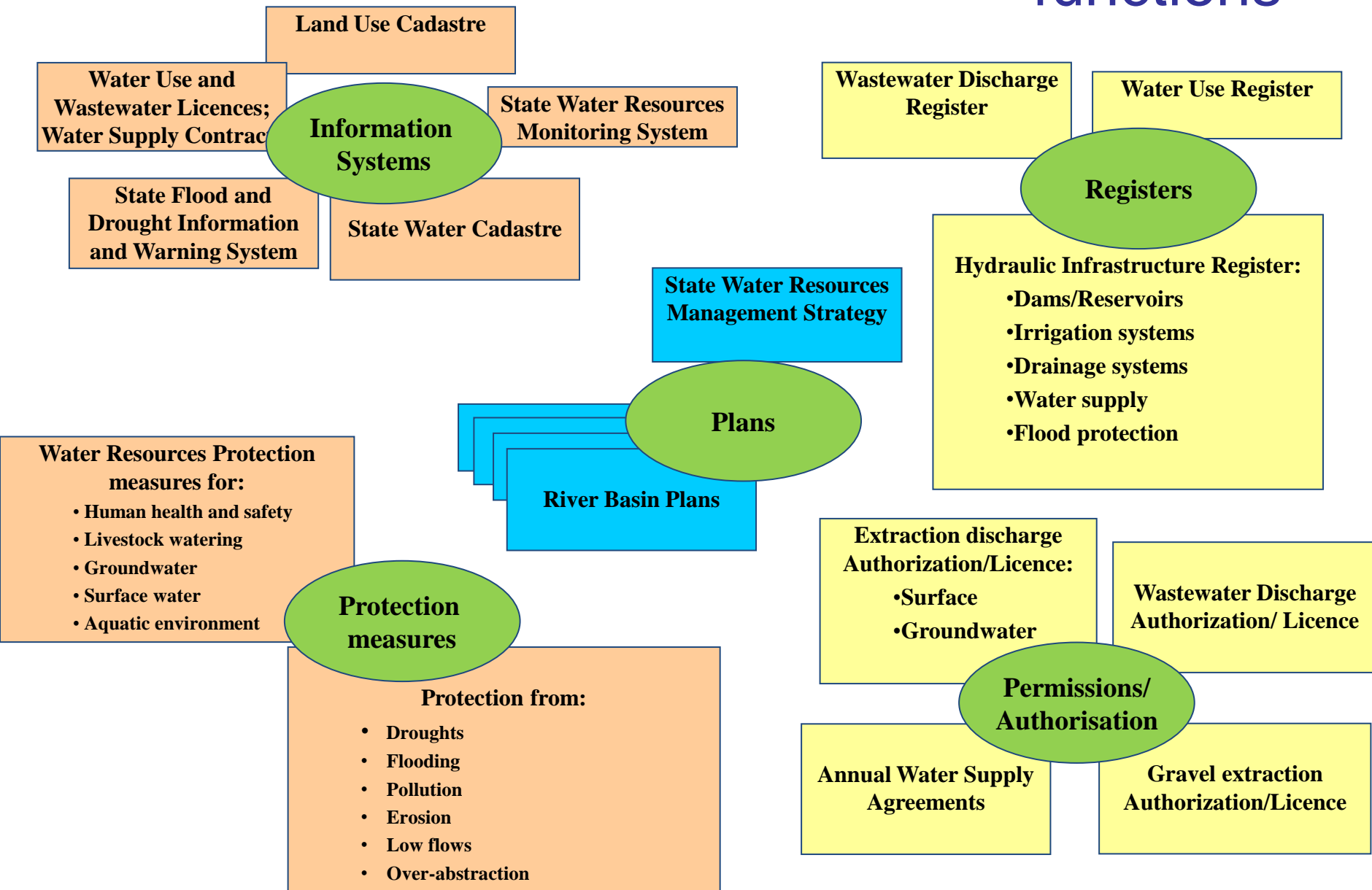
Action Plan

- Form State Water Council
- Separate the Irrigation Department into three branches:
 - Water Resources Branch (WRB)
 - Irrigation Services Branch (ISB)
 - Irrigation Development Branch (IDB)
- Recruit and train WRB personnel
- Form River Basin Councils and prepare river basin plans
- Prepare the State Water Resources Management Plan (SWRMP)
- Prepare, consult and enact the draft Water Resources Act
- Form the Water Resources Department
- Implement river basin plans
- Implement State WRMP and river basin plans
- Strengthen water resources management in universities and training establishments

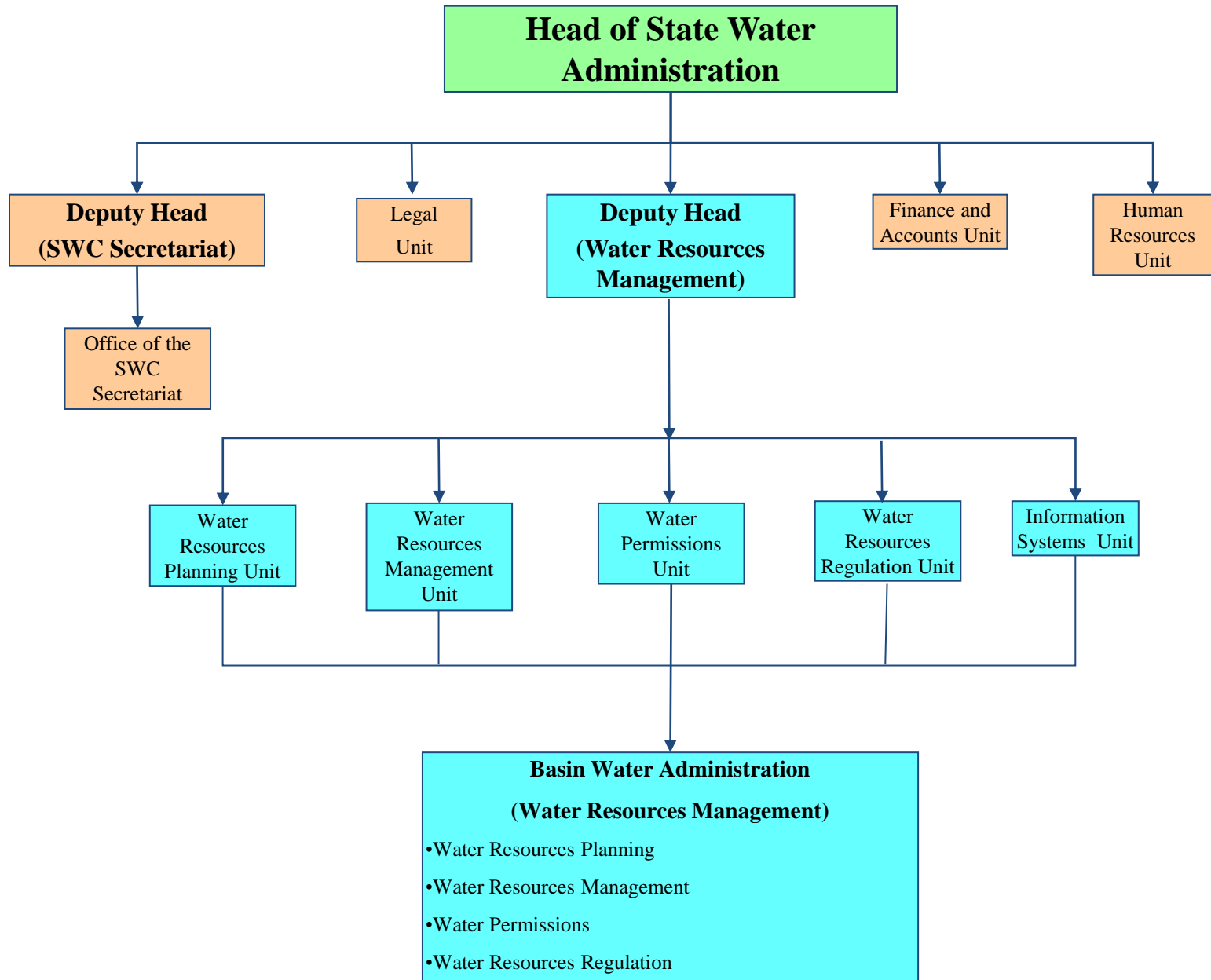
Possible organizational structure for WRM



State Water Resources Administration functions

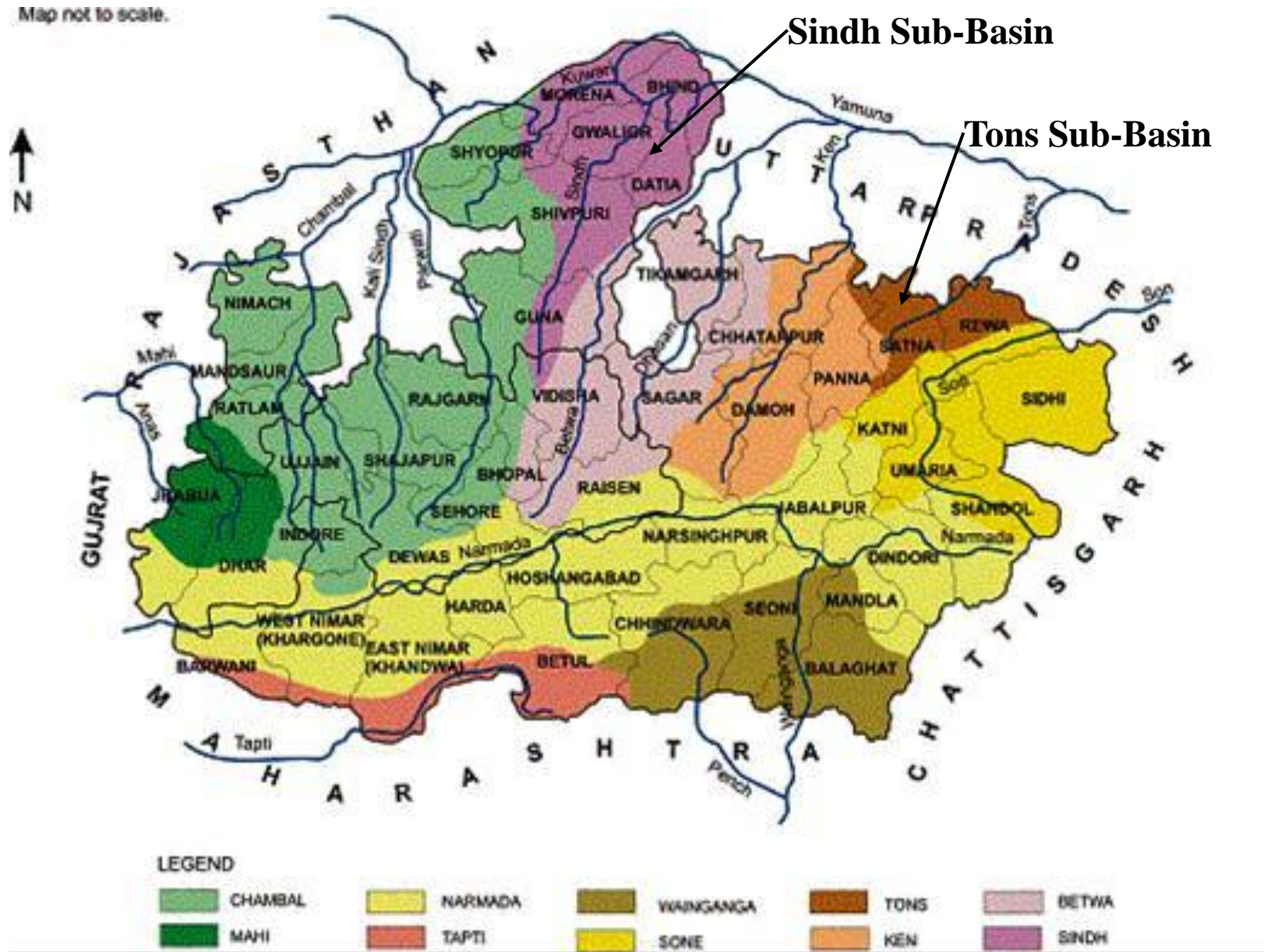



Possible SWA structure



Madhya Pradesh (sub-) river basins

Map not to scale.

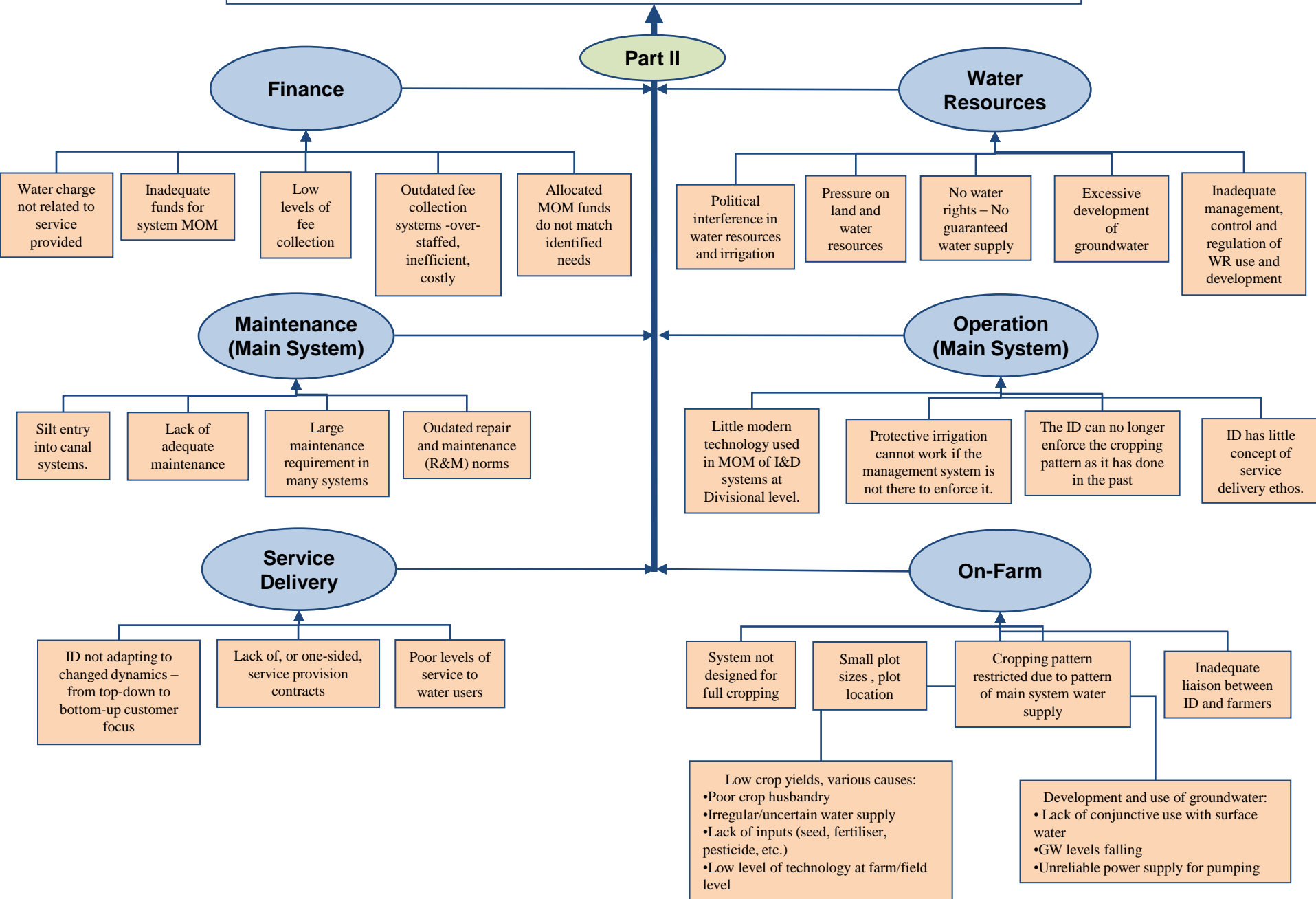


A photograph of a long, straight irrigation canal running through a green field. The canal is filled with water and has a concrete or brick lining. The field is green and appears to be a crop field. In the background, there are trees and a clear sky. The text is overlaid on the center of the image.

Part II - Main system management - Reform of the Irrigation Department

Irrigation and Drainage systems management, operation and maintenance

Problem tree – Part I (System focussed)



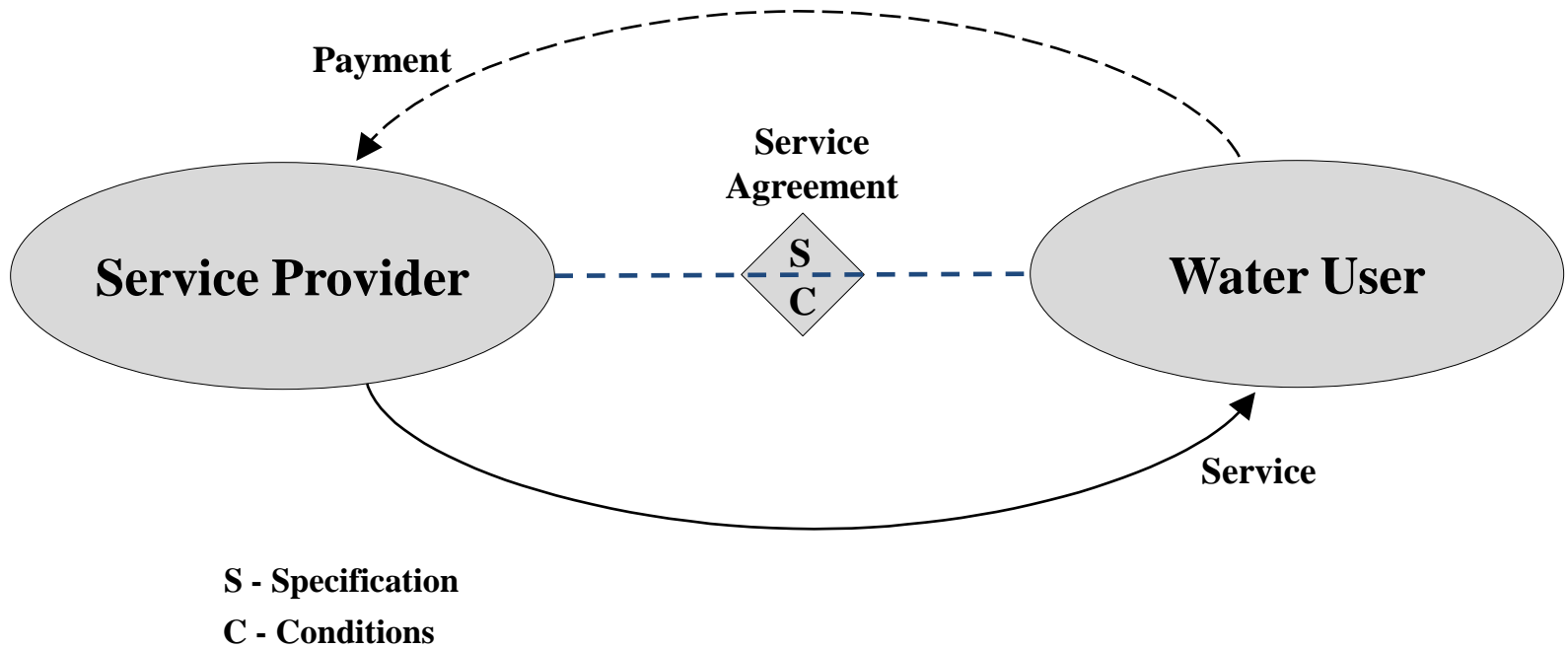
Issues

- Service Delivery
 - Top-down
- Operation (Main system)
 - Supply-orientated, relatively operation rules, limited measurement
- Maintenance (Main system)
 - Outdated R&M norms and procedures
 - Inadequate funds
- Finance
 - Water charges a tax, not a service fee. Not linked to needs.
 - Low recovery rates
 - Outdated fee assessment and recovery procedures
- Human resources management, education and training
 - Outdated HR management processes and procedures – esp. for WALMIs
- Management policy, processes and procedures
 - Focused on construction rather than water management
 - Employs mainly civil engineers
 - Lack of focus on individual system performance
 - Outdated systems, processes and procedures

Action Plan – ID Reform

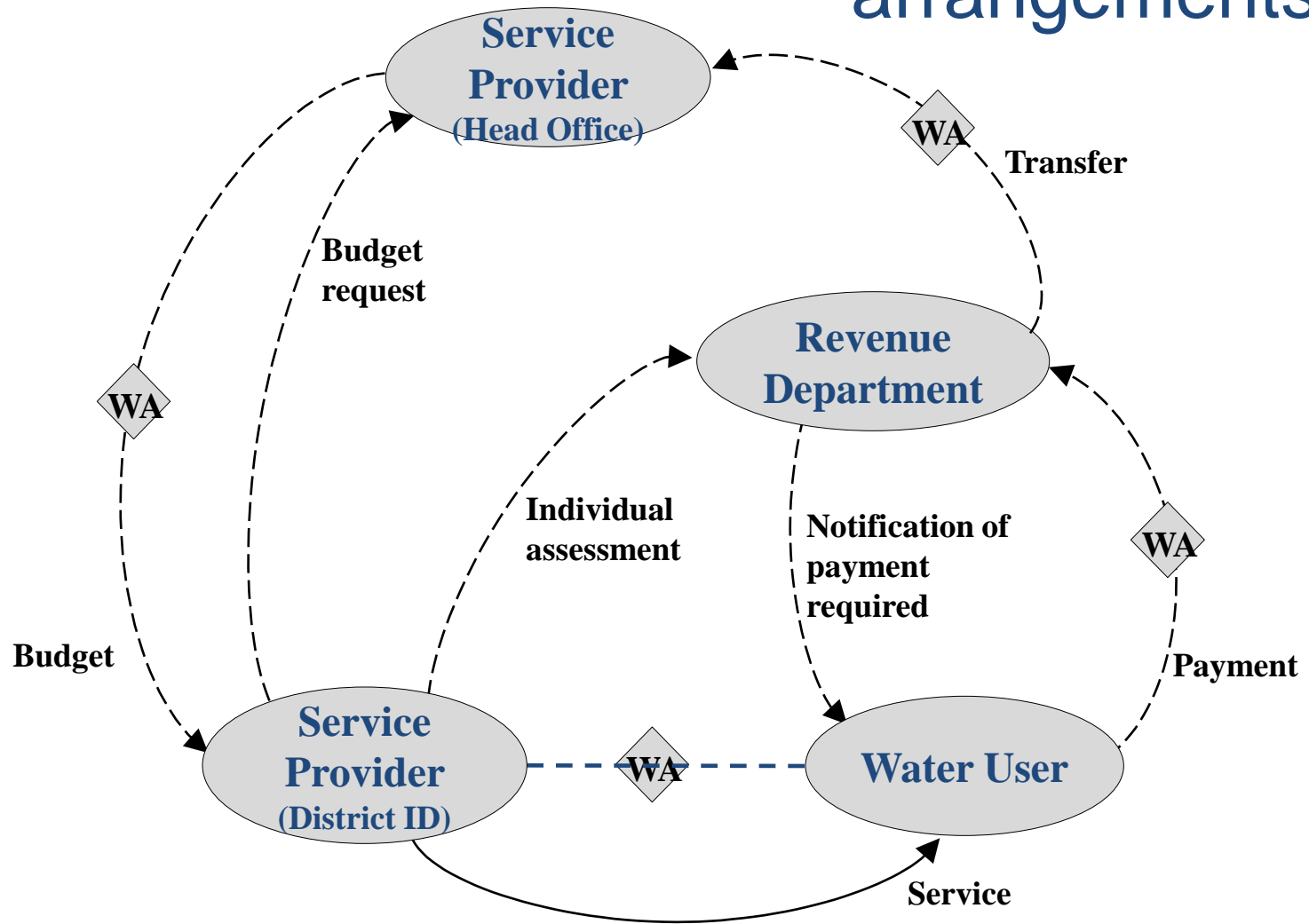
- Change from construction to management focus
- Restructure the whole organisation, separate construction and management, operation and maintenance (MOM)
- Employ new multi-disciplinary staff, not just civil engineers
- Radically change the human resources management
- Change staff attitudes – service delivery, farmers as clients, etc.
- Promote able and motivated younger staff to senior positions
- Modernize management systems (RS, GIS, MIS, etc.)
- Use asset management planning
- Focus on service delivery and partnership with water users
- Introduce performance-based management systems
- Support water users associations and farmer participation
- Free up cropping patterns to match farmer demands
- Modernise system management – conjunctive use, etc.
- Consider public-private partnership for system management

Service delivery relationships



Source: Huppert and Urban, 1992

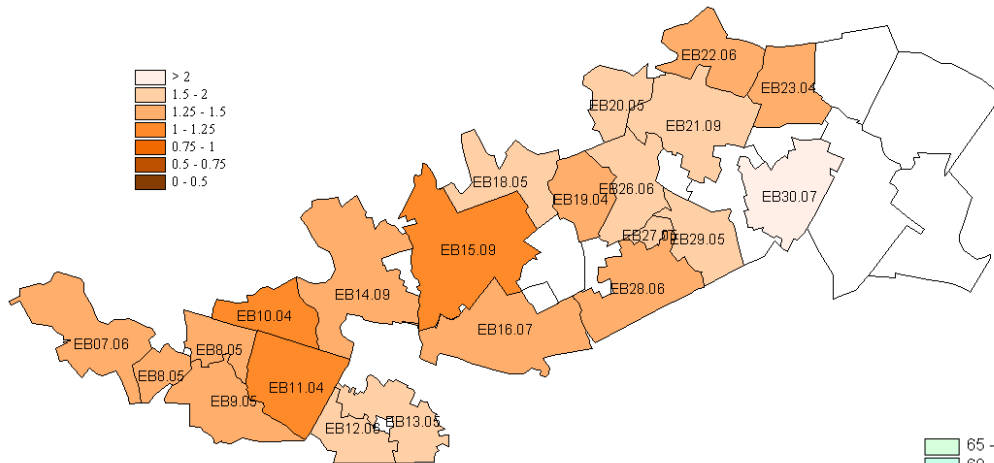
Current payment and service delivery arrangements



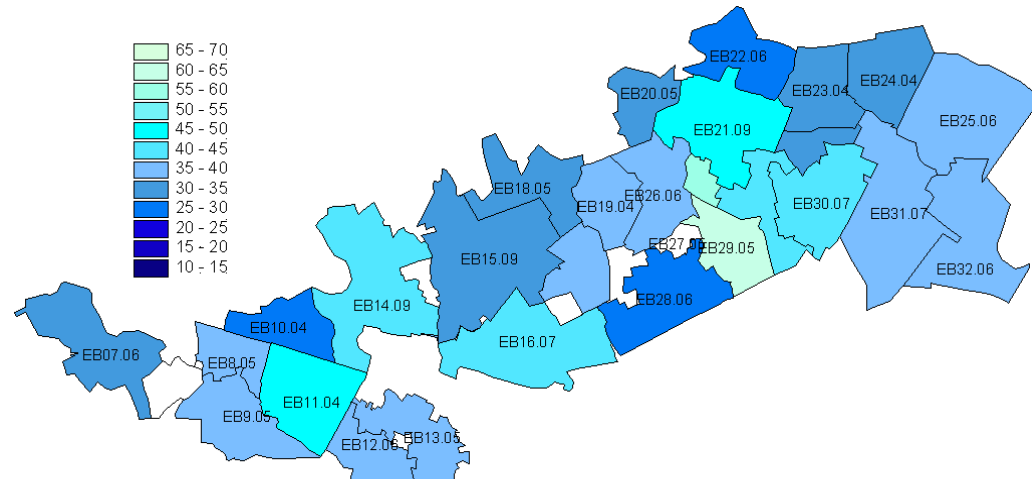
WA – Water Act

Use of remote sensing for scheme performance assessment

Relative water supply (supply/demand)

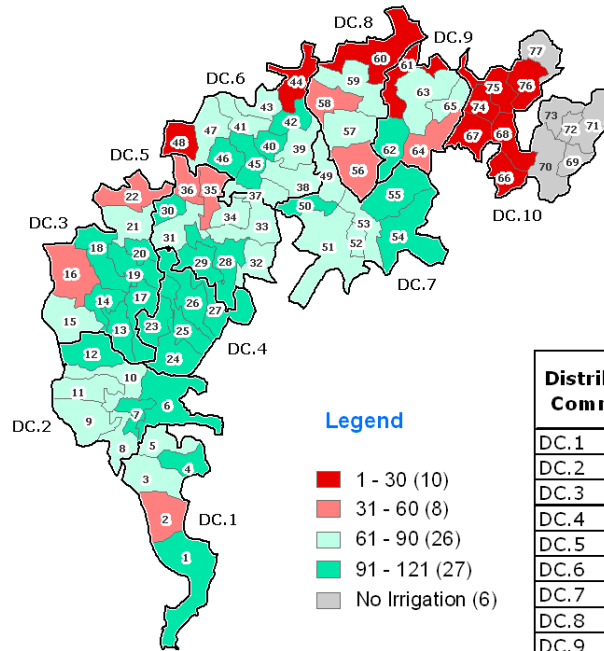


Crop water deficit (mm/month)



Performance assessment of Nizamsagar Command Area, AP

% Area Irrigated

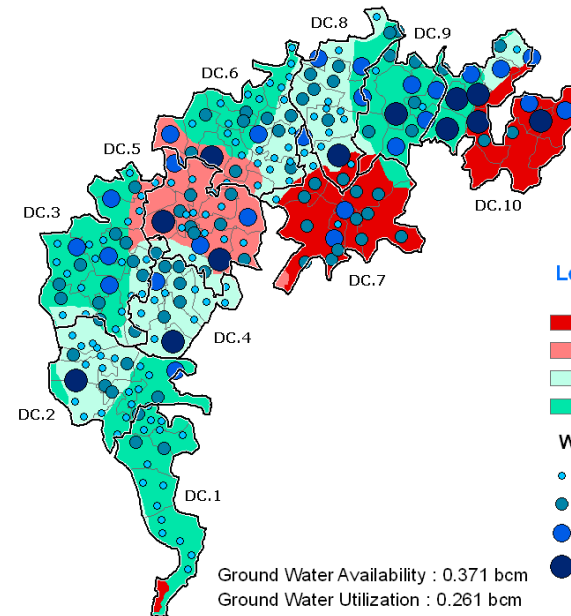


Legend

- 1 - 30 (10)
- 31 - 60 (8)
- 61 - 90 (26)
- 91 - 121 (27)
- No Irrigation (6)

| Distributary Committee | Localized Ayacut | Area Irrigated (acres) |
|------------------------|------------------|------------------------|
| DC.1 | 14630 | 11509 |
| DC.2 | 21189 | 18275 |
| DC.3 | 31632 | 26786 |
| DC.4 | 14681 | 15819 |
| DC.5 | 31509 | 25081 |
| DC.6 | 30536 | 21948 |
| DC.7 | 16767 | 13769 |
| DC.8 | 16121 | 7408 |
| DC.9 | 13764 | 7620 |
| DC.10 | 34907 | 1486 |
| Total | 225736 | 149701 |

Ground Water Status & Wells Density



Legend

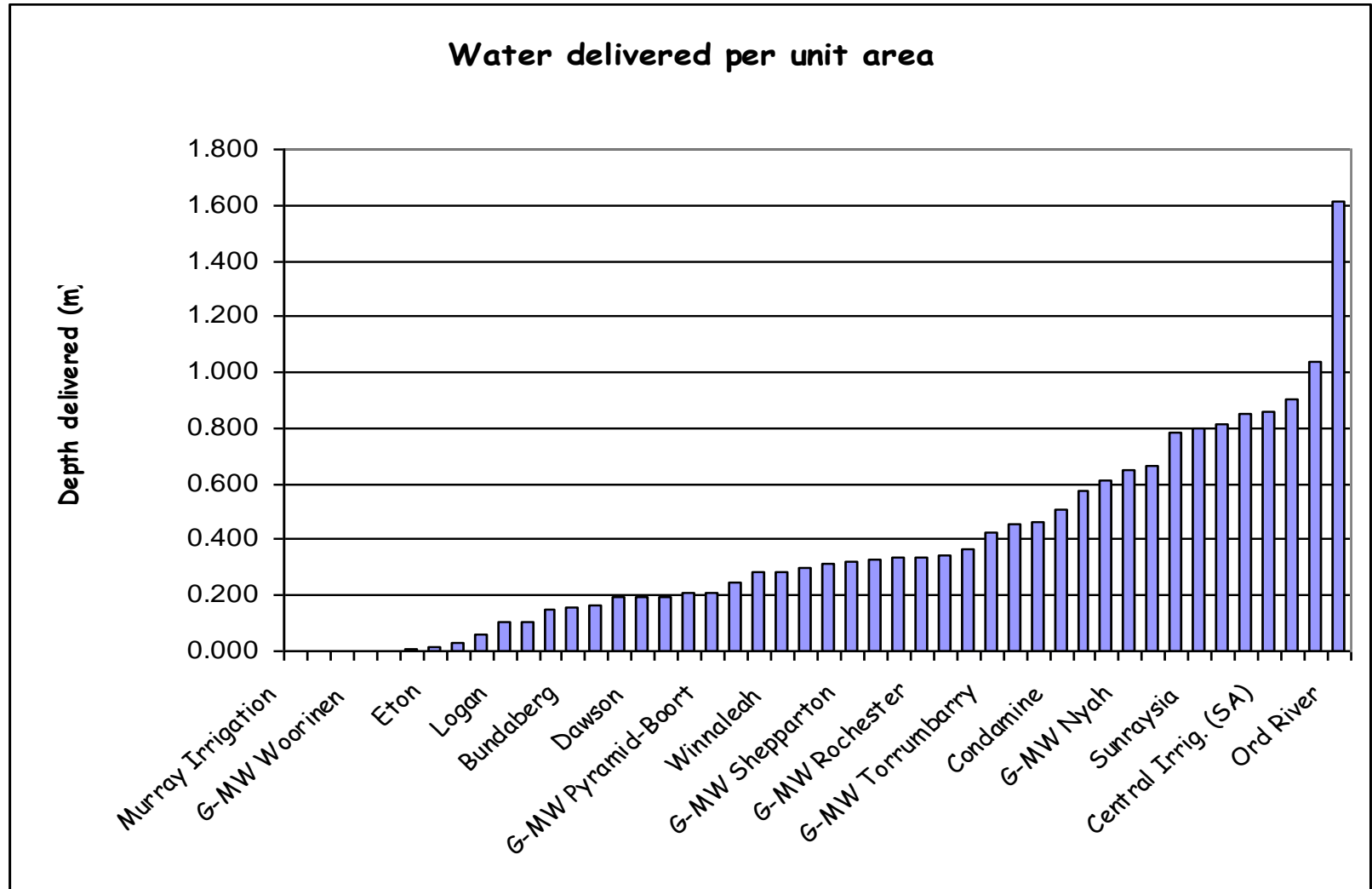
- Over - Exploited (14)
- Critical (13)
- Semi - Critical (21)
- Safe (29)

Wells Category

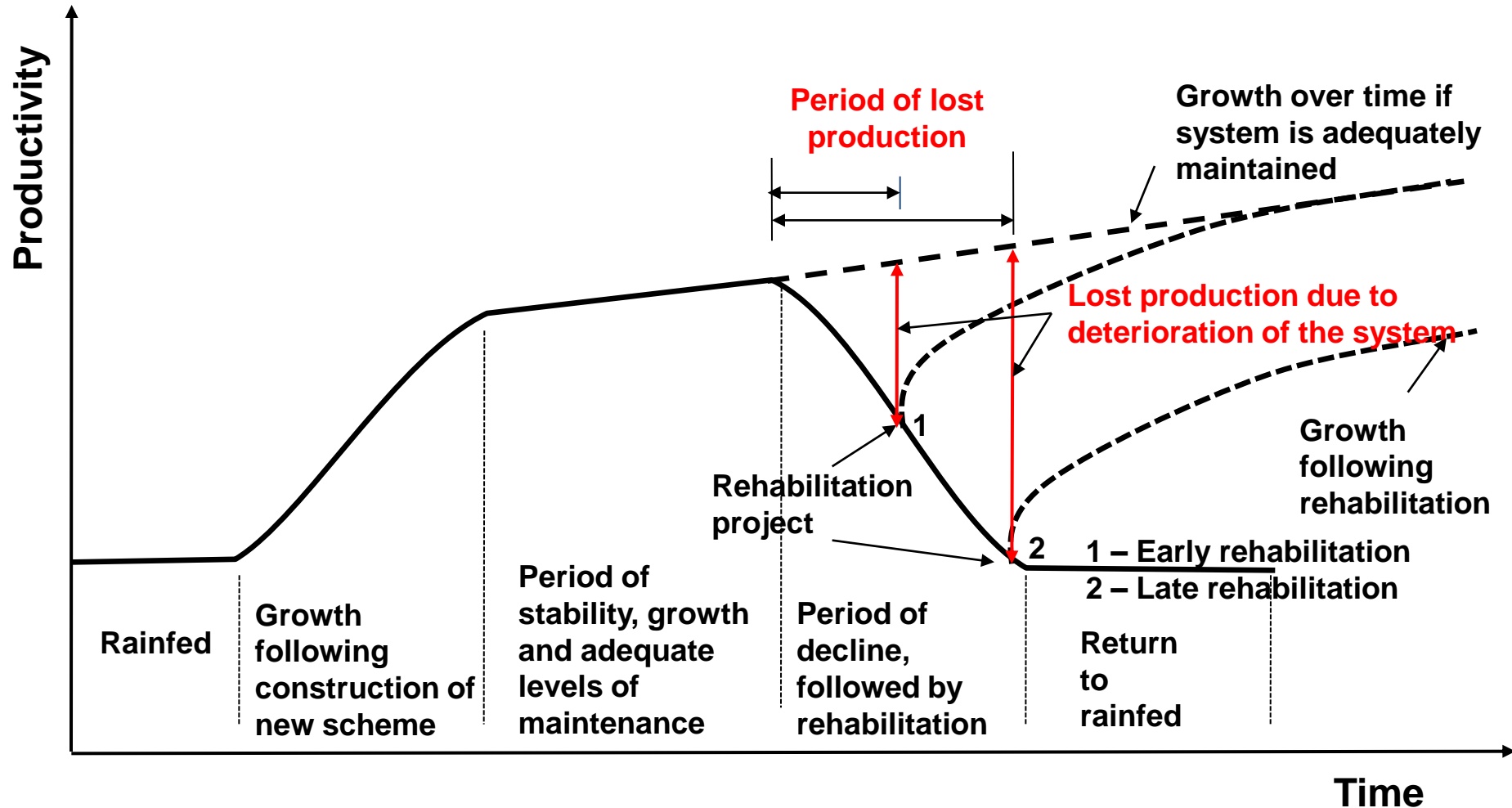
- 1 - 150 (115, 9431)
- 151 - 300 (72, 15475)
- 301 - 500 (26, 10163)
- 501 - 952 (12, 7846)

Note: For Wells category : The no's in brackets represents the no. of villages and the no. of wells in that category

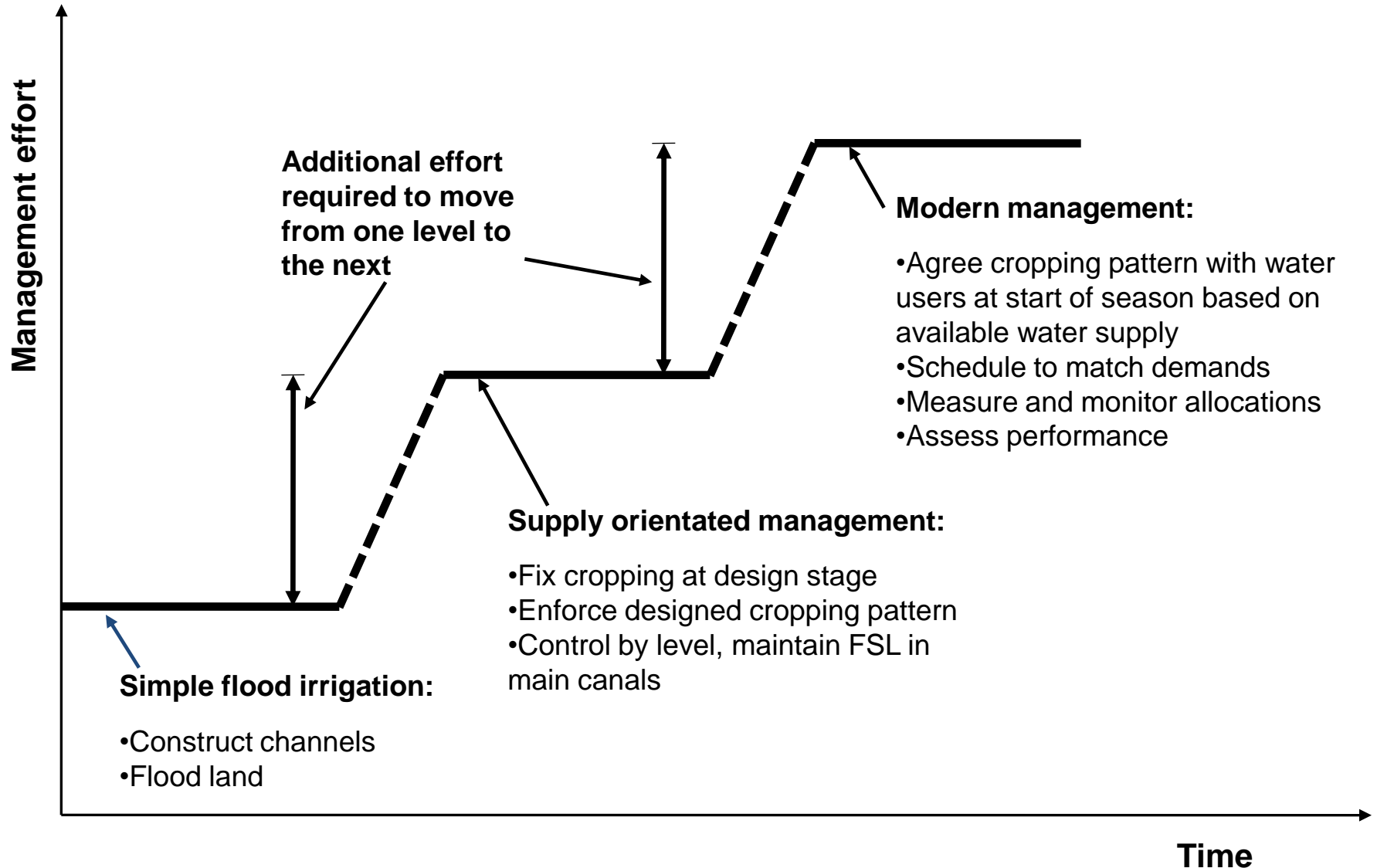
Benchmarking system performance – Australia



Performance management - Saving lost production



Management effort required for different irrigation practices





Part III – Reform at the on-farm level

On-farm issues

- Large number of small landholdings
- Inadequately organised water distribution
- Low crop yields
- Low water use productivity
- Little or no planning for conjunctive use of surface and groundwater
- Insufficient uptake of modern technologies

WUA issues

- Leadership – Presidential rather than Chairman. No role for Management Committee
- Role of Competent Authority (e.g. ID Engineer as Secretary)
- Limited guidance, support and training provided by government
- Governance structure - need to separate governance and management
- Not able to set and collect own service fees.
- No WUA staff – who manages the water distribution?
- Elections for all WUA Management Committee every 5 years
- Size of WUAs an issue : 200-300ha too small, viable size 1,200-1,500 ha.
- “Flowback” system excessively bureaucratic, ID retains full control of funds
- ID control maintenance work process
- No offices, equipment or transport.
- No water rights or water entitlement

On-farm Action Plan

Action Plan:

- Restructure current CAD&WM programme
- Review, discuss and redraft PIM Act
- Prepare draft Charter for issuing to WUAs
- Establish WUA Regulatory Authority
- Strengthen WALMIs – build capacity in IMT and water management
- Establish and train WUA Support Units at Circle/Divisional level
- Form and train WUA support team at Sub-Divisional level
- Awareness raising and training within ID

On-farm Action Plan

Action Plan (cont.):

- Research and develop water management approaches for different types and sizes of irrigation scheme, incorporating conjunctive use of surface and ground water. Prepare training material.
- Run awareness raising and re-engagement workshops for WUAs
- Individual WUAs discuss and agree their Charter. Change WUA management processes to match. Incorporate rules for water allocation and management during water short years.
- Establish chak-based representative system. Train representatives.
- Establish revised budgeting, fee setting and collection procedures based on asset management planning.
- Plan, design and implement on-farm works (measuring structures, field channels, lining,, etc.).
- Develop procedures to measure performance and progress.

On-farm Action Plan

Dharoi Irrigation Scheme, Gujarat



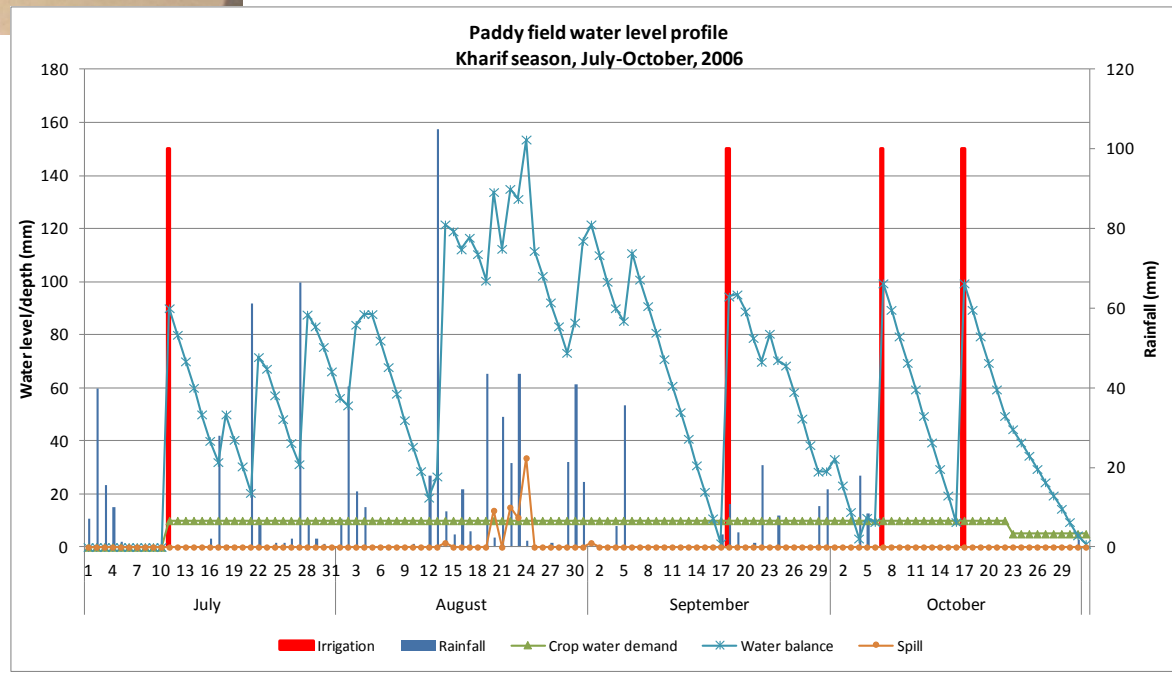
On-farm Action Plan

Odisha Community Tank Management Project

Water harvesting in tank command area,
Kharif season



Tank Management Game



Conclusions

- Water scarcity is already, or is becoming, a key issue in many states in India
- Better understanding required of water management, from the river basin down to the field level
- New approaches are required to address this growing water crisis, including reforms at the on-farm, main system, river basin and policy level
- New approaches require technical innovations and institutional change and support.
- Change is required, “business as usual” is not an option.



Thank you

References

Bos, M.G, M.A. Burton and D. Molden. 2005. Irrigation and Drainage Performance Assessment: Practical Guidelines. CABI Publishing, Wallingford, UK.

Burton, Martin. Irrigation management: Principles and practices. CABI Publishing, Wallingford, UK.

Burton, Martin, Laurence Smith and Julienne Roux. 2007. Toolkit for monitoring and evaluation of agricultural water management projects. Agricultural and Rural Development Division (ARD), World Bank, Washington (forthcoming).

IWMI. 2007. Water for food, water for life. A comprehensive assessment of water management in agriculture. Earthscan, London and International Water Management Institute, Colombo.

Martin A. Burton, Rahul Sen, Simon Gordon-Walker, Anand Jalakam, and Arunabha Ghosh (2011) *National Water Resources Framework Study: Research Report Submitted to the Planning Commission for the 12th Five Year Plan*, September, New Delhi: Council on Energy, Environment and Water and 2030 Water Resources Group, pp. i-584. <http://ceew.in/pdf/CEEW-WRG12Sep11.pdf>

Martin A. Burton, Rahul Sen, Simon Gordon-Walker, and Arunabha Ghosh (2011) *National Water Resources Framework Study: Roadmaps for Reforms*, October, New Delhi: Council on Energy, Environment and Water and 2030 Water Resources Group, pp. i-68. <http://ceew.in/pdf/CEEW-WRG10Oct11.pdf>

References

World Bank. 1998. India – Water resources management sector review: Report on the irrigation sector. Report No. 18416 IN, World Bank, Washington D.C.

World Bank. 2005. India's water economy: Bracing for a turbulent future. Report No. 34750-IN, World Bank, Washington D.C.

WRG. 2009. Charting our water future: Economic frameworks to inform decision-making. 2030 Water Resources Group, International Finance Corporation, Washington D.C. Available at www.mckinsey.com/water