

IRRIGATION GOVERNANCE CHALLENGES

PERSPECTIVES AND INITIATIVES IN ANDHRA PRADESH

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Abstract

The paper discusses some of the challenges encountered in moving towards accountable and proactive governance in irrigation management. The paper draws heavily from my experience of leading a team of freelance professionals and technocrats that worked on these issues. It highlights challenges that emanate from the polity and from natural features. Almost all major rivers in India run across more than one state boundary, through states with different institutional structures and rainfall patterns, with competing demand for water among and between sectors, and with different economic growth rates and phases of basin development. Similarly, there are challenges located in the structure and function of the existing organizational arrangements, the institutional capacity to handle scarcity of resources, the absence of a multi-disciplinary approach and the devolution of managerial roles to stake holders. The complexity of these challenges is increasing with increase in demand and the challenges are thus dynamic in nature, in consonance with the contemporary socio-political and economic environment. A great deal of political negotiation and contestation is involved in overcoming these challenges at various levels. The paper studies these challenges in the context of recent interventions in water sector governance, in particular irrigation, in Andhra Pradesh. These interventions are partly reactive, to address existing maladies, and substantially proactive, to address the issues arising out of the next generation of water sector complexities.

Challenges to Water Governance

Generically, governance is about institutions that provide opportunity and sustainability, including financial sustainability, transparency of procedures and agenda and equity of opportunity, access and rights. The scope and extent of these issues would ordinarily be manifested through a policy document as a cherished intent of the government. This intent needs to be followed by the rules of the game to provide physical shape to contemplated concepts for end user satisfaction in a sustainable fashion. Water being the basic survival need, after air, is aggressively contested at various levels, from the local community level to the international level. Ownership of energy and water is likely to define the political

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supremacy in the new millennium and is widely quoted to be the most likely cause of future wars². Water governance, thus, gradually assumes increasing relevance as part of the development agenda of states. Challenges to water governance are many and owe allegiance to various political perspectives, social circumstances and natural environments.

India has few competitors in the world as regards the width of the spectrum of challenges posed to water governance. A student interested in studying complexities in water governance would find a multi-page problem menu on offer for satisfying inquisitive appetite, whereas the persons vested with water governance responsibility have an unenviable job. The range of challenges includes physiographic and political challenges as well as the positioning of policy in the phase of basin development, the pressures arising in a developing economy growing at about 8-9 %, and, last but not least, demographic pressure.

With its size of about 3.24 million km², India is one third of the size of Europe. In the north, it has glacial and perennial rivers, some of which are among the world's largest. The south has major seasonal rivers on the Deccan Plateau. India accounts for 2.4% of the world's area and about 1869 BCM³ (billion cubic meters) of water, i.e. almost 4% of the world's fresh water resources. The Central Water Commission estimates that the water available for human use out of the above is approximately 1123 BCM (690 BCM as surface water and 433 BCM as ground water).

A quasi-federal polity like India with water as a subject within the legislative powers of 32 states adds to the physiographic challenge. Almost all major rivers pass through different sets of legislation, governance, institutional structure and management rules on their way from the source to the sea. The Union government is empowered by the constitution of India to interfere, resolve and adjudicate in the matters of inter state conflict through special purpose vehicles called inter state water dispute tribunals. One of the major causes of these inter-state disputes, apart from growing demand and competition for water, can be traced to the pre-independence water sharing agreements between the erstwhile princely estates. Post independence, the political boundaries were redrawn through the Re-organization of States Act, 1956. Interstate water disputes in many cases are fallouts of this reorganization. Inter state water dispute tribunals have generally taken a long time to award. Thereafter, political parochialism ensured that these awards were not respected but more violated than followed.

The surface water available in the country is equivalent to an ultimate irrigation potential⁴ of about 76 million ha while ground water is equivalent to about 64 million ha irrigation potential. The stage of

² There are numerous such writings. The former Pakistani foreign minister, Khurshid Mehmood Kasuri has warned both Pakistan and India that a war between India and Pakistan probably may break out on water related issues. http://www.dailytimes.com.pk/default.asp?page=2010\03\03\story_3-3-2010_pg7_24

³ There are various estimations that do not vary widely. However the present estimates of water availability and irrigation potential are those of Central Water Commission, Government of India. These are accessible at <http://www.cwc.nic.in/main/webpages/statistics.html#1>

⁴ Handbook of Water Statistics, (2006) Central Water Commission, Government of India.

development of irrigation potential varies considerably from state to state. Some river basins are closed completely for all co-riparian states, while other basins are closed for a particular riparian state that is to say that a state has exhausted its allocated water. This is a crucial variable that determines the nature of expectation from the governance system as the basin moves from the surplus stage to deficit stage and then to the allocation stage.

Irrigation dominates the usage of water and consumes 90-95 % of water, varying from state to state. The irrigated lands, which are about 40% of cultivated lands, contribute about 65% of agricultural production and thus are a major contributor to food security. Nevertheless, the share of agriculture in the gross state domestic product (GSDP) is gradually reducing. It is now about 17%, down from 35% five decades ago. The fragmented and uneconomically small size of land holdings creates a politically sensitive large constituency of stakeholders who are dependent on agricultural land as owners, tenants or laborers. To sum up, 90-95% water contributes to about 17% to GSDP and supports about 65% of the population. The Indian economy can no more be termed as an agricultural economy, but Indian society is a predominantly agriculture-supported society, making water an extremely sensitive issue. Any overt attempt to improve water use efficiency is perceived as reduction in supply and feared to be perpetuated, leading to permanent deprivation. No politician can afford to give even an oblique impression of supporting an action that even seems to be connected to water-rights deprivation and thus the support to water-use efficiency may be perceived as a politically incorrect stand if not adequately and properly contextualized and communicated.

Andhra Pradesh, which is of the size of France, has a population of about 90 million, and presents the same wide spectrum of variation. Rainfall varies from 500 mm in the south west of the state to about 1200 mm in its northern parts. There are three major river basins: Godavari (catchment of 73201 km² and 41.9 BCM (Billion cubic meter), Krishna (catchment of 74382 km² and 23.0 BCM) and Pennar (catchment of 48111km² and 2.8 BCM). The potential of Krishna and Pennar is completely exhausted and these can be termed as closed basins. The state level stage of development of surface water is 4 million ha out of a possible 7.9 million ha under surface water and 2.9 million ha out of a possible 3.9 million ha. A major irrigation infrastructure creation program was initiated during 2004-2005 to harvest the balance potential under surface water. The program is expected to be completed by 2014 and would invest about US\$ 45 billion.

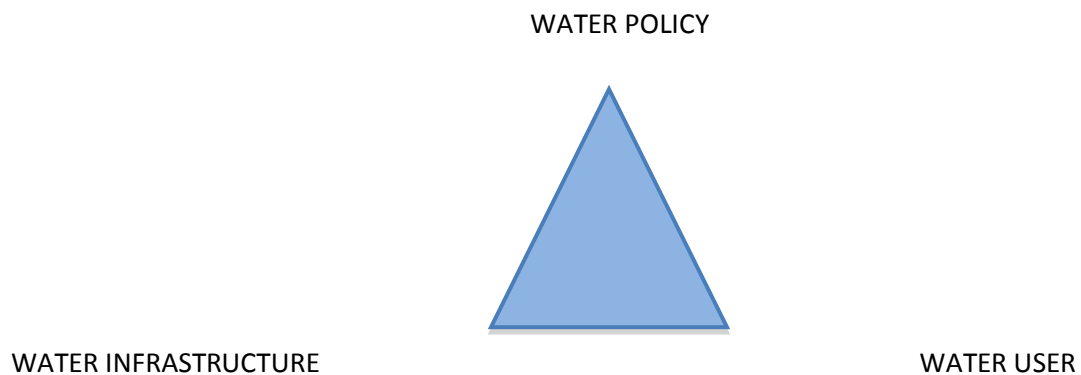
Present per capita water availability in Andhra Pradesh is 1,400 m³ per year⁵, and the state is thus 'water scarce' and will move closer to the 'severely scarce' category⁶ by 2020, with the projected increase in the population. Therefore, with limited water resources available, governance and water management related instruments will need to effectively and equitably address the demands of economic growth and development in the state.

⁵ Less than 1,700 m³ per capita per year is categorized as water scarce.

⁶ Less than 1,000 m³ per capita per year is categorized as severely scarce.

Step-by-Step Approach to Improve Governance

Any water service related governance in a democratic and socialist set up needs to be people centric. One can easily identify the three main actors that impact water availability and water related services. These are, the infrastructure that allows the water to be utilized, the water users, and the policy, rules and regulations that provide, regulate or limit the access to water. The latter is a direct product of the governance model adopted. Governance becomes very complex in large scale irrigation systems as it involves a large geographical area, number of people and number of institutions at different levels. One of the aims of the initiatives in irrigation governance improvement is to establish strong linkages between the irrigation department and farmers' organizations in governing water resources. This paper is not intended to deliberate discourses on the theoretical perspectives on governance. It deals with the attempts made by the Irrigation and CAD (Command Area Development) department in relation to governance, structural and functional adjustments for water management, both at government and farmers level.



The experiences in irrigation governance show that, as we move towards creating favorable grounds for better governance, new sets of challenges keep unfolding. These challenges arise out of discovery of various complexities of the water sector by the stakeholders that would mean that the organizations entrusted with water governance equip themselves with management skills to address these new complexities. Further situational analysis would lead to the evolution of an efficient support system. Change and reform are not a onetime affair and call for regular revisiting of the various components of governance, including structural requirements, challenges, issues and policy related actions to achieve the goals. The basic characteristics of the initiatives include an orientation towards self governance, which would be participatory in nature, consensual in orientation, accountable, transparent, responsive, effective and efficient, equitable and inclusive and upholds the rule of law. One of the ideas of narrating the case of participatory management in Andhra Pradesh, as it evolved over the years, is to provide the details of the process for achieving good governance in irrigation systems.

Water governance and in particular, irrigation system governance is thus a complex issue. It is not easy to achieve the desired results in terms of judicious use of water, consensual decision-making process and participatory management. Various actors and stakeholders are involved who are dependent on water directly or politically. These actors and stakeholders are perceived to play at mutually competing purposes. Parochialism inherent in this approach makes water sector a zero sum game. In such a scenario, efficiency related measures run the risk of being perceived as future deprivation from the presently available quantity of water to a particular sector amongst the competing sectors and to a group of users within a sector. Resolution of inter-sector issues is possible at highest level of bureaucracy or political hierarchy. In Andhra Pradesh, this decision-making was assigned to bureaucracy. Water management across sectors was brought under the state level apex body for planning and management while a regulatory commission is created for providing the guidelines on management to review performance and to suggest measures for further improving performance and streamlining the processes. This assisted in creating a state level perspective of water as opposed to a competing sectors' scenario. To simplify the complexities involved, a step by step and a theme-based approach was adopted. Within the irrigation sector, institutional performance and financial sustainability related issues were taken up parallelly and gradually. Gradual implementation avoided scaring the various groups of stakeholders. Gradual implementation also meant that there was no significant departure from the existing practices in one go. This approach instilled confidence among the FOs (farmer organizations) and the departmental officials that they can implement the new set of guidelines. Implicitly, these groups were getting prepared for the next stage of the agenda. The following sections detail the steps initiated in Andhra Pradesh following the above approach while focusing on the actions by the major user of the water, that is, irrigation. Key actions, not necessarily in chronological order, are discussed.

Creating Space

Prior to 1997, the state was in the first generation of basin development, with a focus on development of infrastructure. There was hardly any visible and well-directed attempt to improve water use efficiency or to formalize the participation of the farmers until 1997 when the Andhra Pradesh Farmers Management of Irrigation System Act was enacted to provide space to farmers in operation, maintenance and management of irrigation systems. Elections under the Act were conducted in November 1997.

During 2004, the new political and bureaucratic dispensation initiated a fresh look at the role of irrigation in the development of the state as an instrument of poverty reduction. The Vision 2020⁷ document had earlier projected a possible annual average growth rate of 6% for agriculture with an investment of about Rs. 1,250,000 million in irrigation infrastructure coupled with other investments and initiatives in agriculture. This precisely means enhancing capital formation in the agricultural sector. This investment focused on creation of new irrigation infrastructure.

⁷ Vision 2020, Prepared during the year 1999 by Government of Andhra Pradesh and McKinsey & Company.

Political space for efforts to improve governance for higher efficiency was limited as there was no immediately visible popular demand for improving efficiency, though in principle none can negate the need to improve governance and efficiency. However, the opportunity cost of inaction or delaying action was not appreciated. Therefore a discussion was initiated with the political dispensation on the necessity for such an agenda and also whether we own it as our agenda or we should appear to implement a direction from outside. Arguments in support of necessity of investment in efficiency and management were put forth to decide whether we should create new infrastructure while neglecting the existing, and thus not create a sustainable operation and maintenance mechanism. By that time the Xth plan was midway through and its midterm appraisal highlighted key areas requiring attention, which included investment in efficiency. Additionally, the National Water Policy 2002, the Report of the sub committee of the National Development Council and the Approach Paper for the XIth Plan also highlighted the key concerns in the water sector. All these documents highlighted the role played by irrigated agriculture for food security and stressed to provide a meaningful role to farmers in the management of the irrigation system, to improve cost recovery and operation and maintenance, to create appropriate state and basin level institutional arrangements, close the gap ayacut and increase efficiency of the projects. These documents have also suggested various measures emerging from best practices identified across the states and thus listed the priority areas of intervention in the water sector. These documents and suggestions therein created a favorable space for the agenda of participation, sustainability, efficiency and transparency. Initially, low cost politically insignificant issues were picked out of the above prescriptions while the process gradually moved to next stages.

As a first step to implement the above agenda, a team of professionals was constituted at state level to look into the institutional issues, technical issues and the monitoring of the system. The team also reviewed the Andhra Pradesh Water Vision released in 2004. An in-house Geographical Management Information System cell was created to assess the status and output from the system. The cell compiled and analyzed data on organizational features (like administrative hierarchy, features of farmer organization), natural resources (catchments surface water and ground water status, availability and usage and temporal and spatial variation), infrastructure related information (irrigated area and performance measurements etc), apart from climate and other related data.

The state water sector agenda evolved through a consultative process, based on the analysis of the available data and the inputs from the professional team. The process aimed at improving the governance of the water sector and operational modalities. In the light of the recommendation of the Central Water Commission (CWC) to all Indian states to adopt a comprehensive policy document for efficient use of water resources detailing the state's vision, this water agenda was converted into a comprehensive water policy. The policy highlights that water is a finite and increasingly scarce resource. It also highlighted the immediate challenge of managing the demand for drinking water, irrigation, industry and power supply. The projections indicate that the increasing demands from all users will outstrip available water supplies by the year 2025. The policy document comprises of six sections spelling out the needs, objectives, strategies, approaches, implementation arrangements and the road map for water resources management in the state. The policy also focuses on improving and

safeguarding existing drinking water supplies, managing water for irrigation, industry, power supply and environmental sustainability and prevention of pollution along with issues like development of new infrastructure, maintenance and operation of existing infrastructure, pollution, over-abstraction and unplanned development, water logging, salinization, increasing toxic elements, as the main challenges and issues of concern for the state. The policy is expressly designated to be a dynamic document to address evolving issues. This approach facilitates functionality as compared to the rigid policy documents generally adopted. While the policy drafts were under discussion and consultation, some non-negotiable and uncontested issues were simultaneously unrolled.

Governance – State to User Level

An appropriate organizational structure to address the requirements of the evolving agenda was identified as a key requirement and is given adequate emphasis. These organizational arrangements are contemplated and implemented at the levels of decision-making, administration and implementation. That is to say that the arrangements are contemplated from state, regional level and user level in a continuum with strong functional linkages, both vertically and horizontally. Guiding principles for these organizational arrangements create space for participation, professional advice, review of and consolidation of ongoing efforts and their impacts to refine the decision-making. These include creation of a Water Management Committee, the Andhra Pradesh Water Regulatory Commission, restructuring the Irrigation Department and empowering Farmer Organizations. Role and responsibilities played by these are briefly stated below.

Water Management Committee⁸

This is a state level apex body for decision making on water related issues and is constituted to have a holistic view of state water resources, regulation, performance, convergence and coordination among various water sector related departments. The broad functions of the Water Management Committee include water sector overview, setting guidelines for efficient water use in various sectors and related services, promoting research and analysis in water resource management for future policy formulations and reforms, fixing rates for various water uses, monitoring water quality and water pollution and harmonizing the existing policies. The Chief Secretary chairs this Committee consisting of the Secretaries of various water user departments.

⁸ The Water Management Committee was constituted through government order number 95, dated 05-06-2007 of Irrigation and Command Area Development Department.

Andhra Pradesh Water Regulatory Commission⁹

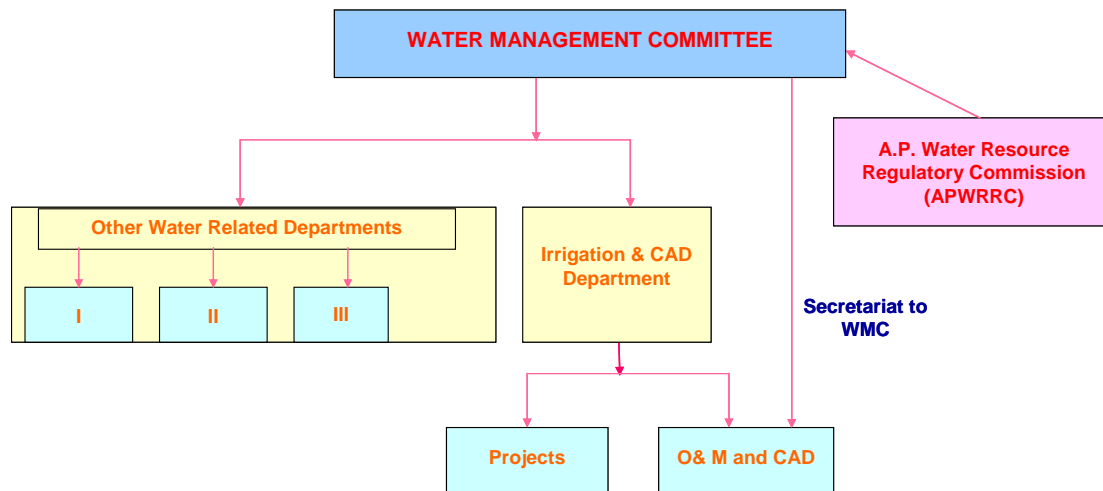
The Commission is constituted through an Act of the assembly for ensuring the performance standards of service delivery by various service providers, both government and private. The Commission would have jurisdiction over the entire water sector and services like irrigation, drinking water, industrial water, pollution of water, etc., and would consist of a Chair Person and three experts from the field of Irrigation Engineering, Ground Water, Agriculture/Economics and Finance/Revenue. The Commission's mandate is different than what is generally adopted by other states in India. It is not constituted as a body accountable to none. It has been constituted to assist the state government in implementing the policy and provide required oversight and guidelines. The state level apex body that is the Water Management Committee may also request expert advice from time to time on emerging issues or agendas before it. The Commission would also act as a technical support to the Water Management Committee.

Re-organizing the Irrigation Department

The legacy of the first generation, construction or supply phase, still continues in the water services related departments. With closure of basins and with no further available water, departments, including the Irrigation department, should have moved to acquire the new set of skills to address the issues related to water management and efficiency. In the Irrigation Department, the efforts during the last five years are focused to move from design, construction and repair to developing management plans which include agriculture, revenue generation, livelihoods, networking and utilizing the various water bodies. As the next generation issue, management of created infrastructures with equitable and judicious utilization occupies a prime position, which calls for appropriate policies and support programmes. Thus, the major task is to bring in institutional restructuring, including professionals with a multi-disciplinary background.

⁹ The Andhra Pradesh Water Resources Regulatory Commission Act, (Act 15 of 2009).

STATE LEVEL WATER GOVERNANCE



As a first step for creating space for such a multi-disciplinary team and a meaningful role for farmer organizations, review of performance and service delivery of the water sector was included in the regular review of construction management at the highest level. This arrangement aligned the reform agenda with construction/infrastructure oriented thinking of the Irrigation Department and focused on the creation of a dedicated wing with the mandate to improve irrigation performance. The ICAD department is thus reorganized to consist of three functional wings.

- *Project wing* – for construction of new projects,
- *O&M wing* – for O&M of completed projects with a focus on outcome and efficiency. The government has also decided to establish six professional multi disciplinary Project Management units comprising of engineers and other professionals, and
- *Minor Irrigation Wing* – for creation of new and revival/restoration of minor irrigation projects.

Command Area Development re-organization

The scope and complexity of the water sector agenda requires continuous technical and managerial support. The Command Area Development wing of the Irrigation Department is thus assigned the responsibility to act as secretariat for the Water Management Committee. The CAD wing is reorganized into the following cells for a focused approach. The government and hired professionals staff these cells.

- *Participatory Irrigation Management Cell* – for management of irrigation projects and irrigated agriculture through farmers' organizations. The cell organizes the capacity building of the farmers' organizations and their management;
- *Water Policy Research Cell* – to provide support to the Water Management Committee and Technical Group;
- *Operation and Management Cell* – for cost recovery and plough back of tax revenue for maintenance of the irrigation projects;

- *Water Audit and Benchmarking Cell* – for coordinating the WUA wide annual water audit and benchmarking through the respective Chief Engineers;
- *Technical Cell* - for providing technical support for the above listed agenda and for externally aided projects; and
- *Remote Sensing and Geographical Management Information System Cell*

Empowering Farmers' Organizations

Andhra Pradesh is the pioneer State to enact the statutory provisions for de-centralizing irrigation management through farmers' organizations. The Andhra Pradesh Farmers Management of Irrigation System Act, 1997 provides for three-tier farmer organization (Water User Association, Distributory Committee and Project Committee) for major irrigation projects, two tiers for medium irrigation (Water User Association and Project Committee) and single tier for minor irrigation projects (only Water User Associations). The government completed the elections of the 10800 Water User Associations, 323 Distributory Committees, 23 Major and 60 Medium Project Committees and thus formalized the stipulations of a decade old legislation.

The WUAs have been made a *continuous body*¹⁰ with one third of the members retiring every two years. Every member is elected for a period of six years. This provision has ensured continuity and institutional memory. State government has *fixed the dates of election for every second year*. The elections for the WUAs are now scheduled for every second year during the first fortnight of January and the elections for the Distributory committees are scheduled for the second half of January. This schedule is in force from January 2008 onwards. This provision will bring transparency and will avoid litigation by those who do not support the emergence of a new constituency of farmers with likely political implications. The FOs are supported to establish a formal office for smooth functioning of their affairs. These units are permitted to incur up to 10% of the tax re-plough amount on non-recurring and recurring expenditure related to office establishment¹¹. Permission to WUAs to hire *Lashkars* for water release management from the establishment cost further strengthens the traditional role of the community in managing the water release schedule. This aims at bringing a shift of attitude, inculcating ownership of the irrigation system among the farmers. Performance of these organizations is evaluated through independent studies and suggestions for appropriate changes are evaluated.

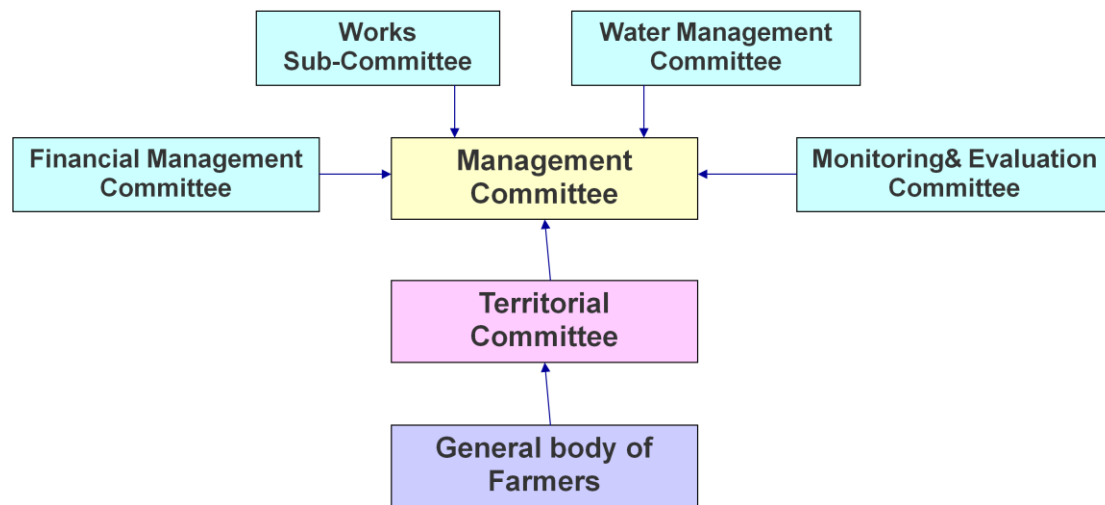
The empowerment of farmer organizations to assume the responsibility as enacted in the APFMIS Act is a key requirement of the decentralized management of the irrigation infrastructure and sustainability. The *logical start point* evolved a capacity building strategy encompassing a needs assessment of the

¹⁰ The Water User Associations were made continuous bodies, vide amendment to Andhra Pradesh Farmer Management of Irrigation System Act during 2003.

¹¹ Circular Memo No COM/CAD/DEE1/1147/07, dated 13-08-2007, permits the establishment cost of the Farmer Organisations from the tax replough amounts. The memo also authorizes the Farmer Organizations to hire the Lashker within the norms.

primary stakeholders and capacity assessment of the secondary stakeholders for addressing the identified needs of primary stakeholders and that of implementing the new agenda. Circle level training centers are established, providing a platform for the WUAs in each circle for capacity enhancement and for exchange of views among fellow WUA members. Detailed modules for the WUAs, DCs and engineering staff are prepared and implemented, covering various requirements as identified in the needs assessment, which also includes exposure visits to other projects within or outside the state. The general awareness campaigns on water management and services to be delivered by the farmers' organizations are arranged as part of the strategy for transparency. The goal of the capacity building is to achieve efficient water management, including transparent and accountable water management.

The APFMIS Act envisages the constitution of four sub-committees of farmers for discharge of the responsibilities assigned to Water User Associations. These sub-committees distribute the responsibilities and thus also avoid centralization of power in the hands of few farmers. The capacity building program targets these sub-committees as well. The relationship of various entities within the WUA is shown in the diagram below.



Networks – Inside Outside Approach

Modern management theories support the systems approach of management. This recognizes and addresses the wide-ranging set of activities that are in a complex, dynamic, evolving and interactive relationship. This relationship is organic because it is evolving and mutually dependent. Management of complex systems would need expertise in each field involved, apart from general management and administration skills. This argument was put forth, as explained above, in favor of creation of a multidisciplinary approach within the department. The question, however, would remain, how much of the expertise should be created *inside* the department and how much can be hired through professional agencies *outside*. It may not be difficult to argue that not all the expertise needs to be created inside the department. Depending upon the nature of the output and availability of such expertise outside, various

types of contractual relationships can be formalized with professional organizations recognized for such expertise. This inside outside model based thinking led to the creation of a multi-disciplinary team inside the department and created a network with professional agencies that are independent of the department. Some of these agencies supported the state level decision-making process while some others delivered the defined professional services at sub – district level. An in-house professional is assigned with the responsibility to be a dedicated contact point to interact with the outside agencies and implement the services as identified.

State Level Support and Consortium

At the state level, the Andhra Pradesh State Remote Sensing Application Center provided the services on digitization of the command areas, canal networks, irrigated area assessment, cropping pattern etc. More specifically, the Center provided the various services during the recent floods, like the forecast on the likely inundation, drainage congestion points, etc., which assisted in decision making. For empowering the WUAs in efficient agricultural water use, management and increasing productivity, the department recognized the need of creating a Consortium of line departments, research institutions and private companies for knowledge sharing on best practices and innovations in irrigated agriculture, productivity enhancement, trade and marketing of agricultural produce. The Consortium¹² is housed in the Center for Good Governance, which is providing services related to knowledge compilation and sharing in the areas of agricultural productivity and provides an e-learning platform.

District Level Support System

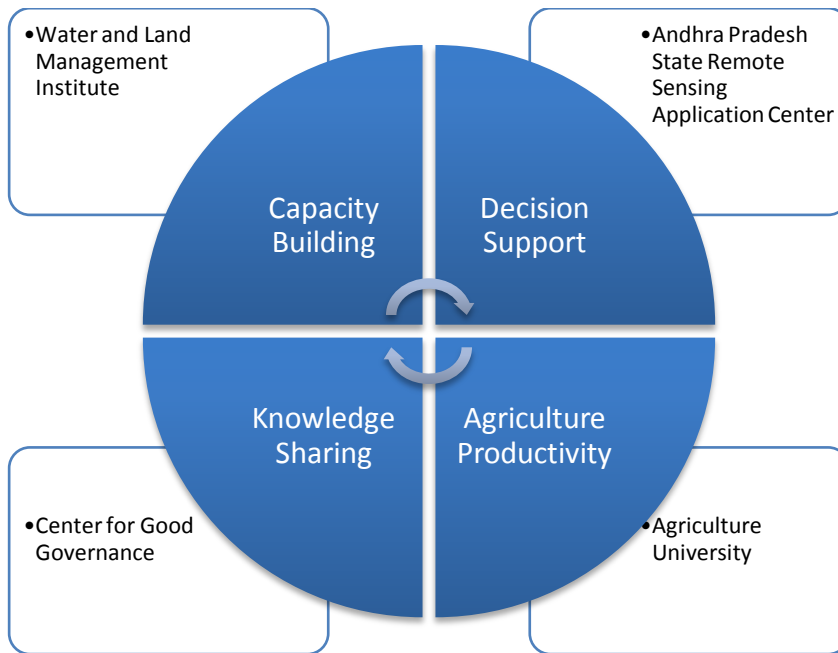
The Water and Land Management Training and Research Institute is providing support for developing the capacity building strategy and also carry out various capacity building events at the district and sub-district levels. Services of a large number of NGOs are hired for community mobilization and process strengthening related works. Specifically for water bodies, a District Level Committee under the District Collector is constituted for convergence of activities of a large number of departments that provide services related to water bodies like fisheries and agriculture.

Farmer Field School Approach

The strategy adopted here is to leverage the existing social capital of WUAs and various other initiatives in the private and public sector for implementation of the extension strategy on agriculture. The Agriculture University provides the technical backstopping and *Krishi Vignana Kendras* that are managed by the University and the Indian Council of Agricultural Research act as the implementation agency. The approach of extension is learning by following a free from subsidy model by adopting the Farmers Field School (FFS) method. The FFS is a comprehensive package for identified crops as integrated crop management practice. Linking the agricultural university to the farmers' organizations has formalized the lab-to-land concept. The FFS based extension is well received by the farmers. Very recently a farmer

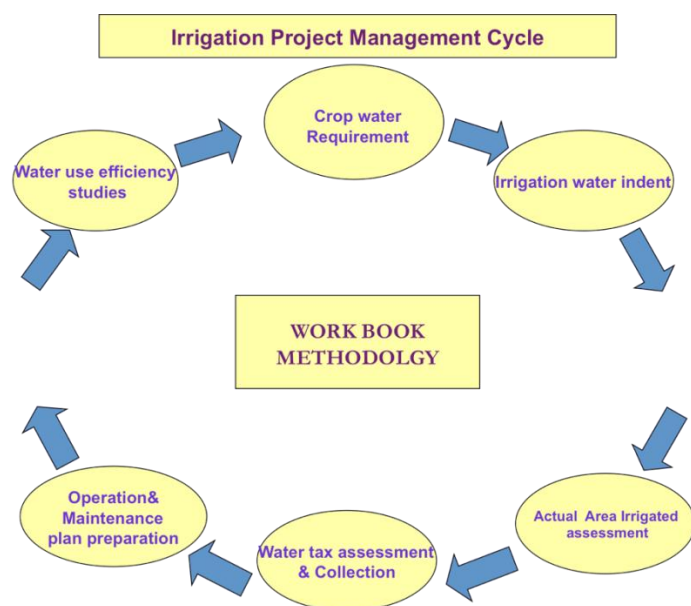
¹² The Consortium on productivity enhancement was constituted, vide GO Ms no 189, dated 19-09-2008 of Irrigation and Command Area Development Department.

center was created in the office of the Commissioner, Command Area Development and gradually farmer organizations are approaching this office for a single source of both, water management related issues and agriculture related services. With successful establishment of these institutional arrangements, focus is now on agriculture productivity, leveraging the extensive network of the farmer organizations and professional agencies.



Project Cycle Approach

A Project Cycle approach is adopted for management of irrigation systems to conform to the agriculture seasons. The FOs are encouraged to plan and manage their respective areas through the work-book¹³ approach following the classical management principle of plan, act and review. The FOs plan the operation and maintenance related activities ahead of the agricultural season and record it in the work book along with likely cropping patterns and consequent water demands. The activities are carried out in accordance with the plan. Before the beginning of the next season, the performance of the system is evaluated through self-assessment by the FOs. This self-assessment is also followed through more



rigorous formal systems. The annual performance evaluation leads to publication of an annual report on performance. The state government has introduced a system of performance assessment on various parameters to analyse the temporal and spatial variations in performance of the projects, administrative hierarchy and also that of farmer organisations. Performance measurement is formalized and made mandatory through a government order for each project on season and annual basis. The Planning Commission has also advised the state governments to take up the performance assessment on identified parameters. The CAD wing of the

department coordinates this activity. Annual reports on the performance assessment are published at the state level. The first report, comparing the performance of the three agricultural years 2006-2009 is under publication. The evaluation comprises of the following components:

Water audit

The seasonal water distribution plan for each WUA (and other users) is prepared before the start of the season on the expected cropping pattern and other projected needs. The expected outputs for each unit from the water supplied are anticipated and proposed. The actual performance against the proposed plan is evaluated after each season to compare the intra- and inter-project performances.

¹³ Workbook comprises of a compilation of schedules to be prepared by WUA and DC, based on field needs. It includes formats for use by FOs for water indent, water release plan requests, crop plans, season-wise user fees – demand and collection based on irrigated area assessment in each season. Compilation of information in the workbook also facilitates understanding related to water use efficiency of the project. These schedules are completed by WUAs along with the concerned Competent Authority. The process is facilitated by the Training Coordinators of Field Training Center (FTC).

Benchmarking

This comprises of another set of indicators wherein the overall picture of the project in the catchment and its performance at a macro level, including the externalities, is evaluated.

Performance indicators

There have been various attempts worldwide to identify a set of indicators that can comprehensively measure the performance of irrigation projects. The wide range of services and the complex nature of interdependent factors affecting the performance of the projects render it as a challenging proposition for the project managers and the planners. However, an initial and functional list of indicators is agreed upon, covering the themes of agricultural performance, environmental performance and the technical parameters of project performance.

Self-monitoring

A pictorial chart based tool of participatory situational analysis has been developed to help farmer organizations for assessment of their own performance on a seasonal basis. The analysis is taken up on identified parameters on a chart, which are self explanatory and usable by illiterates as well. The analysis of these charts by the project managers provides insights in project performance at the macro level.

Financial Sustainability

Participation of farmer organizations in water and financial management are two undisputed tenets for meaningful and decentralized management of irrigation projects. Adequate provision of funds to meet the delegated requirements of the functions is ensured through the changes brought in.

Budgetary Support

Cost norms are laid down for each category¹⁴ of works to assess the fund requirement. These requirements are supported by recently created separate budget provisions for each project to ensure fund flow necessary for O&M of the projects.

Water Tax Re-plough Account

Hitherto the tax re-plough procedure was following a circuitous route and did not have a dedicated budget head in the state accounts. Funds were allocated to a single account head with each Chief Engineer for tax re-plough and for other maintenance needs through the same head of accounts. From

¹⁴ The operation and maintenance of the projects are classified in three categories of works as per the nature of the works. The A category works are those to be carried out by the WUAs through the tax re-plough funds as enacted in the APFMIS Act and are generally of the nature of routine minimal works that would facilitate operation of the projects. The B category works are deferred maintenance works. The last category of works include the original works, expansion works and modernization of projects

2007-08 onwards, an exclusive budget head is created for tax re-plough to the FOs. This head is operated by the Commissioner CAD and thus is insulated from the ever-pressing demands of other maintenance. This budget head secures the fund allocation to the FOs.

Local Collection and Plough Back

System of assessment of areas irrigated under each WUA is modified to provide role to primary stakeholders, that is, farmers. The demand is raised by the concerned revenue authority and tax collected with the involvement of WUA. These steps are one step short of tax collection and re-plough by the WUAs themselves. However, the government has agreed in principle to allow the water tax to be converted to user charges to allow it to be retained at the local level outside the treasury system to facilitate the timely availability of the funds. The decision is likely to be implemented from 2010-11.

Financial Delegation

The government has also further simplified the procedure¹⁵ for taking up the works and simultaneously also created provisions for meaningful participation of farmers. The category 'A' works are to be carried out by the WUAs alone. Works up to Rs 500,000 can be taken up by the WUAs themselves, while works above this limit can be tendered. The B category maintenance works follow the same financial delegation. This dispenses with procedures causing delays. These provisions are also aimed at completing the required maintenance works during the canal closure period.

Industrial Water Royalty

The water off take points from irrigation projects are now provided with measuring devices for estimation of the quantity and schedule of the water taken by various users other than the Irrigation Department. The reasons for such arrangements are twofold. One is to assess the exact quantity consumed by the user department to calculate the water use efficiency subsequent to water off take. Another reason is to assess the tax or royalty demand, from the department concerned or for the equivalent subsidy, from the government. These measures are initiated for financial sustainability of the irrigation projects. Water used by the industries is chargeable at the rates fixed by the government¹⁶. A long standing anomaly on the role of the Industries Department *vis à vis* the Irrigation Department was resolved recently by assigning the responsibility to the Irrigation Department, suppressing an earlier order. The industrial water royalty demand is of the order of Rs 800 million annually¹⁷ and forms a substantial part of the total operation and maintenance demand of the irrigation system.

¹⁵ The simplified procedure for the collection of tax and enhancing the share of the farmer organizations were issued, vide government orders no 96, dated 08-06-2007 and GO Ms No 170, dated 14-10-2008 respectively.

¹⁶ The industrial water royalty rates are fixed, vide government order no 39, dated 02-04-2002 of Irrigation and Command Area Development Department.

¹⁷ Estimates made by the Commissioner, Command Area Development, on the basis of the quantity of water allocated to various industrial purposes and the prevailing rates for industrial water. This also includes the annual royalty of Rs 100 million from Srisailam Hydropower Project.

Decision Support System - Geographical Management Information System

Several departments are involved with water related services. Within the Irrigation Department, several Chief Engineers/Engineer in Chief are managing the major and medium irrigation projects in the state. This has quite obviously created a peculiar situation, where at the state level, information of state water and irrigation project status and output was not available at one place for comprehensive decision making. This role was assigned to the Commissioner CAD and a Geographical Management Information Cell was created, which is being gradually upgraded as the Andhra Pradesh Irrigation Information Center. This cell is presently being manned by Assistant Executive Engineers and Deputy Executive Engineers of the department, selected through a rigorous selection procedure and who have the requisite exposure and qualifications of GIS and MIS. Additionally, professionals are hired from time to time for guiding and supervising the activities of the cell. The cell has a functional and continuous working relationship with the Andhra Pradesh State Remote Sensing Application Center and with the Irrigation Unit of the Center for Good Governance. This cell now handles the various types of spatial and tabular data on water, projects, irrigated agriculture, farmer organizations, performance, floods, hydrological boundaries, various standard remotely sensed layers, demographic details, etc. Some of the key initiatives that assist decision making are listed below.

Reservoir status management system¹⁸

This is an automated system to monitor the status of reservoirs during the flood and canal operation period. One engineer at dam site of each of the major irrigation projects and 30 largest medium irrigation projects are designated to pass on the information daily at 8 am through an SMS to a designated cell phone which is connected to a server. The information sent by the designated engineer contains the details of the present levels of the reservoir, capacity status, inflows and outflows (canals, surplus, power, drinking, etc.). This information is uploaded to the connected database. Subsequently, automated fax and SMS are disseminated to designated cell phones of senior officers like Chief Minister's Office, Chief Secretary, Commissioner Relief, Secretaries of Irrigation Department and Senior Engineers. This information is available to anyone on demand through a SMS.

WUA Database and Rating

A comprehensive database of more than 10000 WUAs is created. It contains static information on the WUA and the data collected through Rapid Assessment Survey. The analysis of the survey report has lead to an action plan for physical works and for the capacity building of the farmers' organizations. The WUAs are rated on the basis of performance on three main groups of indicators: water management, financial sustainability and management *per se*.

¹⁸ The linked webpage can be accessed with username as 'guest' and password as 'guest' at <http://cadarsms.cgg.gov.in> for reservoir status and <http://apcada.cgg.gov.in/> for canal flow monitoring.

GMIS of projects

An elaborate database of static and performance information related to the projects is being created for assisting in the management of projects. The information network is planned to provide connectivity and accessibility up to the WUA level.

Digitized canal network

The entire canal network of all the major and medium irrigation projects is digitized and the related hydraulic, agriculture and performance data is being updated to the main and distributory canals along with the maintenance works carried out. These view the present flow levels during the canal operation period.

Flood prone area

The flood prone areas in the deltas of Krishna, Godavari and Pennar are marked through remote sensing. The reason for flooding many a times is congestion of the drainage system. These points are being identified on prognosis or the historical data of the floods.

Irrigated Area Assessment

The irrigated area assessment is corroborated through remote sensing, three times during each crop season. This additional process of irrigated area assessment will reduce the discrepancy between the figures of the Revenue and Irrigation Departments and would lead to a more realistic assessment.

Water logged area assessment

Factors affecting the performance of the projects are being regularly evaluated at the state level and corrective steps being taken. Water logging of project command is a serious concern in Deccan Plateau because of the undulating topography and mismanagement of water application. To assess the extent of water logging, observation wells are established in the commands of the projects, which are monitored by the State Ground Water Department. The spatial distribution of these areas on a map is shared among the project engineers for corrective measures.

Conclusion

The initiatives narrated above are primarily focused on ensuring transparency and appropriate decentralisation in decision-making and creating accountable systems at all levels in accordance with the state policy for equitable distribution of resources and optimal output. The attempts so far include creating a state level structure, followed by the district level and farmer organisation level structures with a well defined mandate, transparent system of functioning and people centric decision making, which is generating better results for efficient use of water and main system management. Continuity of these efforts and concurrent modification of the approach would need to be assured. Consistent leadership is a prerequisite for such continuation.

The available literature and experiences highlight plenty of examples of community managed irrigation system. However, the Andhra experience is unique in terms of its sheer size, spanning over 4 million ha of farmlands and about 6 million farmers. Having established the institutional structure and procedures related to water governance, the focus is now shifting to the next generation issues of productivity. Next in line is pollution control. The bigger challenge would be the continuity of the efforts initiated, sustainability, efficiency and maximizing the agriculture output to the envisaged levels.

