



सत्यमेव जयते

FINAL REPORT

OF

MINOR IRRIGATION AND WATERSHED MANAGEMENT

FOR THE

TWELFTH FIVE YEAR PLAN (2012-2017)

PLANNING COMMISSION

GOVERNMENT OF INDIA

NEW DELHI

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SUMMARY

Chairman of Working Group

The Context

A majority of people in India would continue to live in villages for decades to come¹. Natural resources of land and water are and would remain primary rural livelihood anchors as over half the 'main workers' remain in agriculture², there is little occupational diversity in villages and very few working age people have skills useful in cities³. Increasing natural resource productivity is thus critical to enhance livelihoods and reduce poverty in villages; it is an imperative for our food, water and ecological security.

About 55% of our agriculture is rain-fed⁴ where delayed, deficient or erratic rains lead to severe reduction in crop output and even total crop failure and only one crop is typically cultivated in a year⁵. The gains of the great strides the country has taken in food production have largely been confined to irrigated plains and deltas; rain-fed regions have lagged far behind and have in fact suffered widespread resource degradation due to inappropriate resource use⁶, poor husbandry and low investments. Since growth in agriculture has historically been the largest driver of poverty reduction in India, rain-fed regions remain mired in poverty.

Rain-fed Regions: Food Security & Poverty

Of the 127 Agro-climatic Zones defined under the National Agricultural Research Project 73 are rain-fed. Rain-fed areas account for 60% of the Net Sown Area and 55% of the Gross Cropped Area. Almost half of our food crop area (77% for pulses, 66% for oilseeds and 45% for cereals), over two-thirds of the non-food crop area and over 50% of our horticulture is rain-fed. Rain-fed areas produce 40% cereals, 60% cotton, 75% oilseeds 85% pulses and support

¹ According to the UN State of the World Population 2007 Report India's population would be 60% rural in 2030. A 2010 report by McKinsey Global Institute, titled, 'India's urban awakening: Building inclusive cities, sustainable growth', presents a similar prognosis. Rural population would remain very large even when a majority begin to live in cities.

² Forests are a key livelihood supplement, especially for the tribes. Ironically, policy makers historically have shied from insisting that forests, the second largest land-use, occupying half as much area as agriculture must do more to strengthen rural livelihoods/economy in a predominantly rural country.

³ Low level of 'skills useful for urban employment' and the poor quality of formal education among rural people in the 15 to 35 age group militate against rapid urbanization.

⁴ According to Gol, Department of Agriculture and Cooperation, Directorate of Economics and Statistics (2007-08, Provisional) 44.22% of Net Sown Area and 44.56% of Gross Cropped Area was irrigated.

⁵ Cultivable land is also often left fallow due to high risk and factor constraints, which means *less than half of the potential of cultivable land is used*.

⁶ Farmers in rain-fed regions have often discarded their traditional subsistence-oriented mixed farming systems, emulating practices from irrigated areas to cultivate input-intensive commercial/high value crops, exposing themselves to indebtedness and great risk and often damaging the resource base itself.

40% human and 60% livestock population. All the Scheduled Tribes live in rain-fed areas. Even in the best case scenario for irrigation, rain-fed areas would have to produce 40% of our food.

Poverty is highest in regions, States and districts where a larger share of agriculture is rain-fed. For example, more than 50% of rural population in Orissa, Chhattisgarh, MP and Jharkhand is classified as BPL and the 100 poorest districts in the country are almost entirely rain-fed.

Rain-fed Areas: Policy Neglect

Nationally we have lacked a coherent policy to develop natural resources as a means to enhance livelihoods, remove poverty, ensure household (as opposed to aggregate) food security and spur decentralized growth. Self-sufficiency in food grains production has been the main driver of strategies to develop natural resources. The advent of green revolution technologies during the 1960s focused attention on the “high potential” plains, beginning with the Intensive Agricultural Districts Programme during the 3rd FYP. While this strategy served the nation well in ensuring aggregate food security, it is inappropriate for rain-fed regions as it requires complete control over water that these regions lack. Such attention as rain-fed regions did receive in the decades following the green revolution has largely been oriented—by conception or in implementation—towards mitigation rather than enhancing livelihoods and spurring growth.

Rain-fed regions first received specific, though marginal attention during the 4th FYP with the launch of the Drought Prone Areas Programme (DPAP) in 70 chronically drought-prone districts. DPAP was, however, concerned with drought proofing rather than livelihoods and growth-focused development of natural resources. A collection of discrete activities by different line departments to mitigate widespread distress, especially to cattle in the event of drought, DPAP was quintessentially ameliorative. It soon degenerated into a budgetary device to allocate funds across line departments and was stretched to many more districts due to political exigencies. Programmes for desert areas, mountains and coastal areas have been even smaller and have not fared any better than DPAP.

The national watershed development programme (NWDP) begun in 1995 was the first significant and considered initiative to develop rain-fed areas. However, watershed development has had a pronounced conservation bias thanks to its origins in river valley conservation schemes where the goal was to reduce siltation of dams, and people, productivity and livelihoods did not enter the calculus.

Overall public investments in rain-fed areas have also been very low. While cumulative public investment in major and medium irrigation schemes is estimated at Rs 5.5 lakh crore at current prices, watershed development has

cumulatively received less than Rs 40,000 crore⁷. Private investment, the major contributor to irrigation, is perhaps even lower in rain-fed areas. Also, procurement and price support policies have favored wheat and rice, neglecting millets and other crops most suited to rain-fed areas.

The net sown area expanded considerably during the first three decades since independence in the wake of population growth, the 'grow more food campaign', various land distribution programmes and privatization of the commons⁸. Much of the expansion was outside the plains and in rain-fed areas, bringing land unsuited for field crops under the plough. Often, farmers engaged in such expansion were poorer people, relatively new to farming and unable to develop the land to make it suited for farming.

Challenges in Developing Rain-fed Areas

Ecological Diversity: Rain-fed areas are largely in undulating, hilly and mountainous (UHM) terrain with no opportunities for widespread irrigation. UHM regions represent great agro-ecological diversity—depending on quantum and variability of rainfall, temperature, geo-morphology and predominant farming systems. The terrain also induces high micro-level variations—soil depth, soil quality, land degradation and water availability can vary within a single village. Thus, there cannot be “standard packages” *a la* green revolution to be “extended” or stamped around.

Managing Ecological Commons: Due to the nature of the terrain, rain-fed regions tend to be “ecologically connected”—since water flows downhill, how the upstream is managed affects the downstream. Also, there are competing claims on water, especially groundwater which is inherently limited in UHMs, between domestic uses, subsistence farming and commercial agriculture. Further, livelihood systems in vogue often conflict with potentially more productive alternatives—for instance, open grazing affects *rabi* and vegetable cultivation and livestock rearing under open grazing regime affects overall resource management choices. The implication of inter-connectedness is that isolated actions by individual farmers cannot succeed. Needed collective action requires social mobilization, fostering and nurturing participatory/consensual institutions and enabling legal provisions for such institutions to enforce shared perspectives. Social mobilization requires patient engagement and time.

Limited Knowledge, Know-how & Research: Research and knowledge building in natural resource management has been dominated by the green revolution framework of maximizing production under controlled conditions. Wheat and paddy have dominated research agenda with little attention

⁷ Of course, investment in irrigation itself is meant to develop erstwhile rain-fed areas. What is meant here is that investment to develop the potential of rain-fed areas *where irrigation is not possible* has been low.

⁸ Data compiled by Indiastat.com from various government sources estimate an increase of about 22 mHa in NSA, which is about 30% of the current rain-fed area.

paid to traditional rain-fed crops of millets, oilseeds and pulses. Fragmented across narrow disciplines, research remains focused on breeding and other “above the ground” issues while the “below the ground” themes, such as soil-water-microbe dynamic remain neglected.

Absence of Know-How, “Scale Models”: Techniques and strategies to enhance resource productivity, reduce vulnerability and stimulate regeneration have been successfully tried out on small scale by many NGOs, innovative farmers and intrepid researchers in different parts of the country. There are no mechanisms to harness this tacit knowledge and there are no scale models or success stories on large scale to guide and induce serious shifts in policy and action.

Low Capacity for Private Investment: Low productivity and frequent crop failures leave no investible surplus with farmers in rain-fed areas. Many are relatively new entrants with limited experience of intensive agriculture. Farmers often lack proper tools and draft power. Neglect and low investment in resource development further reduce returns, setting in motion a vicious cycle, impoverishing people as well as resources.

Weak Organizational Capacity: There is a dearth of human resources with skills in social mobilization, nurturing local institutions, participatory planning for natural resource development and inter-disciplinary work. There are no institutions to develop such human capabilities and provide support to those engaged in implementing programmes. No mechanisms exist to systematically engage PRIs and NGOs.

Flawed Strategies & Gaps

Fragmented Programming: There are now large budgets for IWMP, RADP, NHM, MGNREGA, Minor Irrigation, NRLM, etc. The activities promoted/ permissible under these are highly relevant for the development of rain-fed areas. However, each of these is conceived and implemented in departmental silos and there is no unified mechanism for coordination and convergence. As a result, these programmes do not lead to “area development”, potential synergies are lost and investments, interventions and results remain sub-optimal.

Flawed “Solutions”: Watershed development is the main programme for the development of rain-fed areas. Given their ecological characteristics, developing rain-fed areas does broadly require a watershed approach. Unfortunately, with its roots in protection of dams from silting watershed thinking has remained preoccupied with “erosion-prevention” and “run-off harvesting”. Together, these objectives have spawned a “ridge-to-valley fundamentalism” and a “tool-kit” approach of sticking on the ground various structures and “treatments”—check-dams, trenches, loose boulder structures, drainage line treatment, etc. Watershed development projects lack clear development goals and standards for investment and outcomes. There is no

focus on production and regeneration and no investment in private lands which occupy a major portion of most landscapes. 'Livelihood' added to the watershed lexicon during 11th FYP is understood as an "add-on" activity of promoting enterprises—including grocery shops!—often with no bearing on the design of the "treatments" in the watershed.

The Opportunities

Developing about 150 mHa of rain-fed areas⁹ would require about Rs 7.5 lakh crore at the rate of Rs 50,000/Ha. Current allocations for MGNREGA, RKVY, RADP, NHM, IWMP, MI and BRGF alone are of the order of Rs 60,000 crore a year. At this rate it would take only about a dozen years to transform our rain-fed areas.

Much of what needs to be done to develop rain-fed areas is labour intensive and would create large scale employment and reduce poverty in villages on the way to opening the doors to rural prosperity. By reversing the process of resource degradation, rain-fed area development would mitigate effects of climate change and lead to food and water security locally as well as nationally. High skills are not required, except in social mobilization and preparing resource development and usage plans—the so called "treatment". Like MGNREGS, work can be taken up simultaneously in every village and micro-watershed and phased out across years. The gestation period for investment is very small as some returns from "treatment" begin to flow from the very next rainy season. The large and growing urban demand for diverse farm products provides the pull for much needed diversification of farming systems in rain-fed areas. Though scattered, there is a fair amount of experience and know-how among practitioners compared to when the NWDP was initiated and it is possible to outline broad planning approaches to develop rain-fed landscapes. Finally, PRIs now provide a broad institutional framework to take up systematic, decentralized investment to develop rain-fed areas.

The Way Forward

Need for a Holistic Perspective: Developing rain-fed areas requires pursuing three inter-connected goals *simultaneously*: enhancing current livelihoods for most people (equity), enhancing current carrying capacity (growth) and setting in motion regenerative processes to enhance future carrying capacity continuously (sustainability). This calls for re-shaping interactions between people and natural resources as well as those between nature's elements to produce multiple, long-lasting, synergetic effects rather than merely maximizing current production. Relationships between people need to be reordered by fostering institutions to regulate resource use and facilitate joint

⁹ One needs to take a comprehensive view of the resource base that includes farmland, pastures and other commons and forests. The total area needing systematic development would be of the order of 150 mHa.

action to develop resources so that everyone gains and future needs are balanced against present demands. Alternate resource use systems need to be developed by changing people's interaction with resources to expand the production frontier in a viable way. Finally, interactions between nature's elements—earth, water, sun and air—need to be facilitated to regenerate soils, recharge aquifers and make the land-bound part of the water cycle most productive.

Convergence: The policy making, programming, budgeting and implementing silos need to be dismantled. Mechanisms need to be created to ensure that policy making is focused on “development of rain-fed areas” as a single theme and schemes relevant for this theme converge in the field regardless of their origins in Central and State Ministries. In the present context, at least MGNREGA, IWMP, Minor Irrigation, RKVY/RADP and NHM must be planned and implemented in a convergent manner. Besides such convergence across schemes, there is a need to create mechanisms to pool knowledge resources from various government and non-government agencies engaged in research and action and to harness the grassroots capabilities of NGOs.

Need to Bridge the Water Divide: Irrigation is typically planned in isolation as the sole or standalone means to secure crop production¹⁰. Use of fresh rainwater or green water thus receives no attention while planning and designing irrigation projects. Though ‘full’ and widespread irrigation is not possible in rain-fed areas, opportunities do exist¹¹ for small scale and supplemental irrigation. An alternative formulation is therefore required for the development of rain-fed areas whereby blue water or irrigation is seen in conjunction with green water to maximize productivity of all water.

Key Recommendations for the Twelfth Five Year Plan

The working group concluded that ‘developing rain-fed areas’ was the common ground for the three themes assigned to it, namely, watershed development, MI and NRAA. Each theme was, however, deliberated upon by separate sub-groups to facilitate discussions. It is envisaged that the recommendations presented separately for each theme will be integrated through NRAA.

Watershed Development

With the induction of the Common Guidelines during the 11th FYP, new watershed projects were taken up only by DoLR under the Integrated Watershed Management Programme (IWMP). Completing projects earlier

¹⁰ Irrigation systems provide only a fraction, called water duty (usually 60%), of the water required by crops but nothing is done to work out where the rest would come from or how the water duty could be lowered.

¹¹ Such opportunities can also be created through groundwater recharge, storage of run-off and by allocating water from medium and large projects to fill local water bodies.

sanctioned under various schemes was a key watershed development focus of DoLR. New projects were sanctioned only from FY 2009-10 after the Common Guidelines were approved by the Union Cabinet towards the end of FY 2008-09. Projects covering 15.13 mHa were approved till the end of FY 2010-11 against a Plan target of 22.65 mHa.

Rationale: Several schemes relevant for the development of rain-fed areas are being implemented by various Ministries and MGNREGA is expected to prioritize activities focused on rain-fed area development. What, then, is the rationale for continuing IWMP?

The main rationale for continuing and expanding IWMP is that a 'watershed programme' provides the framework necessary for rain-fed area development schemes just as urban planning provides the framework for housing and other urban development schemes. While a ridge-to-valley approach should not be rigidly enforced, especially in undulating terrains, rain-fed area development planning does require a watershed approach because of the ecological connectivity of typical rain-fed landscapes. Besides, certain activities needed for the development of rain-fed areas, such as use of light machinery for land leveling and deepening of water bodies, pipes for conveying water, larger masonry works, etc. cannot be taken up under MGNREGS¹².

The recommendations of the Working Group are as follows.

1. Strengthen the Implementing Structure for Convergence & Quality

- There should be a single agency at State and District levels for implementing IWMP and MGNREGS.
- A single Steering Mechanism should be created at the State and District levels for IWMP, MGNREGS, RKVY/RADP and NHM.
- As the NWDPRA projects have now been completed, the staff should be shifted to DoLR from MoA.
- Consortia of NGOs and research organizations should be promoted for capacity building of PIAs/PRIs.
- Research agencies (e.g. Soil & Land Use Survey of India, CSWCRTI) should be mandated to provide technical support to DoLR.

2. Enhance Livelihood Focus & Sustainability of Watershed Programmes

- Areas treated in the past should be included in new projects since the treatment generally was marginal.
- Maintenance of watershed works should be included under MGNREGA.

¹² Though MGNREGS permits 40% capital expenditure, one-fourth of it has to be borne by States. Other capital intensive projects, such as roads, often take precedence in using up the 40%. More importantly, being demand driven, MGNREGS cannot be converted into a watershed programme even though a watershed approach can and should be mandated for natural resource related works under it.

- Promotion of production-related institutions should be included in Common Guidelines.
- Necessary legal framework should be created to enable CBOs to play a regulatory role in the use of natural resources, such as groundwater, pastures, etc.
- MSP should be declared for rain-fed area crops, such as millets and these crops should be procured.

3. Develop Data Base, Know-how & Standards (common with NRAA)

- A National Level Data Center should be set up.
- Network based research support system should be set up, linking up NGOs and research institutions.
- Action research pilots should be initiated jointly with NGOs and research institutions for special areas (the Himalayas, ravine areas, areas where groundwater has been overexploited, inland salinity affected areas and water-logged areas).

Minor Irrigation

The lowest end of projects irrigating up to 2,000 Ha, including all groundwater irrigation projects by virtue of their small size are clubbed into this category. The nomenclature 'minor' conjures insignificance and needs to be changed. Further, projects with command area limited to a village or a Panchayat need to be implemented and managed by PRIs.

The main Centrally Assisted Schemes for developing MI during the 11th FYP were AIBP, RRRWB and the MI component of Bharat Nirman. Overall, the targets are expected to be met.

MI schemes can broadly be conceived in four contexts, namely, in areas with underutilized groundwater potential, e.g. Bihar, West Bengal and Assam; in the UHM regions, such as the central and eastern plateau, Hills and Mountains with potential for lift and diversion-based irrigation from springs and streams; across the country for restoration and rehabilitation of water bodies/ water courses (tanks, *pokhars*, natural drainage channels in the foothills as in Assam, the *Ahaar Pyne* system, etc.); and groundwater management in the non-alluvial areas. The first category is in the nature of standalone irrigation where access to finances and electricity and their efficient use are concerns. The other three contexts call for convergence and integration with the broader theme of rain-fed area development.

The recommendations of the Working Group are as follows.

1. Change in Nomenclature

- Surface Irrigation:
 - Small Scale 100 ha to 2,000 ha
 - Tiny/ Mini up to 100 ha
- Ground Water: Ground Water Irrigation

2. Modifications in Cost Structure of AIBP for Surface Water

- For Small Scale 2.5 lakh/ha; for Mountains 3.5 lakh/ha
- For Tiny/Mini 1 lakh/ha
- For Special Category States & Tribal Areas:
 - Reduce Eligibility of Individual Schemes from 20 to 5 ha
 - Reduce Eligibility of Schemes within 5 km from 50 to 20 ha
- For Other States Reduce Eligibility of Individual Schemes to 20 ha

3. Include in RRRWB Restoration of Traditional Systems, e.g. *Ahaar-Pyne*, Natural Drainage-cum-Irrigation Channels in foothills, e.g. in Assam

4. Implementation and O & M

- Handover Schemes up to 100 Ha to PRIs
- Involve NGOs as Support VOs

5. Data Collection

- Complete 5th MI Census & Preparatory Work for 6th MI Census
- Integrate MI Data into PRIs' Data Base
- Earmark 1% of Allocation for Data Collection
- Make Data Available on Public Domain

6. Enhancing Water Use Efficiency

- Identify & Support NGOs (SVO) for Training & Extension
- Earmark 2% for Training/Capacity Building

7. Ground Water

- Stimulate Development in Less Developed Areas
 - Introduce Scheme with Central Subsidy
- Take up Pilots on Community Tube Wells
- Promote Artificial Recharge
 - Central Subsidy for Artificial Recharge through Dug Wells
 - State Scheme in Overexploited Areas for Artificial Recharge
- Ground Water Management & Regulation
 - Aquifer Mapping
 - Strengthen Ground Water Monitoring Observation Wells
 - Develop Enabling Laws for Participatory Ground Water Management
 - Technology Up-gradation
 - Restructuring and Strengthening of CGWB.

National Rain-fed Area Authority (NRAA)

The NRAA was established in November 2006 as an inter-ministerial body in the Department of Agriculture and Cooperation, Ministry of Agriculture following an announcement by the Prime Minister on 15 August 2005 to set up such a body. It was later moved to the Planning Commission. Though the Prime Minister had promised to set up a body to 'focus on removing the

problems of farmers in dry-land areas' with the hope to 'have a new green revolution', the mandate eventually assigned to NRAA's was as an advisory body to provide knowledge inputs, make perspective plans, formulate policies and coordinate to bring about synergy and convergence. It has been hobbled by weak strategic positioning (in one Ministry), emphasis on knowledge and advisory role and corresponding staffing with scientists and technocrats, lack of mechanisms to ensure convergence, lack of field presence and weak support systems.

The NRAA since its inception has prepared a vision document, helped develop the Common Guidelines for watershed development, assisted MoEF in a programme for the development of fringe forest areas, developed the Bundelkhand Package and conducted a few research studies. It is yet to play the spearhead role towards the development of rain-fed areas envisaged in its conception. It clearly needs to be re-conceptualized and restructured with clear objectives and corresponding resources and authority.

The recommendations of the Working Group are as follows.

- 1. Restate Mandate, with Convergence—*Not Advisory*—as the Main Role**
- 2. Restructure Governance Consonant with the Mandate of Facilitating & Ensuring Convergence**
 - Council Chaired by Dy. Chairman of PC with MoA & MoRD as Co-Vice Chair, Representation from relevant GoI Departments, States & NGOs
 - CEO Designated Secretary GoI, Selected from Open Market with Five Year Term
 - (Alternatively, Separate Body, with a NDC-like Council Similar to PC & CEO the Rank of MoS)
- 3. Strengthen the Organization**
 - Provide Adequate Support Structure
 - Set Up Units in Key Rain-fed Farming States or Regions (Perhaps Six)
 - Strengthen Human Resource Base with Multi-disciplinary Teams
 - People with Field Experience
 - Community Development, Institution Building & Livelihoods Promotion Besides Technical (Natural Resources) Fields
 - Set Clear Goals & Monitoring Mechanisms for NRAA

4. Set Up Convergence Mechanisms at State & District Level

- Common Convergence Body for IWMP, MGNREGA, RADP, etc.
- Chaired by CS or Development Commissioner at State & Collector at District

5. Knowledge, Capacity Building & Dissemination

- Develop & Orchestrate Strategies for
 - Capacity Building, Especially in the Field
 - Knowledge Building, by Engaging Relevant Knowledge Institutions & NGOs
 - Systematic Involvement of PRIs & NGOs
- Set Up a Clearing House for
 - Accumulation, Sharing & Dissemination of Knowledge & Information
- Set Up Mechanisms for
 - Facilitating Technical Support to PIAs

6. Pilot Large Scale Convergence Demonstrations During the 12th Plan

- At Least One Pilot in Each of 15 Agro-Climatic Regions
- 10,000 to 25,000 Ha Each
- NRAA Role:
 - Orchestration, Mobilising Technical Support
 - Ensuring Goal-Oriented Planning
 - Facilitating & Incentivising Convergence
 - Facilitating NGO Participation
 - Facilitating Knowledge Building, Dissemination & Uptake of Experience
 - **Not Implementation!**

Proposed Allocations (Rs Crore)

Watershed Development:

Completion of Old DPAP, DDP & IWDP Projects	288
Completion of Projects (22.65 mHa) Sanctioned During 11 th FYP	21,350
Partial Cost for New Projects (25 mHa) During 12 th FYP	14,722
Pilots for Special Areas	100
Total	36,460

The major share of the allocation is towards spillover costs of projects approved during the 11th FYP. Only a marginal increase (less than 10%) is being proposed in the area to be covered during the 12th FYP at 25 mHa.

Minor (Small & Tiny Scale) Irrigation

	mHa	State Plan	Central Plan	Total
Surface Water				
AIBP Schemes 100 to 2000 ha	0.7		17,500	33,000
AIBP Schemes up to 100 ha	0.3		3,000	
By States	0.5	12,500		
Sub Total	1.5			
Ground Water Development				
Alluvial	3.4	17,000		46,510
Hard Rock	0.5	4,000		
Hilly Area	0.1	1,500		
GW development in DPAP/Tribal areas	1.12	9,000		
GW recharge via dug wells in hard rock areas	1.43	10,355		
Scheme of Groundwater Management & Regulation			4,655	
Sub Total	6.55			
RRRWB	2.4	30,000		30,000
Investigation, R&D & Awareness	LS	40	10	50
Best practices				
Pilots on Stream tank integration	LS	50		50
Scheme on accelerated Artificial GW Recharge	LS	15,000		15,000
RMIS	LS		127	127
Grand Total	10.45	99440	25292	124732

National Rain-fed Area Authority (NRAA)

	Apex Level	Regional Level	Total
Establishment (Salaries & Operating Costs)	65	124	189
Workshops, Publicity, Data Base &	1.4	8	9.5

WORKING GROUP: MINOR IRRIGATION AND WATERSHED MANAGEMENT

Website			
Convergence Demos (Gap Filling Funds)	225	0	225
Total	291.5	131.9	423.4

WORKING GROUP: MINOR IRRIGATION AND WATERSHED MANAGEMENT

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SH. S. L.J AIN, SR. JOINT COMMISSIONER	MINISTRY OF WATER RESOURCES, NEW DELHI.
SH. L.FANAI, DY.SECRETARY	MGNREGA, MINISTRY OF RURAL DEVELOPMENT, NEW DELHI.
SH. ALOK CHATURVEDI, RESIDENT COMMISSIONER	GOVT. OF BIHAR, NEW DELHI.
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WORKING GROUP: MINOR IRRIGATION AND WATERSHED MANAGEMENT

MEETING DATE	VENUE
05.04.2011	Committee Room, Dept .of Land Resources, NBO Building, Nirman Bhawan, New Delhi.
13.05.2011	
15.06.2011	
19.07.2011	
02.08.2011	

CHAPTER- I**INTRODUCTION****1.1 Working Group and Its Sub Groups**

The Planning Commission constituted a Working Group on Minor Irrigation and Watershed Management for the XII Five Year Plan under the Chairmanship of Sh Deep Joshi, Co-Founder, PRADAN vide its letters i) File No.25(1)/A/2010-WR dated 10.02.2011 & ii) File No.25(1)/A/2010-WR dated 13.04.2011 (**Annexure 1.1**).

1.2 Sub Groups in Working Group

In its first meeting held on 5 April, 2011, the Working Group decided to constitute three Sub-Groups one each on (i) Watershed Management (ii) Minor Irrigation and (iii) National Rain-fed Area Authority. These Sub-Groups were constituted vide File no (1)/A/6/2010-WR dated 18.5.2011 which is reproduced as **Annexure 1.2** in this report.

1.3 Terms of Reference of Working Group**1.4 Preparation of the Working Group Report**

The terms of reference (broad functions) of the Working Group (Minor Irrigation & Watershed Management) are given below:

- i) Examine critically the physical and financial performance of the sectors during 11th Plan and suggest strategies, priorities and allocations for the 12th Plan
- ii) Examine the performance of Integrated Watershed Management Programme based on the newly formulated Common Guidelines, 2008.
- iii) Examine the performance of the NRAA and suggest measures for strengthening its role.
- iv) Assess the scope of a convergence of a programmatic convergence between IWMP, MGNREGA and Minor irrigation projects
- v) Any other issues considered relevant by the group

This report contains a chapter on Watershed Management, NRAA and Minor Irrigation including Performance Overview, Shortcomings in Sector, Strategy for XII Plan and Recommendations. The names of officers who were actively involved in preparation / drafting of the report are mentioned in below:

Watershed Management	Dr Savita Anand, JS(WM), DoLR, Sh. Surinder Kumar, DIGF (WM) DoLR SH. M.V.RAMACHANDRUDU, (WASSAN) Ms. Arti Chaudhary. AIGF (WM) DoLR
National Rain-fed Authority	Ms. Nivedita Banerji, Secretary, SPS Sh. Crispino Lobo, WOTR, Sh. V.K.Madhvan, CHIRAG, Dr.A.K. Sikka, NRAA.
Minor Irrigation –SW	Sh. S. L. Jain, SJC (MI), MoWR, Sh.K J Joy, Senior Fellow, SOPPECOM, Sh B P Das, Former Engineer in Chief, Orissa
Minor Irrigation -GW	Dr Poonam Sharma, Scientist-D, CGWB, Sh Rana Chaterjee, Scientist-D, CGWB Dr Suresh, Scientist-D, CGWB

The report has been prepared under overall guidance of the Chairpersons of Sub Groups and Sh Sushil Gupta, Member (SML), CGWB & Member Secretary of the Working Group on WM&MI.

1.5 Acknowledgements

The Working Group acknowledges the useful suggestions and observations of all members and co-opted members which were deliberated in detail in the 5 meetings. In addition to the contributions made by the Members/ Co-opted Members, the Working Group also acknowledges the contributions made by many other officials of the NRAA, DoLR, MoWR, CWC, CGWB, NABARD, State Governments etc. that helped in preparation of this report.

CHAPTER- II

WATERSHED MANAGEMENT

Report of the Sub Group on Watershed Management

2.1 Introduction

A working group on “Minor Irrigation and Watershed Management” was constituted by Planning Commission, Government of India to develop and define broad contours of future watershed development projects that could be implemented during the 12th Five Year Plan. To give proper and adequate attention to watershed management related issues, a Sub Group on Watershed Management was constituted with following composition and functions.

2.1.1 Composition of Sub Group

Smt. Anita Chaudhary, Secretary, DoLR, MoRD	Chairperson
Joint Secretary, MGNREGA, MoRD	Member
A representative from Ministry of Environment and Forests	Member
Shri Venkatesh Tagat, Chief General Manager, NABARD, Bangalore	Member
Shri G.N. Sharma Consultant (Works), MGNREGA, MoRD	Member
Dr. S.P. Wani, Principal Scientist, ICRISAT, Hyderabad	Member
Shri M.V Ramachandrudu, Director, WASSAN, Secunderabad	Member
Dr. Savita Anand, JS (WM), DoLR	Member

2.1.2 Broad functions

- To examine critically the physical & financial performance of the watershed management sector during 11th Plan and suggest strategies, priorities and allocations for the 12th Plan
- To examine the performance of IWMP based on newly formulated Common Guidelines, 2008
- To assess the scope of programmatic convergence between IWMP, MGNREGA and minor irrigation projects
- Any other issues considered relevant by the group

The Sub-Group held two meetings on 3.5.2011 & 10.5.2011 in the committee room of the Department of Land Resources to deliberate upon the issues referred to in para 1.2. The recommendations of the Sub-Group were

presented before the 'Working Group on Minor Irrigation and Watershed Management' for twelfth Five Year Plan on 13.5.11. The suggestions and observations of the Working Group have been considered to finalise the recommendations of the Sub-Group.

2.2 Watershed Development: The Context

The declining per capita land and fresh water availability coupled with soil erosion and land degradation in India are posing serious threat to food, social, environmental and economic security. Land and water go together and their development cannot be considered independent of each other, especially for sustainability of rain-fed areas. Rain-fed areas constitute about two-thirds of nation's 142 mHa cultivated area, are the resource poor areas with low levels of productivity and suffer most from degradation and the vagaries of nature. It is estimated that these rain-fed areas contribute only 45 per cent to total food production whereas irrigated areas which account for 37 per cent of the cultivated area contribute 55 per cent to total food grain production.

The productivity gains achieved during green revolution in irrigated areas have bypassed rain-fed areas. However, these irrigated areas are also now unable to sustain the gains due to land degradation and falling factor productivity. Even if full irrigation potential of the country is achieved, due to poor irrigation water utilization efficiency about 75 million hectares (mHa) will still remain as rain-fed and would continue to be a major food grain production domain.

Conservation and management of rainwater hold key for sustainable agriculture in rain-fed/degraded areas. It has also been amply demonstrated in India and elsewhere that it is impossible to envisage or implement sustainable solutions for land and water resources development and management without active and full participation of local community. Development of land and water together with sustainable production system when confined to small natural drainage unit such as watershed leads to sustainable development. Watershed management has, therefore, emerged as a new paradigm for planning, development and management of land, water and biomass resources with a focus on social and institutional aspects apart from biophysical aspects following a participatory bottom up approach.

Realizing the above, the Government has accorded very high priority to the holistic and sustainable development of rain-fed/ degraded areas based on

the watershed approach. It is being considered as principal vehicle for transfer of rain-fed agricultural technology and to bring in ever green revolution. The national agriculture policy seeks to promote the integrated and holistic development of rain-fed/degraded areas through conservation of rainwater and augmentation of biomass production through agro-forestry with active involvement of the watershed community. Such system based approach distinguishes watershed development from earlier approach that primarily focused on soil and rainwater conservation.

Over the years, various Central Ministries and Departments have been implementing watershed development programmes. From river valley projects (1960s) to the Common Guidelines for Watershed Development Projects (2008), the watershed development programmes have come a long way. The Watershed Guidelines (1994) could be considered as a turning point in the policy, practice and discourse of watershed approaches in India as the participatory watershed management and a focus on livelihoods, as opposed to merely resource conservation began with these guidelines.

A brief description of the programmes being implemented on watershed basis by various Central Ministries and Departments is given below.

A. Ministry of Rural Development (Department of Land Resources)

- ❖ **Drought Prone Areas Programme (DPAP):** DPAP is the earliest area development programme launched by the Central Government in 1973-74 to tackle the special problems faced by those fragile areas which are constantly affected by severe drought conditions. The Drought Prone Areas Programme was in operation in 627 blocks of 96 districts in 13 States during 1994-95. On the recommendation of the Hanumatha Rao Committee, 384 new blocks were brought into the purview of this programme and 64 were transferred from DPAP to DDP. Consequently, coverage of the programme was extended to 947 blocks of 164 districts in 13 States. With the reorganization of States, districts and blocks, at present the programme is under implementation in 972 blocks of 195 districts in 16 States. Since 1995-96, a total number of 27,439 projects covering an area of 13.72 mHa have been sanctioned, on watershed basis under DPAP.
- ❖ **Desert Development Programme (DDP):** Up to 1994-95 the Desert Development Programme was in operation in 131 blocks of 21 districts in 5 States. On the recommendations of the Hanumatha Rao Committee, 32 new blocks were brought within the purview of the programme and 64 blocks were transferred from DPAP.

Consequently w.e.f. 1.4.1995 the coverage of the programme was extended to 227 blocks of the country. With the reorganization of districts and blocks, the programme is under implementation in 235 blocks of 40 districts in 7 States. Since 1995-96, a total of 27,439 projects covering 7.87 mHa have been sanctioned, on watershed basis under this programme.

- ❖ **Integrated Wastelands Development Project (IWDP):** IWDP, a Centrally Sponsored Project, has been under implementation since 1989-90. From 1st April 1995, the programme is being implemented through watershed approach under the Common Guidelines for Watershed Development. The projects under IWDP are generally sanctioned in areas not covered by DDP and DPAP. The programme is being implemented in 470 districts in 28 States of the country. Under the programme, 1,877 projects covering a total area of 10.72 mHa have been sanctioned on watershed basis since 1995-96.
- ❖ **Integrated Watershed Management Programme (IWMP):** The watershed and related programmes have undergone revision and reorganisation following the recommendations of the Parthasarathy Committee (2006) and the subsequent formulation of the Common Guidelines. Accordingly, DPAP, DDP and IWDP of the Department of Land Resources have been integrated and consolidated into a single modified programme called **Integrated Watershed Management Programme (IWMP) w.e.f. 26.02.2009**. This consolidation is for optimum use of resources, sustainable outcomes and integrated planning. Watershed development has evolved from a purely technical, externally imposed intervention in the 1980s to a more participatory exercise in which local people help design and implement management plans. A target of 22.65 mHa had been set for taking up new projects under the programme during the XIth Plan against which projects covering a total area of 15.13 mHa in 24 States of the country have been approved up to 2010-11.

B. Ministry of Agriculture (Department of Agriculture & Cooperation)

- ❖ **National Watershed Development Project in Rain-fed Areas:** Under this programme, since inception up-to end of 2009-10, an area of about 10.34 mHa has been treated to improve soil fertility, in-situ soil & water conservation in rain-fed areas, with an expenditure of Rs 3,820.55 crore. During 2010-11, an area of 2.50 lakh Ha has been

covered with an expenditure of Rs 260.50 crore. For the year 2011-12, it has been targeted to cover 2.45 lakh Ha area with an outlay of Rs 260.00 crore.

- ❖ **Soil Conservation in the Catchments of River Valley Projects & Flood Prone Rivers:** Under this programme, since inception up-to end of 2009-10, an area of about 7.34 mHa has been treated to improve soil fertility and water conservation, with an expenditure of Rs 3,012.15 crore. During 2010-11, an area of 1.96 lakh Ha has been covered with expenditure amount of Rs 245.65 crore. For the year 2011-12, it has been targeted to cover about 2.00 lakh Ha area with an outlay of Rs 250.00 crore.
- ❖ **Watershed Development Projects in Shifting Cultivation Areas (WDPSCA):** Since inception and up-to the end of 2009-10, an area of about 0.51 mHa has been treated with an expenditure of Rs 413.09 crore. During 2010-11, an area of 0.35 lakh Ha has been covered with amount of Rs 40.00 crore. For 2011-12, it has been targeted to cover about 0.40 lakh Ha area with an outlay of Rs 50.00 crore.

C. National Bank for Agriculture and Rural Development (NABARD)

- ❖ NABARD has been involved in implementation of various watershed development programmes viz. Indo-German Watershed Development Programme (IGWDP) in Maharashtra, Andhra Pradesh, Gujarat and Rajasthan; NABARD's Watershed Development Fund (WDF) projects in 15 states; Planning Commission supported Integrated Watershed Development Programme (IWDP) in Bihar and Kutch Drought Proofing Project (KDPP) in Gujarat. The aggregate programme sanctioned covers an area of 1.72 mHa and the total funds handled are to the tune of Rs 1,600 crore.

D. Other watershed programmes

- ❖ The Planning Commission is implementing the Western Ghats Development Programme (WGDP) and Hill Area Development Programme (HADP). Besides, there are other externally aided projects (EAPs) funded by various International and National Donor Agencies.

During the XIth Plan the Department of Land Resources, MoRD has sanctioned new projects for an area of 15.13 mHa (up to 31.03.2011) under Integrated Watershed Management Programme (IWMP).

Based on the experiences gained in the past, the watershed programmes implemented by different departments have been radically restructured for implementation during the XI Plan in conformity with the Common Guidelines for Watershed Development Projects, 2008 issued by the National Rain-fed Area Authority. These guidelines allow much greater degree of flexibility in choice of technologies, decentralization of procedures; provision for sustainability; and ensure active participation of watershed community in the planning and execution of watershed development programmes. Above all, the Guidelines have incorporated livelihood enhancement as a key focus of watershed development.

Future watershed development projects have to find themselves in the midst of – changing global equations; changing technology; climate change related issues; deteriorating soil fertility; diminishing forest cover; depleting ground water; increasing urbanization; decreasing productivity of several crops (irrigated/ rain-fed crops); newer aspirations of younger generations in rural areas; increasing disparity between rich & poor in the society; conflicting agriculture and land use policies (corporatization of agriculture; special economic zones; increasing mono-cropping; others); breaking institutional arrangements for rural/ agriculture finances; increasing landlessness and further fragmentation of land etc. There is also a need to re-position watershed development projects in the context of several relevant development initiatives such as Mahatma Gandhi National Rural Employment Guarantee Scheme, Rashtriya Krishi Vikas Yojana, Backwards Regions Grant Fund, National Rural Livelihoods Mission, etc, which operate in the same districts/ villages. There are also some missing links in the context of watershed development projects, which need to be addressed in future (E.g.: special areas of concerns like reclamation of salt affected soils, ravine, waterlogged areas post-project sustainability issues, externalities in watershed development projects, etc)

2.3 Physical and Financial Performance of Watershed Management Projects during 11th Five Year Plan

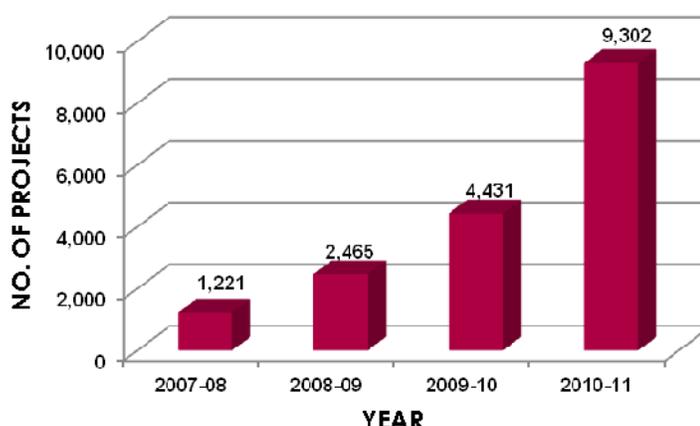
During the Eleventh FYP, the activities under Watershed Development Programme were focused to completion of large number of ongoing projects under Desert Development Programme (DDP), Drought Prone Areas Programme (DPAP) & Integrated Wastelands Development Programme (IWDP) and launching a new modified programme of Integrated Watershed Management Programme (IWMP) by amalgamating the earlier programmes.

The Department decided not to sanction any new projects under DDP, DPAP & IWDP programmes in the Eleventh Five Year Plan and shifted the focus entirely to accelerate completion of the projects. Department took the policy decision of completion of Pre-Hariyali projects (sanctioned before 2003-04) by 31.3.2011 and Hariyali projects (sanctioned 2003-04 to 2006-07) by 31.12.2012 except for snow-bound areas where a grace period of three years have been allowed for completion. As a result of the endeavor of the Department, 32,495 projects out of 45,062 were either closed or completed by the end of the financial year 2010-11.

Pre-IWMP Programmes	No. of Projects sanctioned during 1995-96 to 2005-06	Projects completed/closed by 2010-11
DPAP	27,439	20,580
DDP	15,746	10,998
IWDP	1,877	917
Total	45,062	32,495

Of the above 32,495 projects completed / closed, 17,419 projects could be completed /closed during the Eleventh Five Year Plan. The acceleration achieved in the completion, on account of policy decisions and concerted efforts of the Department, is evident from Diagram 2.3.2.

Diagram 2.3.2: No. of pre-IWMP projects completed in first four years of Eleventh Five Year Plan



During the first four years of the Eleventh Five Year Plan, the total expenditure stands at Rs 6,978.32 crore which is 74% of the total outlay of Rs 9,429.68 crore for the Eleventh Five Year Plan.

Table: Physical & Financial progress in Watershed Projects of DoLR

Year	Area to be taken up for development (m. Ha.)		Finances (Rs in Crore)	
	Target	Achievement	Target	Achievement
2007-08	-		1,114.50	1,164.54
2008-09	-		1,545.00	1,594.40
2009-10	5.41	6.31	1,762.98	1,762.65
2010-11	8.5	8.82	2,458.00	2,456.73
2011-12	8.74	-	2,549.20	---
Total	22.65	15.13	9,429.68	6,978.32
In %	100%	67%	100%	74%

The Department of Land Resources under the Ministry of Rural Development originally had a target to cover 25 mHa for the Plan period which was reduced to 22.65 mHa. The main reason for reduction in target was the fact that though the Common Guidelines for Watershed Development Projects were approved in 2008, the new programme of IWMP was operationalised after the Cabinet approval on 26.2.2009. Therefore, during the first two years of Eleventh Five Year Plan, no projects under IWMP could be sanctioned. However, the sanctioning of projects could commence towards the latter half of 2009-10 and an area of 15.13 million hectare could be sanctioned to 23 States in the country as given in Table 1 above.

The new generation of Watershed Projects under IWMP are characterized by features which were hitherto not known to pre-IWMP projects. The projects are being implemented by dedicated agencies at State, District and Project level. After mobilising the community with the assistance of Entry Point Activities (EPAs), Detailed Project Reports are prepared before taking up Watershed activities under the projects. The Projects also require taking up livelihood activities, including development of micro-enterprises and enhancing the production system.

2.4 Recommendations on Watershed Development for Twelfth Five Year Plan

2.4.1 Special Areas of Concern

The existing norms and practices for watershed development may not be strictly applicable to certain parts of the country due to the nature of the terrain, other ecological factors, socio-economic factors and the level and nature of resource degradation/depletion. These areas are water-logged areas in rain-fed regions; coastal areas affected by salinity ingress; the Himalayan hills; ravine areas; areas where groundwater is over-exploited;

areas affected by left wing extremism. These special areas may require a different set of technical interventions, cost norms, institutional arrangements, etc. The Sub-Group proposes to prioritize these 'special areas of concern' in different parts of the country (with the support of SLNAs) and initiate a stream of large scale pilots in different parts of the country to improve the productivity of these lands. These pilots are expected to develop a package of practices based on scientific principles and community participation.

Recommendation 1:

- ❖ *Pilots in Special Areas of Concern: DoLR may initiate a stream of pilot projects for these special areas of concern - Waterlogged areas in rain-fed areas; inland salinity areas along coasts; Himalayan hills; Ravinous areas; Blocks where groundwater is over-exploited; Areas where left wing extremism is predominant in collaboration with research institutions and credible voluntary organizations in different parts of the country. Based on the lessons from these pilots, a new generation watershed development projects would be designed for such special areas in due course of time. It is proposed to take 2 pilot projects in each of the special area of concern identified with an approximate estimate of Rs 100 crore.*

2.4.2 Strengthening the Data and Knowledge Base for Watershed Development

Watershed development activities and other initiatives for improving productivity in rain-fed areas are being taken up by a variety of implementing agencies. The tacit knowledge of practitioners, including farmers is often ahead of what is available from formal research bodies and is unavailable to the wider field of practice. The research/ knowledge inputs into watershed development projects are minimal and there are limited efforts to use the research findings to improve the science/ technique behind watershed approaches. It is therefore important to devise mechanisms to harness knowledge and know-how from all available sources and make it available to field practitioners. A possible way is to promote network based research support system for watershed development through the National Level Data Center in the DoLR.

Recommendation 2:

- ❖ *Network Based Research Support System: The Department of Land Resources should bring about appropriate synthesis of existing data by suitably restructuring the National Level Data Centre to be established in the Department. It is proposed that a "network approach" would be promoted to work in close coordination with research/ academic/ voluntary sector based agencies that are*

engaged with action research on watershed related issues. It is expected that the National Level Data Centre would play a critical role in the process of evolving and institutionalizing the network based research support system to watershed management projects in the country.

2.4.3 Strategies for Improving Performance of IWMP

2.4.3.1 Strengthening Department of Land Resources

The Department of Land Resources spearheading the IWMP has very limited technical capabilities and no formal linkages with relevant research bodies that are presently in the domain of the Ministry of Agriculture. It is important that the technical capacities and knowledge systems of DoLR are strengthened significantly to ensure that available knowledge is brought to bear on watershed development policies and programming and the projects are better managed and guided. For this purpose, the following recommendations are made.

Recommendation 3:

- ❖ *Technical Agencies to Work in Collaboration with DoLR: The organizations like Soil & Land Use Survey of India (SLUSI) should work in close collaboration with DoLR. Such organizations could provide necessary knowledge input to the watershed development projects in the country.*

2.4.3.2 Restructuring Institutional Arrangements at State level

Watershed development projects and approaches are central to the development of rain-fed areas. The scope and scale of operations needs to be expanded as extensive areas across the country need such approaches/ programmes. Experience shows that watershed programmes have fared better in States like Gujarat, Madhya Pradesh, Orissa, Tamil Nadu, where dedicated departments/ agencies have been established for watershed development. Similarly, it is found that there is better convergence between watershed development projects and MGNREGS when these two schemes are implemented/ coordinated by a single department/ agency at State level (e.g., Andhra Pradesh; Gujarat). Since the physical works/ activities under these two schemes are largely similar, this arrangement brought considerable synergies between these two programmes. The Sub Group therefore recommends the following:

Recommendation 4:

- ❖ *Dedicated Agency for Watershed Management: Establish a dedicated State level agency as a "Department/ Mission for*

Watershed Management". The State Level Nodal Agency (which is already established in each State as per the Common Guidelines for Watershed Development Projects (2008)) could be embedded into this agency and this SLNA could continue to manage IWMP. This dedicated agency should look after MGNREGS as well in the IWMP Programme Districts. This agency should have its own staff at all levels, unlike current practice in some States, where only State level unit is dedicated to watershed development and rest of the staff are from regular line departments. The co-ordinating mechanism for convergence at State level should be replicated at the District as well. This agency could hire professional staff from open market and also get staff from other departments on deputation.

Recommendation 5:

- ❖ *Pooling Human Resources from Other Ministries: In several States, projects supported by Ministry of Agriculture (NWDPPRA, etc.) are in the final phase. There are no new watershed development projects under Ministry of Agriculture. The officers/ staff who are working on these projects have considerable experience of watershed development projects. It is desirable that the staff engaged with these programmes in the Ministry of Agriculture should continue to look after the works of watershed development in the Department of Land Resources so that the experiences gained in watershed development over a period of time are fruitfully utilized.*

2.4.4 Improving the Sustainability of Benefit Flows from Watershed Projects:

The various impact assessment studies indicate that the benefits of watershed projects were largely not sustainable due to a variety of factors, such as unsustainable institutions; low or no maintenance of assets; unregulated use of conserved natural resources and other externalities that have a negative influence on watershed resources (such as energy policies; negligible support to rain-fed crops in terms of minimum support price/ procurement, etc.). The following recommendations are proposed to help improve the sustainability of benefit flows from watershed development projects in the country.

Recommendation 6:

- ❖ *Maintenance of assets created under watershed projects: The Watershed Development Fund (WDF) created through people's contribution is expected to be used for the maintenance of assets created on Common Property Resources. However, the actual amount available under WDF is not adequate for maintaining the*

assets. Therefore the Sub-group recommends that funds from MGNREGS and any other schemes/ programmes available at Gram Panchayat should be used for maintenance of all assets created under watershed programmes. Plans prepared under MGNREGS should include all permissible works/ activities that are essential for maintenance of assets created under watershed development projects in villages. For better sustainability the Department of Land Resources must also consider providing budgetary support to such projects which have shown promise of sustainability at least for a period of 3 years after the completion of the project. Such projects can be identified by the States through a well defined, objective and transparent process of evaluation.

2.4.5 Restructuring Village level Institutions

Creating sustainable institutions for watershed management is a major challenge. It is found that most of the institutions (mainly in the form of committees) related to watershed projects are “project centric” or “works centric”; in other words, the institutions get created and are perceived by their constituents solely in the context of executing project activities. Given this perspective, it is very difficult to make them functional after the execution phase of the project. Only some of the committees/ institutions seem to have survived after project period is over (e.g. it is found that watershed committees are dormant after the plans are executed where as village forest committees are functional as they are associated with protection of forest resources, which is not a time bound activity). The vision and architecture of these committees is too limited to promote sustainable use of watershed resources. It is important to make a deviation from this standard approach of forming watershed committees, which are unsustainable in most cases. It is recognized that there are other different phases of the project with different functions and this functional domain defines the institutional design of the current project.

Recommendation 7:

- ❖ *Creating institutions: Along with creation of project and village level institutions like WCs, SHGs and UGs as envisaged in the Common Guidelines, there is a need to create institutions that promote/ support production systems and economic growth of individual members. This needs to be incorporated in the Common Guidelines. Illustratively, these institutions could be for the management of fisheries, processing of farm produce, etc. Further, institutions should be established for promoting sustainable management of*

watershed development projects to regulate the use of water resources.

Recommendation 8:

- ❖ *Establishing Institutional and Legal Base for Community Based Regulatory Systems of Conserved Natural Resources: State Governments need to be encouraged to institute laws/ programmes/ policies to empower local communities/ Gram Panchayats to establish systems for regulated use of groundwater and other natural resources in rural areas. There are several experiences in India where community based institutions are more effective in ensuring regulated use of natural resources (groundwater; common land, forests, etc.) with a focus on sustainability and growth with equity. The enabling conditions/ factors behind the success of these practices should be integrated into such laws/ policies.*

Recommendation 9:

- ❖ *Minimum Support Price for Millets/ Rain-fed Crops: It is observed that cropping/ land use practices followed after watershed development activities are implemented often are not suitable for rain-fed conditions. Improvement in water availability spurs farmers to shift away from traditional crops such as millets, pulses, oilseeds, which are more suitable for rain-fed agriculture, to the so called 'premium crops' that require irrigation, leading to unsustainable and unscientific use/management of the resource base. Non-availability of quality seeds of traditional rain-fed crops, lack of proper processing facilities and marketing support are some of the key factors behind the declining acreage under millets even in rain-fed areas. It is important that farmers in watershed villages adopt scientific and locally relevant agricultural practices by diversifying farming systems and strongly promoting rain-fed crops. This practice would also ensure that watershed benefits are sustained for a longer period, as farmers would not have to resort to unsustainable exploitation of groundwater. The Sub-Group recommends that minimum support price to region-specific major rain-fed crops should be announced followed by procurement and distribution of rain-fed crops in Public Distribution System. This support from State/ Central government would go a long way in making rain-fed*

agriculture profitable for farmers and in ensuring food security and ecological sustainability.

2.4.6 Inclusion of areas already treated under watershed programme

The watershed programmes have been implemented in the country since the Fifth Five Year Plan. In the earlier period, not only were the cost norms low, the approach too was not based on holistic principles of watershed management. The Department of Land Resources has decided to take up the untreated area of those projects, which could not be completed and were foreclosed due to various reasons under IWMP. However, those projects which were successfully completed with minimal investment in the past are ineligible for treatment under the new dispensation of IWMP. Considerable areas within these watersheds still need attention and such projects need to be revisited for holistic development.

Similarly, there are areas which are technically command areas but enjoy only minimal or no benefits from the irrigation system. Such areas also need to be tackled under watershed programmes if they form an integral part of a watershed under consideration.

Recommendation 10:

- ❖ *Inclusion of areas that were already treated in previous watershed projects: Areas that were covered under completed watershed development projects (under various previous schemes) sanctioned up to 2002-03 should be revisited. The extent of such areas is required to be assessed by State Governments. While selecting, preference may be given to the oldest completed watershed projects. The expenditure required to be made in such areas will be met through convergence with schemes like MGNREGA, RKVY, BRGF, etc.*
- ❖ *Also, the areas which are technically command areas but enjoy only minimal or no benefits from the irrigation system should be included in the watershed projects if they form an integral part of a watershed under consideration.*

2.4.3 Intensive strategy for Capacity Building Service Delivery

The Sub-Group recognizes the importance of capacity building support to achieve desired results in watershed development. Common Guidelines for Watershed Development Projects (2008) have already recognized the role and potential contribution of resource organisations in Government/ Voluntary sector in imparting effective capacity building to the stakeholders in IWMP. Some of the States like Andhra Pradesh, Jharkhand, Karnataka,

Uttarakhand have already formed consortia to carry forward their capacity building programmes. Such mechanisms need to be instituted in all the States so that the knowledge, know-how and experience of research bodies and NGOs can be used to the maximum.

Recommendation 11:

- ❖ *Consortium Based Capacity Building Support System: Consortium based capacity building support systems should be promoted for strengthening watershed development projects in the country. The Consortia may include Research/Academic Institutions, Voluntary Organizations, etc. The concept of Resource Support Organizations or Support Voluntary Organizations is an important part of this strategy. It is also recommended that professional courses, mainly short duration certificate courses, on watershed development projects are initiated in different parts of the country to augment the human resources supply to the watershed development projects. In this regard, reputed institutions from Government Sector/ voluntary sector/ research institutions need to be roped in for offering certificate courses (1 to 3 months) with a specific focus on watershed approaches/ technologies; rural livelihoods; rain-fed farming systems; rural institutions and management.*

2.5 The size of 12th Five Year Plan for watershed development:

During the first year of 12th Five Year Plan, the Department is expected to complete all the remaining ongoing projects of DDP, DPAP and IWDP which are approximately 3,250 in number. Budgetary requirement for accomplishing this task is Rs 288 crore.

The 12th Five Year Plan will also oversee completion of watershed projects on an area of 22.65 mHa sanctioned during the last three years of 11th Five Year Plan, assuming an average project period of five years. The budgetary requirement for this will be Rs 21,350 crore.

The Department proposes to cover an area of 25 mHa during the twelfth Five Year Plan @ 5 mHa per year. As the project period on an average is five years, these projects will be at different stages of completion during the Five Year Plan. The budgetary requirement for this will be Rs 14,722 crore.

As the proposed 12th Five Year Plan also includes taking up of a stream of pilot projects for special areas, an amount of Rs 100 crore has been included in the estimate.

Based upon these expectations the anticipated size of Twelfth Five Year Plan works out to be approximately Rs 36,460 crore at the current rates (detailed calculations in Annexure I).

Detailed cost estimates for watershed development during 12th Five Year Plan*Rs in crore*

Items of expenditure	Assumptions	Estimated Amount
Completion of all remaining pre-IWMP projects during 2012-13 (DPAP-2200, DDP-620, IWDP-430 projects-all figures are approximate)	All remaining pre-IWMP projects will be completed by 31.12.2012 (except for a small no. of projects in snowbound areas) and during this year only the last installment and in some cases last two installments of such projects will be released.	288.00*
Completion of 22.65 mHa sanctioned during the 11 th FYP	<ol style="list-style-type: none"> 1. So far an amount of Rs 1998.31 cr. has been released during 2009-10 & 2010-11 and another Rs 1721.20 cr. is expected to be released in 2011-12. These amounts are to be deducted from the total central assistance required for completion of 22.65 mHa. 2. It is assumed that 10 % of the areas are hilly & difficult that makes the average cost per Ha Rs 12,300/-@. 	21,350.00**
Sanction & Completion of 5 mHa during the 1 st year of 12 th FYP	The projects will receive all the installments during the plan itself.	5,535.00***
Sanction & implementation of 5 mHa during the 2 nd year of 12 th FYP	The projects will receive two installments amounting to 70% during the plan itself.	3,874.00 [#]
Sanction & implementation of 5 mHa during the 3 rd year of 12 th FYP	The projects will receive two installments amounting to 70% during the plan itself.	3,874.00 [#]
Sanction & implementation of 5 mHa during the 4 th year of 12 th FYP	The projects will receive 1 st installment amounting to 20% during the plan itself.	1,107.00 ^{##}
Sanction & implementation of 5 mHa during the 5 th year of 12 th FYP	The projects will receive 1 st installment amounting to 6% during the plan itself.	332.00 [^]

Items of expenditure	Assumptions	Estimated Amount
Taking up pilot projects for special areas of concern - Waterlogged areas in rain-fed areas; inland salinity areas; Himalayan hills; Ravinous areas; Blocks where groundwater is over-exploited; Areas where left wing extremism is predominant	<ol style="list-style-type: none"> 1. It is assumed that 2 pilot projects of 5,000 Ha each will be taken up in each special area of concern 2. Each project is assumed to cost on an average Rs 8.00 crore (it is Rs 6.00 crore in the normal course). The special cost norm is to take into account the specific nature of the work. The cost norm is tentative and will vary according to nature of activities. 3. Total estimated cost = 6 x 2 x Rs 8 crore = Rs 96 crore, say Rs 100 crore 	100.00
Total size of 12th FYP (sum of all the figures in last column)		36,460.00

- * Estimate of total area X Rs 6000 per Ha X 90 % Central share X 15 % installment
- @ At present, the projects under IWMP are being sanctioned @ Rs 15,000/- per Ha for hilly and difficult areas and Rs 12,000/- for other areas
- ** (22.65 mHa X Rs 12300 per Ha X 90 % central share) - amount already released & expected to be released during 11th FYP
- *** 5.0 mHa X Rs 12300 per Ha X 90 % central share
- # 5.0 mHa X Rs 12300 per Ha X 90 % central share X 70 % for first 2 installments
- # # 5.0 mHa X Rs 12300 per Ha X 90 % central share X 20 % for first installment
- ^ 5.0 mHa X Rs 12300 per Ha X 90 % central share X 6 % for first part of first installment.

NATIONAL RAIN-FED AREA AUTHORITY:***RENEWAL AND REVITALISATION***

Report of the Sub-Group¹³ on NRAA of the Working Group on Minor Irrigation & Watershed Development for the 12th Five Year Plan

3.1 Significance of Rain-Fed Areas

Rain-fed areas in India are spread over almost 200 million hectares and constitute about 62% of the total geographical area of the country. Spanning several agro-ecological regions, the rain-fed areas represent geographies with the largest concentration of poverty and backwardness. Under National Agriculture Research Project (NARP), the country was divided into 127 agro-climatic zones and 73 of these are predominantly rain-fed. Rain-fed areas can be classified into five groups on the basis of the major production systems: rice-based, cotton based, coarse cereals based, oilseeds based and pulses based. They can also be classified on the basis of access to irrigation, i.e. proportion of land in a district or block that has assured access to irrigation. The nature of the terrain, i.e. undulating, hilly or mountainous is another cut one can take in classifying. The level of rainfall and temperature could be another classification, and so on. Paying scant attention to such diversity in natural resource configuration, the key thrust in agricultural policy so far has been to indiscriminately extend the water-intensive Green Revolution technology to rain-fed areas. This has led to several catastrophic ecological consequences such as loss of soil fertility, groundwater depletion, loss of bio-diversity and increase in climate change vulnerability. At the same time, lack of inadequate support for rain-fed agriculture in terms of support price, procurement, and availability of inputs, credit, market access and agricultural research has caused widespread desperation. The most visible aspects of this desperation are farmer suicides on the one side and the rising tide of left wing extremism on the other.

It is now increasingly becoming clear that there are physical, technical and economic (in terms of efficiency of investment) limits to irrigation. In the States and districts with substantial area under irrigation, the phenomenon of yield fatigue in major food crops like rice and wheat is already visible. Moreover,

¹³ The members of the sub-group were Deep Joshi, Nivedita Banerji, Crispino Lobo, Alok Sikka, V K Madhavan. The Sub Group had four meetings in New Delhi.

groundwater now accounts for over 65% of the total irrigated area in the country and with water extraction fast exceeding withdrawal in nearly one third of the districts, a looming groundwater crisis is visible in these parts. Given the current rate of urbanisation, even 20 years later a majority of our population will continue to live in villages and a majority of them will remain largely dependent on agriculture. This means that agriculture must continue to remain an area of emphasis and policy attention; the opposite is just not conceivable. Indeed, higher investment in agriculture and in particular rain-fed agriculture can reduce the 'push' factors that drive rural families to migrate to urban areas by providing potential migrant families with the choice and opportunities to lead a life of dignity in villages. All this clearly points to the need for a shift in emphasis at the policy level in favour of rain-fed areas.

Even with the prevailing policy neglect, rain-fed agriculture contributes significantly to the national economy. Rain-fed agriculture accounts for 60% (84 mHa) of the net sown area (approximately 140 mHa) of the country. Rain-fed agriculture accounts for 48% of the area under food crops and 68% of that under non-food crops. In terms of crop groups, 77% of pulses, 66% of oilseeds and 45% of cereals are grown under rain-fed conditions. Rain-fed agriculture contributes 40% of the total food production in the country and supports 40% of human and 60% of livestock population. It also produces 87% of coarse cereals, 85% of pulses, 77% of oilseeds, 66% of cotton and 80% of mangoes and apples. Meeting the future demand for food grains (estimated at 280 million tonnes by 2020) would require a step up in the rate of growth of food production where rain-fed agriculture has to play a critical role. As estimated by the Technical Committee on Watershed Development (2006), even in the best possible scenario of irrigation development, about 40% of the additional supply of food grains needed to match future rise in demand will have to come from rain-fed agriculture. Therefore, a breakthrough in rain-fed agriculture is an imperative for poverty alleviation, livelihood promotion and food security in India.

The livelihood strategies of rural people in rain-fed areas are dependent on a mix of agriculture, livestock, fisheries, horticulture, agro-forestry and wage labour. There are also several other common features of rain-fed areas, namely,

- Rain-fed areas largely comprise of undulating, hilly and mountainous (UHM) regions and are distinctly more rural than the country as a whole.

- Virtually all the Scheduled Tribes (ST) live in rain-fed regions.
- The rain-fed regions have the highest proportion of BPL households. For example, over half the population in Orissa, Jharkhand and Chhattisgarh is BPL, with some districts over 70% BPL. Almost all of the 100 poorest districts in the country fall in the rain-fed regions.
- Crop yields in rain-fed areas are about a third of the national average and all indices of agricultural development such as fertilizer consumption, credit off-take, seed replacement, etc. are far below the national average (the national average itself is significantly depressed by the data from the large rain-fed regions).
- Seasonal migration is a significant source of income for a larger proportion of the rural population.
- The rain-fed regions are also devoid of well-developed aquifers and are often underlain with impervious substrate.
- The rain-fed regions have high micro-regional variations. Therefore, there are no standard “package of practices” that can be extended widely, but only broad approaches that may be used to develop location-specific solutions.
- There is virtually no scope for large and medium irrigation projects as these regions constitute the catchments of the major rivers and significant storage sites are all downstream.

In public policy, the low productivity of rain-fed areas has been touted as a reason to focus on irrigated areas and on expanding irrigation coverage. The whole logic of the Green Revolution was based on this strategy of “betting on the strong”. However, there is evidence, though fragmented, that with more investments in integrated natural resource management and production systems, rain-fed areas can attain significantly higher productivity. The Green Revolution was successful because of significant investments by the state in infrastructure, subsidies (electricity and fertiliser), research (agricultural universities) and provision of inputs. This public investment created opportunities and incentives for private investment in agriculture in irrigated areas. Similarly, increased public investment in rain-fed areas too has the potential to not only revitalise rain-fed agriculture and enhance farm productivity but also to spur private investments in these areas.

3.2 The Challenges of Developing Rain-Fed Areas

Given the ecological complexity of rain-fed areas and the enormous diversity that exists in rain-fed regions across the country, an integrated area development approach rather than a mere productivity enhancement

approach is essential. At the current juncture, there are seven major challenges that need to be addressed.

3.3.1 Need for a Holistic Perspective

It is important to recognise that rain-fed area development is not merely productivity enhancement, soil and water conservation or land-use diversification. Development of rain-fed areas requires a holistic perspective that seeks to regenerate natural resources to meet the goals of productivity and livelihood enhancement while taking cognisance of the ecological factors that affect the carrying capacity of the resource base. Watershed development has been one of the important vehicles for directing public investments to rain-fed areas. It was assumed that investments in creating physical assets through watershed management programmes (as was the case with irrigation) would automatically lead to productivity enhancement in agriculture and other rural livelihood systems. However, it is important to realize that “asset creation” and “agriculture/livelihood development” are not *sequential* steps in chronology but *simultaneous* investments/interventions are needed in different components. Indeed, to be effective, rain-fed area development strategies must *simultaneously* address the issues of livelihood enhancement, preventing resource degradation and triggering resources regeneration processes. In other words, interventions in rain-fed areas need to move beyond conventional watershed development strategies focused on ‘safe disposal of run-off’ and envision ‘developed watersheds’ as self-regenerating ecologies that progressively provide better and more secure livelihoods to their inhabitants. Such an approach also should recognise the crucial role of institutions for management and regeneration of the natural resource base¹⁴. It cannot be undertaken in sequential steps such as ‘watershed plus’ where interventions are first made and then the question of how best to use the rehabilitated or newly created assets is addressed¹⁵. It requires a holistic and integrated approach that

¹⁴ As a hydrological unit with a common drainage, a watershed is an ‘ecologically connected’ landscape. In other words, how one landowner manages her parcel of land has consequences for her neighbours. Therefore, shared strategies are required even if ownership is private, and institutions are needed to foster and sustain such a perspective of interconnectedness and interdependence.

¹⁵ Terracing in the Himalayas and other mountain regions in the world illustrates what is being proposed. The settlers there did not make terraces for ‘safe disposal of run-off’, for which there are other far superior alternatives; they wanted to grow crops to feed themselves, for which flat pieces of land were needed so that the twin objectives of ‘conserving/regenerating resources’ and ‘creating robust livelihoods’ could be met simultaneously. In contrast, present day watershed developers many a times build structures to impound rainwater and then begin to explore/initiate fisheries as a livelihood, often among people with no tradition of or interest in fisheries and no provision for investing in building people’s

recognises that the livelihoods of the rural poor in rain-fed areas are based on a complex interplay between humans, common and public lands, rainwater and soil, private lands and livestock. This calls for integrating natural resource regeneration goals with productivity, carrying capacity and livelihood augmentation goals.

3.3.2 Need for Convergence

There are several programmes and schemes of the ministries of Agriculture, Rural Development, Food, Environment and Forests, Small Scale Industry and Food Processing which are either focussed on or have a significant impact on rain-fed areas. The programmes and investments of each of these ministries are compartmentalised into silos, with very limited exchange between the silos. All concerned ministries and departments have their own dedicated teams and each believes that it has a unique and exclusive mandate. This departmental mode of implementation is marked by a complete absence of convergence, defined as *the pooling of resources and energy to achieve common goals*. MoRD has developed guidelines for convergence of MGNREGA with other schemes/programmes. However, despite recognition of the importance of convergence, the current mode of implementation has no effective mechanism through which convergence could be achieved. The Central Government believes that convergence is essential (and missing) at the State level and the State government would rather leave it to the district; but in effect the mechanisms or incentives to converge resources, information and competencies are completely absent.

Convergence across these programmes and departments is a matter of priority for reviving rain-fed areas. What is imperative is to create a unified mechanism of convergence amongst different agencies targeting rain-fed areas. Given the hierarchical nature of administration in government, the converging mechanism has to transcend the extant hierarchies of individual agencies.

3.3.3 Need for Larger Investments

Rain-fed areas are typified by their “development deficit”—remoteness, poor infrastructure, low water security, low productivity agriculture, widespread hunger and malnutrition. A market mechanism alone cannot overcome this development deficit. Public investment has been one of the prime movers in agricultural and rural development all over the world. The flow of public investment and public subsidies on irrigation, power, fertilizer and food has

capabilities to take up fisheries and the linkages necessary to sustain it!

been highly biased against rain-fed areas. Even though there are a number of programmes affecting rain-fed areas, their combined investment, both in per capita and per hectare terms, is abysmally low. This imbalance needs to be corrected. We need to step up public investment substantially in rain-fed areas to achieve a breakthrough and kick-start growth within a short span of time. A “big push” public investment will, in turn, leverage substantial private investment as well.

Even putting together expenditure by all departments and ministries, the average public spending on rain-fed areas has been considerably lower than that in irrigated areas. As said before, watershed programme has been a major vehicle of channeling investments into rain-fed areas. Till March 2011, a total of 71.58 mHa has been ‘treated’ through watershed programmes run by various ministries, with an investment of Rs 31,964.57 crore. Over 15 years since 1995 (when the watershed programme got a real boost), the average expenditure works out to Rs 2,130 crore per annum and about Rs 4,500 per hectare of treated area. This amount is about one-tenth of the estimated requirement of Rs 40,000 to Rs 50,000 per hectare for rain-fed areas. Such investments are woefully inadequate to meet even the classical watershed development goals of treating rain-fed areas for ‘safe disposal of run-off’ let alone bringing about a breakthrough in their production and productivity levels.

3.3.4 Need to Develop Scalable Models

The preoccupation with irrigation-aided green revolution technologies, absence of a holistic perspective and the segmented departmental mode of implementation have resulted in rain-fed area interventions being reduced to technical exercises aimed at achieving limited soil and water conservation goals. Although there have been many innovations and a number of technologies have been developed and applied at micro scale, there are no large scale models available that demonstrate the potential of rain-fed areas and the elements of an integrated natural resource management approach necessary to realise such potential. At present, there is no mechanism to harness and build on micro-level successes demonstrated in the field by farmers, community institutions, small enterprises or the voluntary sector. Research institutions largely remain focused on technologies and have not been able to collaborate with these living laboratories and consolidate and build on their learnings to generate viable approaches and strategies for the development of rain-fed areas.

What is required is to generate large scale and field-based evidence on the effectiveness of an integrated rain-fed area package by putting together available experiences across rain-fed typologies on various themes such as water, soil fertility, seeds, inputs, land use, livestock, marketing, credit, people's institutions, etc. We need to show the "proof of concept" and the potential of rain-fed areas to stimulate economic growth and foster sustainable livelihoods so that larger programmes may be systematically taken up. In the absence of such models, the rain-fed area interventions will continue to remain in the nature of a "holding operation"—inadequate, scattered, invisible, largely technical and in the final analysis, unconvincing from a policy perspective of sustainable growth, poverty alleviation and livelihood creation.

3.3.5 Need to Improve Research & Information Dissemination

Despite a nation-wide network of research institutions and universities, experience, know-how, information and research on rain-fed areas remains fragmented. There is no platform to share these, access the information or to build models for collaboration around the experiences and know-how in an on-going way. We need to develop platforms for learning and synthesising rain-fed area experiences in different agro-ecological regions of the country so that the evolving experience is captured, validated, codified and made available for dissemination to a wider constituency of practitioners. In addition, we also need to develop mechanisms and incentive systems for dissemination of such information. The current public extension system is deeply rooted in input-intensive and high cost green revolution paradigm and is often unable to provide useful answers for problems in rain-fed areas. For instance, rain-fed agriculture is vulnerable to high climatic risks. Seed technologies and systems have to be oriented towards meeting shortages on account of this risk by ensuring adequate and timely availability of a second batch of seeds for repeat sowing if the first sowing fails due to delays and variations in rainfall. In cases of prolonged dry spells, the local seed systems must be capable of providing seeds of contingency or alternative crops by establishing seed banks. There is also the need for more research and extension support to rain-fed agriculture for increased adoption of productivity-enhancing, cost-minimising, risk-mitigating and eco-friendly agricultural practices like IPM, NPM and SRI. Nation-wide support for such knowledge-intensive (as opposed to input-intensive) alternatives, which have demonstrated their potential in rain-fed areas is still missing.

3.3.6 Need to Enhance Human Resource Capacity

One of the key weaknesses of rural development planning and practice in India has been the failure to build/deploy adequate human resource capacities at the cutting-edge of implementation. Even the best conceived programmes, therefore, fail to achieve desired results because they could not deploy human resources suited to and necessary for the task at hand. As a result, the “additional charge syndrome”—the piling of responsibilities on existing government employees with every new scheme—is found in almost every rural development programme, especially at the level of lower bureaucracy and now the PRIs. Also, the focus of the development machinery remains oriented to transfer/deployment of standard technologies and administration of schemes handed down from the top. The development of rain-fed areas requires high level of social mobilisation, participatory planning, generating location-specific solutions, bringing about convergence and facilitating implementation by PRIs and other people’s organisations. These require human effort of a high quality, especially with respect to social skills, developing context-specific alternatives to raise carrying capacity and productivity of resources, enhance livelihoods, monitoring and careful documentation of impacts. Deployment of adequate human resources and continued efforts to keep honing and upgrading their capabilities is thus critical to ensure support to PRIs and other decentralised systems of rural governance and to facilitate better implementation.

3.3.7 Need to Strengthen the Implementation Structure

Since agriculture is a State subject, beyond defining the broad contours of a programme and allocating investments, a fair degree of flexibility is left to the States. There is no clear strategy on involvement of PRIs in development of rain-fed areas. The emphasis on production systems has led to agriculture being perceived as a private activity/ investment of individual farmers. Given the need for an integrated approach for the development of rain-fed areas, a clear strategy for involvement of PRIs is needed given the role they need to play at the local level in the regulation and management of the commons, such as ground water, surface water bodies, forests and pastures. Further, there is no systematic involvement of Voluntary Organisations in spite of the fact that in several parts of the country they have demonstrated, on a micro-level, promising integrated natural resource management and area development approaches. Although Common Guidelines for Watershed Management Projects (2008) call for the involvement of PRIs and the Voluntary Sector, a cohesive strategy to involve them can facilitate better implementation as well as innovation.

3.3 NRAA: The Mandate & Performance

An announcement made by the Honourable Prime Minister from the ramparts of the Red Fort on the 15th of August 2005, followed by a cabinet decision led to the formation of the National Rain-fed Area Authority (NRAA) on the 3rd of November 2006 as an inter-ministerial body in the Department of Agriculture and Cooperation, Ministry of Agriculture.

The NRAA was set up to address the problems of rain-fed areas and for sustainable development of such areas and was envisaged as an expert body to provide inputs regarding the systemic up-gradation and management of the country's rain-fed areas. It was expected to serve as an advisory, policy making and monitoring body entrusted with the role of examining guidelines in various existing schemes, in the formation of new schemes and to support efforts to bring about convergence and synergy among the numerous ongoing programmes and to advise, guide and monitor their progress. The NRAA was to focus on issues relating to landless and marginal farmers and to cover all aspects of sustainable and holistic development of rain-fed areas. All Central Government Ministries and Departments were to implement their programmes in consultation with the NRAA.

3.3.1 NRAA: The Mandate

As per the Government Notification¹⁶, the NRAA has a highly ambitious mandate:

"The National Rain-fed Area Authority (NRAA) shall be an Advisory, Policy Making and Monitoring Body charged with the role of examining guidelines in various existing schemes and in the formation of new schemes including all externally aided projects in the rain-fed areas.

The National Rain-fed Area Authority (NRAA) shall bring about convergence and synergy among the numerous ongoing programmes and shall advise, guide and monitor their progress.

The National Rain-fed Area Authority (NRAA) shall cover all aspects of sustainable and holistic development of rain-fed areas including appropriate farming and livelihood system approaches."

The role of the NRAA is visualised as follows (emphasis added):

¹⁶ Order of the Ministry of Agriculture, Department of Agriculture and Cooperation of the 3rd November 2006 (F.No.9-2/2005-RFD-IV)

- (i) "To prepare a **perspective plan**, outlining the **national strategy and road map** for holistic and sustainable development of rain-fed farming areas.
- (ii) To evolve **common guidelines** for all schemes of different Ministries including Externally Aided Projects (EAPs) for development of Rain-fed/ Dry land Farming Systems.
- (iii) To **coordinate** and bring **convergence** within and among agricultural and wasteland development programmes being implemented in rain-fed areas of the country.
- (iv) To identify rain-fed **areas** in different States which need **priority attention** and prepare watershed development programmes for integrated natural resource management, in consultation with States, focusing on multi-dimensional crop, livestock, horticulture, agri-pasture integrated systems and programmes for landless farming communities.
- (v) To identify **gaps** in input supply, credit availability, dissemination of appropriate technology and other requirements relevant for development of rain-fed areas.
- (vi) To guide the implementing agencies on **priority setting** and monitor the specific interventions required.
- (vii) To develop plans/ programmes for **capacity building** of Centre/ State Government functionaries in rain-fed areas.
- (viii) To suggest **modalities** to strengthen National and State Level Institutions concerned with Rain-fed /Dryland areas, and establish **institutional linkages** with prioritized watersheds.
- (ix) To monitor **disbursement** of rural credit/ insurance cover/ safety net programmes developed for rain-fed areas.
- (x) To set the **research agenda** including a critical appraisal of on-going programmes and promote diffusion of required knowledge for integrated farming in rain-fed areas to district and lower level authorities.
- (xi) To **evaluate** the effectiveness of completed watersheds and concurrent evaluation of on-going programme"

The NRAA was to be located and serviced by the Ministry of Agriculture. Its Governing Board was to be chaired by the Minister of Agriculture with the Minister of Rural Development as the co-chair, the Ministers from Environment & Forests and Water Resources, the Member, Agriculture Planning

Commission, seven senior representatives of Government or its institutions, a representative of a farmers' organisation as members and the Chief Executive Officer of the NRAA as the member-secretary.

3.3.2 NRAA: The First Five Years

The NRAA was initially located in the Ministry of Agriculture but later shifted to the Planning Commission. Its vision statement says that the NRAA “shall be an **advisory, policy making and monitoring body** charged with the role of examining guidelines in various existing schemes and in the formation of new schemes, including all externally aided projects in the rain-fed areas”. It is visualized that the NRAA shall bring about **convergence and synergy** among the numerous ongoing programmes and **shall advise, guide and monitor** their progress. In other words, the NRAA was to cover all aspects of sustainable and holistic development of rain-fed areas, including appropriate farming and livelihood system approaches.

The achievements of the NRAA were presented in a note provided by the NRAA to the working group entitled “Background Note and Performance of NRAA”. The Note suggests that despite severe limitations NRAA was able to meet some of the expectations from it.

The significant highlights of NRAA’s institutional journey are as follows:

1. The NRAA became operational in May 2007 with the appointment of a CEO (in the rank of Secretary to the Government of India). Out of a total of five technical experts (in the rank of Additional Secretary to GOI), four joined in 2007 and 2008 and the fifth in 2010. One of these technical experts has subsequently left to take up a (parent) cadre position.
2. In the first meeting of the Governing Board of NRAA, it was decided that 25 staff would be deployed in the NRAA from the Ministries of Agriculture and Rural Development. Only 7 staff have been provided against the 25 approved posts or just over a quarter of its requirement and allocation.
3. The NRAA was relocated from the Ministry of Agriculture to the Planning Commission in August 2010 ostensibly in consideration of its role as an inter-ministerial body.
4. Between 2007 and 2011 the budgetary allocation (revised estimates) was Rs 29.76 crore against which Rs 23.74 crore were utilised.

5. NRAA's major achievements include:
 - a. Preparation of the Vision 2025 document;
 - b. Preparation of Common Guidelines for Watershed Development;
 - c. Design of a format for preparation of State specific perspective plans for rain-fed areas and watershed development and DPR (circulated to the states);
 - d. Capacity building and commissioning of three pilot projects;
 - e. Policy paper on water-food-energy, based on which Gol has formulated the scheme for bringing green revolution in eastern India;
 - f. Preparation of a Mini DPR for simultaneous treatment of fringe forest and adjoining non-forestlands for conservation of water, bio-diversity, sustainability of JFM and poverty alleviation for the Ministry of Environment & Forests;
 - g. Assistance to the Department for Agriculture and Cooperation in monitoring and reviewing the drought situation in States;
 - h. Formulation of the Bundelkhand package and providing technical support in its implementation.

3.3.3 Restructuring NRAA

While the NRAA has undertaken a number of useful studies in its short tenure, it is yet to play the kind of overarching role of envisioning and guiding programmes for the development of rain-fed areas that was visualised at its inception. Part of the difficulty is administrative, as it has not had full co-operation from implementing ministries: it is axiomatic that an "advisory body", as the preamble to the Government Order to set up NRAA states, sans any executive or budgetary authority, has little control over what becomes of its advice or whether its advice is ever sought. But in equal measure the difficulty arose from the human resource profile of the NRAA which, although multi-disciplinary, does not have the full complement of the disciplines and has so far been unable to rise to the expectations of giving intellectual leadership demanded by an ambitious, inter-sectoral and inter-disciplinary program to be implemented in rain-fed areas.

It is the considered view of this sub-group that to limit the role of NRAA to "advise, make policies and monitor programmes" for rain-fed areas is grossly sub-optimal given the critical need for public investment and attention to rain-fed areas; and it is indeed a waste, given the fact that "advice" could be obtained from the myriad knowledge institutions, including the ICAR network and policy making—fragmented though it is—and programme

monitoring is in any case in the domain of various Ministries and the Planning Commission. In other words, if the mandate of NRAA is to be confined to giving advice and making policy, **it would be preferable to wind it up.**

The sub-group considers that today, even more than six years ago, **the need for an institution such as the NRAA is critical.** Therefore, we must persist with this institution but with a renewed mandate and thrust, an appropriate governance structure and a short- and long-term action plan backed with adequate financial and human resources at all levels to realise its vision. The NRAA is an **extremely under-resourced organisation.** In the 12th Plan it needs a major increase in budget that would enable it to hire the necessary human resources to perform its vast mandate. This includes *inter alia* experts in social mobilisation, institution building, gender and conflict resolution, rural management, SHGs, livelihoods, rural technology, IT, hydrology, hydrogeology and people with experience in implementing INRM programmes, apart from the existing expertise on agriculture and forestry. Civil society representatives should also form part of the governance structure of NRAA to provide a perspective, expertise and experience from the grassroots. The NRAA also needs to be provided professional autonomy in its functioning.

Moreover, the NRAA needs to have offices and teams of multi-disciplinary experts in each rain-fed region of the country (East, North East, South, West, Central and North) so that they can play a more hands-on role while PIAs are preparing their DPRs, as also during the period of implementation.

It is to be hoped that the relocation of the NRAA in the Planning Commission would enable it to attain the requisite authority for it to be able to play its critical role.

3.3.4 The Desired Mandate for NRAA

In the view of this group, **the primary role of the NRAA should be to facilitate convergence and an integrated natural resource management approach, combining rain-fed farming systems and livelihood opportunities for the development of rain-fed areas.** In other words, to facilitate integration of programmes across ministries in a unified development strategy that can be implemented at the State and district level.

However, we must be careful to highlight what NRAA **should not do.** The NRAA was and is **not being visualised as either an implementing agency or an agency for disbursement of funds.** As can be seen above, its mandate is already vast and the institution, as currently resourced, is finding itself unable

to play all the mandated roles effectively. What is needed is to strengthen NRAA so that it can play its mandated role effectively by being provided much greater human resource support both at the Centre and in the States. Given its inter-ministerial mandate, the NRAA is being visualised as an independent agency that can help States in developing strategies for convergence and integration and support implementation at the field level by bringing forth resources—financial, technical and knowledge—from across programmes/schemes and specialised institutions.

3.4 Recommendations for the 12th Five Year plan

3.4.1 Facilitate Development of Rain-fed Areas Through Convergence

The development of rain-fed areas is not merely about the development of agriculture. Survival in rain-fed regions requires a patchwork of multiple livelihood strategies, including agriculture, horticulture, animal-husbandry, fisheries, use of the commons, gathering of non-timber forest produce and wage labour. These depend on a complex interplay of nature's elements and human intervention. Therefore, developing rain-fed regions must include strategies that simultaneously work on these various themes to enhance livelihoods and to set in motion regenerative processes so that the carrying capacity is continually enhanced. As earlier pointed out, while there are many promising examples that demonstrate the way forward for the development of rain-fed areas, these tend to be micro-experiments; there is yet no experience on a large canvass to demonstrate viable approaches and strategies that could be scaled out. There is no objective basis for unit costs, for example, in watershed development. Similarly, while it is broadly understood that interventions would vary across agro-ecological regions, the precise contours of needed packages are not known. There is, similarly, no large-scale experience of systematic convergence of various schemes for the development of rain-fed areas. It is therefore proposed that in the next five years **large landscape level pilots be initiated, at least one in each agro-ecological region or typologies of rain-fed areas. Each pilot should be of the size of at least 10,000 Ha and a maximum of 25,000 Ha. We propose 15 such pilots, with total area of 225,000 Ha.** The objectives of each pilot will be to demonstrate the integrated development of rain-fed areas through systematic convergence of resources—financial and technical—across Ministries. The primary responsibility to oversee the implementation will lie with State Governments. Within each State these pilots will be implemented by PRIs and in partnership with organisations from the Voluntary Sector. Pilots may be taken up in a Mission Mode, covering specified number of high

priority/potential districts in the selected regions. The districts could be identified based on the findings of a study sponsored by NRAA for prioritization of rain-fed areas, through CRIDA and IASRI, and by combining these studies with other criteria like poverty, high seasonal migration and spread of left wing extremism to rank the blocks most in need of intervention.

In each pilot, schemes and programmes from Ministries of Rural Development (MGNREGA, IWMP and NRLM), Agriculture (RKVY, RADP, NHM, Micro Irrigation, NMSA), Water Resources (Aquifer based planning and micro & small scale irrigation), Environment and Forests (Green India Mission) and Panchayati Raj will be converged as a consequence of a participatory planning exercise to be undertaken at the level of each Gram Panchayat. Each of the Pilots will cover development of land and water resources (including private land), production systems, inputs, market access and marketing, institutions and governance, sustainable use, regeneration and management of commons, aquifer based planning for sustainable ground-water use, management and regeneration, institutional development/strengthening, planning and skill building.

The primary roles of various agencies will be as follows:

- **NRAA:** To conceptualise pilots, facilitate convergence of resources from various schemes in liaison with concerned Ministries/Departments including provision for gap filling through untied funds at the disposal of NRAA, select Voluntary Organisations in consultation with State Governments, facilitate the planning process by assisting State Governments, District Administration and Voluntary Organisations, bring together technical resources and personnel for support and capacity building from other governmental institutions and other States, create a template for unified reporting of the experiences by State Governments that can meet the requirements of each Ministry, and document the experiences, and to create a platform at the national level to enable sharing of experiences across Voluntary Organisations, State Governments and Ministries.
- **PRIs:** Participatory planning, implementation of plans and monitoring of progress.
- **Civil Society Organisations:** Community mobilisation, facilitation of planning and technical support in creation of plans, technical support during implementation, formation and support to collectives of small

and marginal farmers and women and other village level institutions and monitoring of impact and reporting.

- **District Administration:** Review of plans and processes, support to implementing agencies and facilitating agency and disbursement of funds to PRIs.
- **State Governments:** Approval, review and monitoring of each landscape level pilot, integration of resources from multiple schemes and requisition for and disbursal of funds to District Administration and Voluntary sector partners, liaison with NRAA and Ministries and creation of a policy platform for sharing of experiences and for support.

3.4.2 Research, Influencing Policy & Setting Priority

The NRAA will support research that may be undertaken by other government, private or independent research institutions to strengthen the knowledge base regarding rain-fed areas—issues, challenges and opportunities. Further, by virtue of being an inter-ministerial body, NRAA will seek to inform policies with regard to rain-fed areas in Ministries and the Planning Commission and will assist in priority setting. It will provide and facilitate technical support to the implementing agencies to ensure that the new and innovative elements in the new Common Guidelines form an integral part of these DPRs, which is presently not happening.

3.4.3 Clearing House for Information Regarding Rain-fed Areas

The NRAA will collect information and experiences pertinent to rain-fed areas from across research and technical institutions (government and private) and will facilitate access to this information, sharing and dissemination of this information including through the use of modern technological tools and social media. It would become the nodal agency for partnerships among research institutions such as CRIDA, CAZRI, ICRISAT, IGFRI, implementing agencies, civil society organisations working in the field and universities, while providing intellectual leadership to the research agenda for rain-fed areas. It will act as the store-house of technical information, expertise and best practices in rain-fed areas, including a user-friendly, interactive website.

3.4.4 Develop & Roll Out a Capacity Building Strategy

The NRAA will develop and roll-out a capacity building strategy for all stakeholders—government, both central and state, community based institutions, private sector and the Voluntary Sector—in the development of rain-fed areas. It will develop national capacity building strategy based on

the SVO model involving partnerships with all relevant institutions, including CAPART, WALMIs, CSWCRTI, NIRD, SIRDs and leading NGOs described in the Common Guidelines for IWMP. The key themes covered in the capacity building strategy will be participatory planning for integrated natural resource management for the development of rain-fed areas, community mobilisation, integrated livelihood planning and building and strengthening people's institutions.

3.4.5 Creation of State Level Perspective Plans for 2025

NRAA will provide technical support to State Governments to facilitate creation of perspective plans for the development of rain-fed areas. NRAA will also provide support to Ministries based on their need as and when required. It will ensure integration of the "groundwater perspective" as well as water use management, into watershed and other programmes for rain-fed areas. NRAA's mandate should not include regular physical and financial performance monitoring of independent programmes of ministries since this is a task they are required to undertake, but should monitor processes and programmes only where an integrated impact across multiple schemes/programmes is being attempted.

3.4.6 Need Based Support to Ministries

Regular monitoring of progress and performance of projects including physical and financial monitoring is very much the task of Ministries/ Departments. Nevertheless, NRAA is mandated to carry out overall scheme/ programme level monitoring and evaluation and monitoring of processes to evaluate their effectiveness, impact and strengths and weakness so as to identify and document experiences and lessons for future guidance, and for enabling Ministries/Departments and areas/sectors to enhance efficiency of schemes/programmes for the development of rain-fed areas.

3.5 The Organisation Structure of NRAA

The NRAA in the first four years of its existence has suffered as a consequence of four major reasons:

- Weak strategic positioning akin to a minor department in the Planning Commission;
- Excessive emphasis on its advisory and policy making role, reflected in its staffing pattern with a top-heavy technical team;
- Absence of support mechanisms to facilitate convergence; and
- No presence in the field.

In light of the focus on facilitating convergence and the activities envisaged to be undertaken by the NRAA during the 12th Five Year Plan the following key recommendations with regard to its governance and organisation structure are being made.

3.5.1 Restructuring Governance

For the NRAA to function as an inter-ministerial body mandated to facilitate convergence across ministries, its governance structure must possess the gravitas to support the role. The Governing Board of the NRAA must be reconstituted with the Deputy Chairperson of the Planning Commission as chair with Ministers of Rural Development and Agriculture as co-Chairs. The Board should be expanded to include representatives from State Governments (by rotation) and the Voluntary Sector.

3.5.2 Location and Status

The NRAA must remain embedded in the Planning Commission for operational reasons but the Chief Executive must report to the Deputy Chairperson of the Planning Commission and the office be provided with the requisite administrative and financial freedom as well as resources to operate as an independent body.

3.5.3 Leadership

The Chief Executive of the NRAA be designated as a Principal Secretary to the Government of India and be hired from the open market through a search committee for a five year term. The composition of NRAA personnel must reflect the competencies required for the development of rain-fed areas through an integrated natural resource management approach. In other words, the team must consist not merely of subject matter specialists but managers with the ability to work with diverse teams, as well as specialists. The emphasis should be on field-experience in implementation, community mobilisation, institution building and strengthening and livelihoods promotion.

3.5.4 Staffing Pattern

One of the major limitations of NRAA has been its staffing pattern. The small technical team was top-heavy. It is recommended that the NRAA should have four teams with the following focus areas at the central level:

- a. Planning and Convergence
- b. Capacity Building
- c. Monitoring and Evaluation
- d. Knowledgebase (IT systems, database, MIS and research).

In consonance with the new vision of NRAA with facilitating convergence as the key mandate, the team should be diversified away from technical experts to include people with significant experience of grass-roots work in relevant disciplines. The search committee should select such experienced persons from the open market through a transparent search and screening process.

In the Planning and Convergence division, in addition to the CEO, there will be a nine member multi-disciplinary team of experienced specialists, one each from the disciplines of agriculture, forestry, animal husbandry, horticulture, soil science and water resources; and one practitioner each in the field of livelihood generation, institution building and gender.

The Capacity Building division will have three persons with experience in grass-roots capacity building of implementation teams and PRIs.

The Monitoring and Evaluation division will have one dedicated specialist in charge of each of the decentralized units to ensure process monitoring of convergence, implementation, institution building, social and economic impact and the finances.

Finally, the Knowledge Base division will have three specialists, each with an oversight function of research, database management and MIS, respectively. Each of these professionals will be supported by a team of two assistants and administrative staff.

The NRAA will establish regional offices in key rain-fed farming typologies or States that will have their own dedicated multi-disciplinary teams that can support State governments. The Regional Director of each such unit will be drawn for a five year term from the open market and be of the rank of Principal Secretary in a State Government. In addition, there will be a 12 member team of Co-ordinators to assist the Regional Director comprising specialist/experienced persons with knowledge of grass-roots level work. This team will be in charge of Planning and Convergence at the State/ typology level. Each of the other three central level divisions (Capacity Building, Monitoring and Evaluation and Knowledge base) will be represented by a Regional Co-ordinator at the regional office. The regional office will have its own team of administrative personnel to support the Regional Co-ordinators and the Regional Director.

The financial implication of this proposed staffing pattern is given in Section F.

3.5.5 State Level Convergence Mechanism

At the State level a common body should be created to take decisions with regard to IWMP, MGNREGA, RADP, NRLM, etc. This common body with the support of NRAA will be responsible for ensuring convergence of resources and efforts within the State. This body should be chaired by the Chief Secretary of the State.

3.5.6 District Level Body

A Programme Director District Development with similar seniority to the DM/DC will be located in each district (or CEO of Zilla Parishad where active and empowered ZP's exist) and will be chair of a committee that oversees all developmental efforts in the district using funds from Central Government.

3.6 Financial Resources for the 12th Five year plan

3.6.1 Apex Level

	Recurring Costs	Number	Rs per Month	Annual Expenditure Rs Lakh	12th Plan 2012 – 2016 (with 5% annual increase) Rs Lakh
A	Salaries of Professionals				
A.1	Planning and Convergence				
	Chief Executive Officer (CEO)	1	1.5	18	99.5
	Resource Persons (Senior Level)	9	1.4	151.2	835.5
	Resource Persons (Junior Level)	18	0.75	162	895.2
A.2	Capacity Building				
	Resource Persons (Senior Level)	3	1.4	50.4	278.5
	Resource Persons (Junior Level)	6	0.75	54	298.4
A.3	Monitoring and Evaluation				
	Resource Persons (Senior Level)	6	1.4	100.8	557.0
	Resource Persons (Junior Level)	12	0.75	108	596.8
A.4	Knowledge and Research				
	Senior Resource Persons (One Each for Research, Database and MIS)	3	1.4	50.4	278.5
	Resource Persons (Junior Level)	6	0.75	54	298.4
	Sub-Total Salaries of Professionals	64			4137.6

WORKING GROUP: MINOR IRRIGATION AND WATERSHED MANAGEMENT

	Recurring Costs	Number	Rs per Month	Annual Expenditure Rs Lakh	12th Plan 2012 – 2016 (with 5% annual increase) Rs Lakh
B	Salaries of Support Staff				
	Senior Accountant	2	0.75	18	99.5
	Junior Accountant	8	0.53	50.88	281.1
	Data Entry Operators	8	0.2	19.2	106.1
	Office Assistants	12	0.25	36	198.9
	Drivers	8	0.18	17.28	95.5
	Security Guards	2	0.18	4.32	23.9
	Peons	8	0.12	11.52	63.7
	Sub-Total Support Staff	48			868.6
C	Travel				
C.1.	Local Travel			100.1	553.3
C.2.	Domestic Travel			24	132.6
	Foreign Travel			5	27.6
	Sub-Total Travel				713.5
D	Administrative Expenses				
	Office Rent	1	3.34	40.08	221.5
	Other Administrative Expenses	1	8.3	99.6	550.4
	Sub-Total Administrative Expenses				771.8
	OTHER APEX LEVEL COSTS				
	Non Recurring				
E	Advertising and Publicity			5	27.6
F	Workshops, Conferences and Policy Advocacy			12	66.3

WORKING GROUP: MINOR IRRIGATION AND WATERSHED MANAGEMENT

	Recurring Costs	Number	Rs per Month	Annual Expenditure Rs Lakh	12th Plan 2012 – 2016 (with 5% annual increase) Rs Lakh
G	Database Development and Management			4	22.1
H	Development of Interactive Website			3	16.6
I	Gap Filling For 15 Pilots of 15000 Ha @ Rs 10000 per ha				22500
	Total APEX Level (A+B+C+D+E+F+G+H+I)				29124.2

3.6.2 Regional Level

	Recurring Costs	Number	Rs per Month	Annual Expenditure (Rs lakh)	12th Plan Amount 2012 – 2016 (Rs lakh) with 5% annual increase
A	Salaries of Professionals				
	Regional Director	1	1.15	13.8	76.3
	Regional Co-ordinators (Senior Level)	9	0.75	81	447.6
	Regional Co-ordinators (Junior Level)	18	0.6	129.6	716.1
	Sub-Total Salaries of Professionals				1240.0
B	Salaries of Support Staff				
	Senior Accountant	1	0.6	7.2	39.8
	Junior Accountant	1	0.4	4.8	26.5
	Data Entry Operators	6	0.2	14.4	79.6
	Office Assistants	10	0.25	30	165.8
	Drivers	5	0.15	9	49.7
	Security Guards	2	0.1	2.4	13.3
	Peon	5	0.1	6	33.2
	Sub-Total Support Staff				407.8
C	Travel Expenses			33.0	182.1
D	Administrative Expenses				
	Office Rent	1	1.5	18	99.5
	Other Administrative Expenses	1	2	24	132.6
	Sub-Total Administrative Expenses				232.1
	Non Recurring Costs				
E	Workshops, Conferences and Policy Advocacy with State/Regional Governments	2	1	24	132.6
	Total per Region (A+B+C+D+E)				2194.5

WORKING GROUP: MINOR IRRIGATION AND WATERSHED MANAGEMENT

	Recurring Costs	Number	Rs per Month	Annual Expenditure (Rs lakh)	12th Plan Amount 2012 – 2016 (Rs lakh) with 5% annual increase
	Number of Regions				6
	Total REGIONAL Level				13167.2

3.6.3 Consolidated Apex and Regional Level

		APEX LEVEL	REGIONAL LEVEL	TOTAL	% of Total Cost
A	Salaries of Professionals	4137.6	7439.7	11577.3	27.4%
B	Salaries of Support Staff	868.6	2446.7	3315.4	7.8%
C	Travel	713.5	1092.6	1806.1	4.3%
D	Administrative Expenses	771.8	1392.5	2164.3	5.1%
E	Advertising and Publicity	27.6	0.0	27.6	0.1%
F	Workshops, Conferences and Policy Advocacy	66.3	795.7	862.0	2.0%
G	Database Development and Management	22.1	0.0	22.1	0.1%
H	Development of Interactive Website	16.6	0.0	16.6	0.0%
I	Gap Filling For 15 Pilots	22500.0	0.0	22500.0	53.2%
	TOTAL AMOUNT (RS. lakh)	29124.2	13167.2	42291.3	100%

CHAPTER- IV MINOR IRRIGATION

4.1 Introduction

India's total available and usable water resources are estimated at 1,122 billion cubic meter (bcm), of which 690 bcm are from surface water and 432 bcm from groundwater. Against the available usable resources, 629 bcm are currently utilized for various purposes. Irrigation sector's share of 524 BCM, alone accounts for more than 80% of the usable water resources and this requirement would only rise in coming years for increasing crop production to achieve food security. The incremental production would require concerted efforts towards improving cropping intensity, enhancing the crop yield per hectare in irrigated area and creating new potential in rain-fed areas.

The ultimate irrigation potential (UIP) comprising of major, medium and minor irrigation sectors is estimated at 139.95 mHa, of which minor irrigation potential at 81.43 mHa (17.38 mHa surface water, and 64.05 mHa ground water) accounts for 58.2% of the total available irrigation potential. About 74% of the UIP had been harnessed till X FYP. The share of groundwater accounts 45% of the total irrigation potential developed so far in the country. By the end of XI FYP, it is estimated that minor irrigation potential of 64.92 mHa (15.31 mHa surface water and 49.61 mHa groundwater) would be cumulatively created. Thus minor irrigation, in general and groundwater in particular, has been playing a very important role in creation of overall irrigation potential in the country and the term Minor Irrigation is misleading.

All surface and ground water schemes with cultivable command area up to 2,000 Ha are classified as Minor Irrigation schemes. These include *inter alia*, *kuhals*, tanks with surplus weirs, canals and sluices, diversion weirs (anicut), lift irrigation schemes and sub-surface water schemes viz. dug wells, tube-wells, farm ponds, check dams, khadins, snow harvesting structures, etc. In many States/ regions minor irrigation schemes serve more than 60% of total irrigated agriculture. The Minor Irrigation sector is spread over the entire country particularly in its rural environment. It provides inclusiveness.

In general, Minor Irrigation is a part of the Water Resources Department in the states and Union Territories, although in some of the States, separate minor irrigation department has been established. However, in smaller States, particularly in the North East, minor irrigation sector is attached with the Public Works Department/Agricultural department or other department. Depending upon the size of the budget and administrative convenience of the State, the

structure of minor irrigation department and its functions are different from State to State. In most of the States where minor irrigation is part of the Water Resources organization, it is headed by a Chief Engineer for the entire State.

Minor Irrigation schemes, in general, are formulated, planned, investigated and implemented by the farmers, NGOs, Panchayats, State Governments and Union Territories. Minor irrigation schemes have very short gestation period, produce quick outcomes and should be accorded priority in investment decisions. The Government of India provides financial support which is catalytic and promotional in nature. As per the present guidelines, States do not require clearance of Government India for Minor Irrigation projects. Significant development and funding take place in private sector, i.e. by farmers, industries and NGOs. This is particularly relevant to groundwater schemes, while surface water schemes are by and large public-funded i.e. State and Central Government.

Various Ministries at the Centre and different departments of State Governments function in different ways for development of this Sector. Besides Ministry of Water Resources, minor irrigation projects are also financed by the Ministries of Agriculture, Rural Development and Tribal Welfare and also by the Planning Commission through various programmes. The broad objectives of such programmes related to minor irrigation are development of small sources of water storage and distribution for agriculture. A few States such as Bihar, Uttar Pradesh, Andhra Pradesh, Karnataka and West Bengal are also implementing schemes of development of groundwater for irrigation with a component of subsidy / loan available to farmers. Similarly, NABARD and State Cooperative Agriculture and Rural Development Banks (SCARDBs) have been playing an important role in credit disbursement for minor irrigation development in the country.

To achieve food security in coming years, it is important not only to create additional irrigation potential but also to bridge gap between potential created and utilized. There is need to give emphasis to sustainable groundwater irrigation development, adopting water conservation practices, using efficient technologies, reviving dysfunctional groundwater schemes, conjunctive use of surface water and ground water, artificial recharge of ground water, reviving traditional water conservation structures, rain water harvesting, bringing in surface minor scheme as part of major irrigation schemes for regular availability of water and treatment of the watersheds to minimise rainwater run-off in various parts of the country.

4.2 Minor Irrigation Development Scenario

The 1st Plan started in 1951 with an irrigation potential of only 22.60 mHa of which contribution of Minor Irrigation was 12.90 mHa i.e. 57% (surface water 6.40 mHa and Groundwater 6.50 Mha). From then onwards over successive plan periods, irrigation potential increased steadily in surface water schemes. If VI Plan is taken as the mid-level to assess the complete plan-wise development for the six decades till the end of XI Plan, it is observed that, at the start of VI Plan (in 1980), irrigation potential created in surface water (MI) was 8.00 mHa and groundwater 22.00 mHa respectively. There was reportedly no potential gap between creation and utilization till that period. The total potential created at (30 Mha) in 1980 points that the growth was modest, more so, for surface water schemes. The momentum picked up in irrigation potential created after 1980 was particularly by groundwater schemes which were popularly adopted due to rural electrification and green revolution technologies. The growth is apparently plateauing in VIII, IX and X Plan performances. For the minor irrigation scenario as a whole, the potential created by the end of X Plan is 60.10 mHa and the potential utilized at 52.42 mHa only. However, with access to new technologies in drilling, pump sets and irrigation systems, noticeable acceleration in irrigation potential created was observed in groundwater sector. Irrigation potential created and utilised in groundwater sector played a vital role giving a boost to the food production and socio-economic status of farmers in various parts of the country.

On the financial front, unit cost of irrigation potential created in minor irrigation sector especially in groundwater remain low compared to major, medium & minor surface irrigation projects. The expenditure incurred in minor irrigation sector during 1st Plan was Rs 65.6 crore, about 14.84% of the total plan outlay of Rs 441.8 crore in irrigation sector. The Plan investment steadily increased up to Rs 8,634.99 crore during IX Plan and further onto **Rs 14,140.70 crore** during X Plan. Salient details of the growth in surface and groundwater potential and investments made over different Plan periods till XI Plan are given in Table 2.1.

Though Plan investments increased steadily in water sector in Major, Medium and Minor surface Irrigation in successive plans, however focus on investments by the central & state governments in groundwater irrigation sector remain meager (up to the extent of giving subsidy / loans) leaving largely responsibility of the private sector. It is pertinent to state that majority of investments made in groundwater sector in irrigation was by the farmers themselves and was not suitably projected as part of investments in irrigation

sector. A major credit of achieving self reliance in food production of the country goes to farmers' investments in groundwater sector.

Table 4.2.1: Minor Irrigation development during Plan Periods (Physical & Financial)

Five Year Plans	Potential Created, mHa			Potential Utilized, mHa			Investment, Rs crore
	SW	GW	Total	SW	GW	Total	
1951	6.4	6.5	12.9	6.4	6.5	12.9	
I Plan	0.03	1.13	1.16	0.03	1.13	1.16	65.62
II Plan	0.02	0.67	0.69	0.02	0.67	0.69	142.23
III Plan	0.03	2.22	2.25	0.03	2.22	2.25	327.73
Annual Plans (1966-69)	0.02	1.98	2	0.02	1.98	2	326.19
IV Plan	0.5	4	4.5	0.5	4	4.5	512.28
V Plan	0.5	3.3	3.8	0.5	3.3	3.8	630.83
Annual Plans, 1979-80	0.5	2.2	2.7	0.5	2.2	2.7	501.5
VI Plan	1.7	5.82	7.52	1.01	4.24	5.25	1,979.26
VII Plan	1.29	7.8	9.09	0.96	6.91	7.87	3,118.35
Annual Plans, 1990-92	0.47	3.27	3.74	0.32	3.1	3.42	1,680.48
VIII Plan	1.05	1.91	2.96	0.78	1.45	2.23	6,408.36
IX Plan	1.09	2.5	3.59	0.37	0.85	1.22	8,615.07
X Plan	1.152	2.048	3.2	0.875	1.555	2.43	14,140.70
Total till end of X Plan	14.752 (24.6%)	45.348 (75.4%)	60.10 (100%)	12.315 (23.5%)	40.105 (76.5%)	52.42 (100%)	38,468.52

4.2.1 Surface Water Development

Surface water development has been entirely controlled by the government sector in contrast to private sector domination in groundwater development. Minor irrigation tanks which were managed by village communities come under the control of the government. Though Central and State Government implemented several new schemes to augment the irrigation development through major and medium irrigation projects in the country, financial assistance to surface minor schemes has been rather limited considering that

there was negligible private sector involvement and the preference of the governments was towards mega schemes in past.

The growth in surface water (minor) irrigation potential has been modest as seen from Table 4.2.1 above. The criterion of minor irrigation schemes as having estimated cost less than Rs 25 lakh was changed to culturable command area basis in 1978. Thereby, some of the earlier conceived medium irrigation schemes consisting of large dams and canal networks came under the scope of minor irrigation which gave an artificial boost to Plan-wise irrigation development for surface water MI potential during the VI Plan. By the end of the Tenth Plan an irrigation potential of 14.752 mHa has been created and 12.315 (83.5%) mHa has been utilized as against ultimate irrigation potential of 17.372 mHa. While the all India figures may appear closer to ultimate, there is still a lot of potential left with eastern and northeastern states with sizable scope from Madhya Pradesh and Karnataka state also. However, estimation of ultimate irrigation potential requires detailed scrutiny and larger concern is the declining trend in actual utilization. As per III MI Census of 2001 which roughly translates to the end of IX Plan, there are about 12.48 lakh MI schemes in the country belonging to various categories namely tanks and other storages, lift irrigation schemes and permanent/temporary diversions, of which about 9.84 lakh are in use. The ultimate irrigation potential of 12.48 lakh schemes is about 17.34 mHa. For schemes in use, against a potential created of 10.028 Mha, about 6.77 mHa is actually being utilized. Correct and reliable statistics on irrigated areas is necessary to facilitate planning of surface water (MI) potential development.

4.2.2 Groundwater Development

India is the largest groundwater user in the world, with an estimated usage of around 230 cubic kilometers per year, more than a quarter of the global total. Groundwater has an important role in meeting water demands. Erratic precipitation and near utilization of surface water resources, new drilling and pumping technologies, etc. were a few of the reasons for shifting the focus of stakeholders towards groundwater resources.

A summary of irrigation statistics during different plan periods shows that major share of minor irrigation comes from groundwater sources and about 45.348 mHa of all irrigation (102.77 Mha) was through groundwater till the end of X Plan period. In general, creation of irrigation potential through groundwater is mainly by farmers with their own resources or credit and the government investment is not very large. The area benefitted from a single scheme of surface water is large compared to that of groundwater as each

structure in groundwater irrigation is considered as a scheme and the area benefitted is comparatively less. However, as per 2001 MI Census, Groundwater schemes (Tube well/Bore well/Dug well) had utilized 87% of the total irrigation potential created by MI Schemes.

There has been a phenomenal increase in growth of groundwater abstraction structures. The number of dug wells, in past five decades increased from 3.8 million to 9.6 million, shallow tube wells from 3,000 to 8.36 million and deep tube wells from negligible to 5.3 lakh. Electrical pump sets have increased from negligible to 14.8 million and diesel pumps from 66,000 to 6.34 million. Data available from the census of minor irrigation structures indicates a three-fold increase in the number of ground water abstraction structures from about 6 million during 1982-83 to about 18.5 million during 2001-02. The growth has been more pronounced in shallow and deep tube wells (17 to 18 times) when compared to dug wells (about 2 times). This shift is probably the combined result of deepening ground water levels and advances in drilling and pumping technology. The ground water draft for the country as a whole has been estimated for 2004 as 231 BCM, about 92 percent of which is utilized for irrigation and the remaining 8 percent for domestic uses. Hence, the stage of ground water development, computed as the ratio of annual ground water draft to net annual ground water availability is about 58 percent for the country as a whole. The ultimate irrigation potential that can be created from replenishable groundwater has been assessed as 64.05 mHa. Over the past five decades, rapid expansion in the use of ground water, primarily for irrigation, has contributed significantly to agricultural and economic development of India. The progress in groundwater schemes picked up momentum during the III Plan period (1961-66) and continued till 1992. The VII Plan (1985-1990) witnessed an unprecedented achievement of 7.80 mHa of groundwater potential. Ultimately, the cumulative groundwater potential rose to 38.89 mHa in 1992. During the VIII, IX & X Plans however, there was a perceptible drop as progress slackened to 1.91 mHa, 2.50 mHa and 2.81 mHa respectively for the three Plan periods. The potential of ground water created till X Plan (up to 2007) was 45.348 mHa and utilization was 40.105 mHa (89%).

Ground water development is not uniform across the country. It is very high in alluvial areas of Indo-Gangetic plains of Punjab (170 %) and Haryana (127 %) and as low as 22% and less in many States including Bihar, West Bengal, Orissa, North Eastern States, etc. The ground water development in hard rock terrains of Tamil Nadu, Andhra Pradesh and Karnataka states is also very high. Stage of ground water development in Rajasthan, which covers part of Thar

Desert, is 135 %. Though over-development of resources in some parts of the country has created serious problems, a large portion of GW resources are still untapped, in eastern and north eastern parts of the country mainly in the states of Assam, Bihar and West Bengal. The block-wise status of groundwater development in the country is as follows:

- Out of 5,845 assessment units (blocks/ mandals / talukas / watersheds), 803 (13.7%) are categorized as “overexploited” where the stage of groundwater development exceeds the annual replenishment and significant decline in long-term ground water level trend has been observed in either pre-monsoon or post-monsoon or both;
- In addition, 169 (2.9%) blocks/watersheds are “critical” where ground water development has reached a high stage of development (> 90% and up to 100%) and significant decline is observed in the long term water level trend in both pre-monsoon and post-monsoon periods;
- There are 522 (8.9%) semi-critical units, with the stage of ground water development between 70% and 100 % and significant decline in long term water level trend has been recorded in either pre-monsoon or post-monsoon.
- Of the remaining, 4,280 (73%) units are under safe category and 71 (1.2%) units are saline.

State-wise details are given in **Annexure-2.1**. The overdraft has resulted in failure of wells, shortage of water supplies, deepening of existing structures thereby increasing pumping lift, replacing centrifugal pumps with submersible ones, increasing pumping cost and energy usage. In many areas overdraft is also associated with the water quality deterioration due to upcoming of saline water from the lower aquifer. Inadequately planned utilization of arsenic loaded ground water in West Bengal has led to serious health problems in human being, livestock etc.

Though groundwater plays an important role in meeting water demands, Government investment in groundwater development and management is minimal compared to surface water. Studies have shown that unit cost of water for irrigation through groundwater is more than Rs1 per cubic meter, which is borne by the individuals on their own. At the same time, the water charges levied by the Project Authorities for surface water irrigation works out to less than Rs 0.5 per cubic meter and cost of construction of surface storage/conveyance system and operation and maintenance are borne by the Government. A major share of expenditure in groundwater irrigation is private and not properly reflected in groundwater schemes/ programmes.

About 97% of the groundwater schemes are owned by private enterprises. While management of schemes by private individuals is more efficient and has contributed to hugely to food production, unguided and unregulated private investment in groundwater development, aided by free to subsidized electricity, has left its imprints by way of sharp decline in groundwater levels, drying of many shallow tube wells and overexploitation of groundwater resource. The present scenario, ranging from overexploited stage of resource development in the States of Punjab, Haryana, Gujarat, Rajasthan, Western Uttar Pradesh and Andhra Pradesh to low stage in Bihar, Eastern Uttar Pradesh, Jharkhand and West Bengal is the result of unregulated and unguided investments by farmers. Central and State Groundwater Departments are basically involved in research kind and not in groundwater irrigation sector for planning and implementation of schemes in most of the States. Also, there are several States with no dedicated groundwater department to take the role of proper planning, guidance to stakeholders, assessment and keeping a watch on the stage of groundwater use.

4.3 XI Plan Performance Overview

The National Commission for Integrated Water Resources Department (NCIWRD) has adopted figures of 1,581 million and 1,346 million as the high and low projection of population by the year 2050 where it is assumed will get stabilized. In their estimate urban population in the year 2050 is likely between 646 million and 971 million. The total food requirement for the country has been estimated as 449 million tons (high demand scenario) and 382 million tons (low demand scenario). Food requirement, losses in storage and transportation, seed requirement and carry over for years of monsoon failure have been estimated at 12.5% of food grain production. Thus food grain production is required to double to about 420 million tons from the present level of about 210 million tons to meet the projected requirement. Thus, on an average, food grain production needs to be enhanced by around 5 million tons per year. Accordingly targeted growth of 25 million tons in food grain production is to be achieved in XI Plan. The X Plan Working Group had assessed that proportionate share of minor irrigation sector at 60% would be 15 Million tons which would require creation of additional irrigation potential of 7 mHa. This potential was distributed at 4.5 mHa for groundwater schemes and 2.5 mHa for surface water schemes and targets were set for XI Plan accordingly. The target of 2.5 mHa for surface schemes was further distributed at 1.5 mHa for new schemes and 1.0 mHa for renovation of tanks. The overall strategy as proposed by the Working Group for the XI Plan was to address the following crucial issues in Minor Irrigation Sector:

- i) Renovation/Restoration of old tanks as well as old diversion, channels in hilly regions along with improving efficiency of the projects. Besides surface lift schemes may also be given due consideration, particularly, in hilly regions for irrigating high terraces.
- ii) Expansion of irrigation facilities through a time bound programme for exploiting the huge ground water potential in the Eastern Region.
- iii) Promotion of Micro Irrigation System in water deficit areas.
- iv) Promotion of Ground Water Development in areas having untapped/ unutilized potential.
- v) MGNAREGA and watershed development may be linked with Minor Irrigation/Ground Water Development.
- vi) A comprehensive Act for regulation of ground water development on sustainable basis.

4.3.1 Overview of XI Plan Progress/Performance

Against the target of 7 mHa recommended by the Working Group of XI Plan, 7.188 mHa was approved by the Planning Commission for Minor Irrigation Sector. The outlay proposed by the working group for minor irrigation sector for XI Plan was not approved by the Planning Commission. The year-wise outlay for the first four years of XI Plan kept by Planning Commission is given in Table 4.3.1, works out to be Rs 38,478.757 crore for XI Plan. Table 4.3.1 gives the details of physical and financial performance of Minor Irrigation Sector during XI Plan. Actual expenditure from 2009-10 onwards is not available so the same has been taken as equal to the revised outlay.

Table 4.3.1: Physical & Financial Performance of MI Sector during 11th Plan

Year	Physical (in Mha)		Financial (in Rs Crore)	
	Potential Created	Potential Utilized	Revised outlay	Expenditure
2007-08	0.89	0.438	5451.45	4449.89
2008-09	0.9	0.3668	6906.78	5770.82
2009-10	0.9	0.212	7539.41	7539.41
2010-11	0.91#	0.194#	8642.38	8642.38
2011-12	0.91*	0.194*	9938.737	9938.737
Total	4.5	1.4048	38,478.76	36,341.24

anticipated; * targeted
Source: The Planning Commission

The achievement in potential created for the first three years in XI Plan was 2.69 mHa. In the Mid Term Appraisal of XI Plan, the revised target of 4.5 mHa

has been kept and it is anticipated that the target 4.5 mHa will be achieved by the end of XI Plan.

4.3.1.1 Performance Overview of Centrally Assisted Schemes

a) Accelerated Irrigation Benefit Programme (AIBP)

The Accelerated Irrigation Benefitted Programme (AIBP) was taken up with a view to provide Central assistance to encourage the completion of ongoing projects and to help States in creation of irrigation potential. In case of minor irrigation schemes, the central assistance is provided to the projects in the States of North-Eastern Region, hilly States namely, Himachal Pradesh, Jammu & Kashmir, Uttarakhand, undivided Koraput, Bolangir and Kalahandi (KBK) districts of Orissa and projects benefitting tribal areas and drought prone areas. Central assistance is provided as grant which is 90% of the project cost. AIBP funding is on the basis of proposal made by the State Governments.

During XI Plan , a total of 6,488 MI schemes at an estimated cost of Rs 9,798.80 crore have been taken till March 2011, of which 3,670 (57%) have been completed, creating an additional potential of 5.976 lakh Ha against the target of 7.5 lakh Ha from surface (MI) schemes under AIBP of during XI Plan. Based on the average yearly progress during the first four years of the Plan, the target for surface MI schemes under AIBP during 2011-12 has been kept as 1.5 lakh Ha. Thus there is no shortfall in creation of irrigation potential from surface MI schemes under AIBP.

b) Repair, Renovation & Restoration of Water Bodies

The Government of India approved two schemes on Repair, Renovation and Restoration of Water Bodies for implementation during XIth Plan period with domestic support (an outlay of Rs 1,250 crore) and with external support (outlay of Rs 1,500 crore), respectively.

Domestic support (Rs 1,250 crore): The Government of India provides assistance to the extent of 90% as grant with 10% State as share for special category States (North Eastern States), Uttarakhand, H. P., J&K and undivided KBK districts of Orissa, drought prone/Naxal affected/tribal areas, and in the ratio of 25:75 for other areas. The scheme was approved in February, 2009 and after finalization of guidelines, release of funds under the scheme began during 2009-10. Till the end of 2010-11, a sum of Rs 521 crore had been released. The fund requirement for 2011-12 is Rs 684 crore.

External support (Rs 1,500 crore): The Government of India provides assistance to the extent of 25% and 75% State share is to be borrowed from

the World Bank by concerned States. This scheme was also approved at the end of financial year 2008-09. Public Water Bodies are covered under the scheme. During 2009-10, a sum of Rs 190.31 crore was been released. World Bank Loan Agreement has been signed with Tamil Nadu for Rs 2,182 crore to restore 5,763 Water Bodies having a CCA of Rs 4 lakh Ha, Andhra Pradesh for Rs 835 crore for restoration of 3,000 Water Bodies with a CCA of Rs 2.5 lakh Ha, Karnataka for Rs 268.78 crore for restoration of 1224 Water Bodies with CCA of Rs 0.52 lakh and Orissa for Rs 448 crore for restoration of 900 Water Bodies having CCA of Rs 1.2 lakh Ha.

c) Bharat Nirman Programme

The Irrigation component under this programme envisaged bringing 10 mHa under assured irrigation during 2005-09, of which 4.8 mHa was attributed to MI schemes, including 2.8 mHa is under groundwater and 2.0 mHa under surface MI schemes. It is further estimated that, out of 2 mHa proposed under surface water 1 Mha will be from new schemes and remaining 1 mHa from ERM of completed schemes and renovation of traditional water bodies. This is envisaged to be achieved through already ongoing programmes of the Centre and the States. A potential of 2.934 mHa has been achieved from minor Irrigation under Bharat Nirman during 2005--09.

d) Schemes of Central Ground Water Board (CGWB)

In general, the schemes of CGWB are basically scientific in nature and are aimed at using of scientific principles for groundwater management and regulation. There are four schemes of CGWB during XI Plan, out of which three pertain to scientific studies, while the fourth scheme deals with infrastructure development of CGWB, which are as given below:

- i) Groundwater Management & Regulation
- ii) Rajiv Gandhi Institute
- iii) Hydrology Project
- iv) Infrastructure Development (Scheme of MOWR)
 - a. GWB component of Acquisition of Land & Building
 - b. CGWB component of IT Plan

Under the scheme of Groundwater Management & Regulation, District groundwater management studies, groundwater exploration, groundwater monitoring, groundwater resources assessment, artificial recharge to ground water are taken in States. The Board has completed ground water management studies in 6.34 lakh sq km area up to 2010-11 and an area of 1.54 Lakh sq km would be covered in 2011-12; constructed 3,180 exploratory wells up to 2010-11 and 821 would be constructed during 2011-12; monitored

about 15,640 ground water observation wells four times a year; and did chemical analysis of 71,446 water samples up to 2010-11. In addition, dynamic groundwater resource assessment of the country has been done in 2004 and 2009 in association with States. The CGWB is implementing demonstration projects on artificial recharge during XI plan in coordination with State agencies for capacity building and replication in similar hydro-geological settings by the State agencies.

Table 4.3.1.1 XI Plan out lay and Expenditure under Plan Scheme of CGWB (Rs Crore)

S. No	Name of Schemes	XI Plan Outlay	Actual Exp. 2007-08	Actual Exp. 2008-09	Actual Exp. 2009-10	Actual Exp. 2010-11	BE 2011-12	Expenditure up to June 2011
1	Groundwater Management & Regulation	460.00	48.11	54.38	68.91	80.56	110.40	36.00
2	Rajiv Gandhi Institute	24.38	0.60	0.51	1.79	3.23	3.00	1.13
3	Hydrology Project	27.36	1.13	2.12	2.98	3.53	13.30	0.82
4	Infrastructure Development (Scheme of MOWR)							
4a	CGWB component of Acquisition of Land & Building	41.00	1.32	2.68	3.49	6.61	10.60	4.00
4b	CGWB component of IT Plan	5.00	Nil	Nil	0.267	0.48	0.80	0.0
	Total (Plan)	532.74	60.98	69.60	74.44	94.41	138.10	41.95

The Central Ground Water Authority has been entrusted with the responsibility of regulating and controlling ground water development and management in the country and issuing necessary directives for the purpose. CGWA notified 43 areas for regulation of ground water development till X Plan which has risen to 82 areas in XI Plan.

The Rajiv Gandhi National Ground Water Training & Research Institute is responsible for organization of training programmes for officials of CGWB, Central and State government organizations, academic institutes etc. to

build capacity in the field of ground water and related aspects. About 30-35 training courses have been conducted every year by the Institute.

The CGWB under Hydrology Project has set up Computer Data Centres at 26 offices and have upgraded 14 Water Quality Laboratories. This project has facilitated computerization of voluminous data collected over the years by CGWB and State Ground Water Organisations. Dedicated ground water processing and application software, named as Groundwater Estimation and Management System (GEMS) has been developed for hydrogeological data entry, data validation, data processing including ground water resource estimation.

Total outlay of schemes of CGWB was Rs 532.74 Crore against which the anticipated expenditure till the end of XI Plan period would be 437.53 Crore. A summary of the outlay and actual expenditure under different schemes are given below:

e) Artificial Ground Water Recharge through Dug Wells in Hard Rock Areas in Seven States

Pursuant to the announcement by Hon'ble Finance Minister in his Budget Spech 2007, a State sector scheme on "Artificial Recharge to Ground Water through Dug Wells" during XI Plan is under implementation in 1,180 over-exploited, critical and semi-critical blocks in 146 districts in the seven States, namely A. P., Maharashtra, Karnataka, Rajasthan, T. N., Gujarat and M. P. at an estimated cost of Rs 1,798.71 crore, with a subsidy component of Rs 1,499.27 crore. The number of irrigation dug wells proposed for recharge in the scheme is 4.45 million. Of which 2.72 million belong to small and marginal farmers and 1.73 million to other farmers. Average cost of recharge structure per well was Rs 4,000. The scheme ended on March 2010. The status of target achieved in the scheme is given in Table 4.3.1.2.

Table 4.3.1.2: State-wise progress status under the scheme (as on 30-06-2011)

S. No	State	No of structures for which subsidy released	Subsidy released Rs Crores	No of structures constructed
1	A. P.	0	0	0
2	Gujarat	141381	47.713	8247
3	Karnataka	68864	26.252	11007
4	M. P.	93847	39.604	23474
5	Maharashtra	44632	14.031	38023
6	Rajasthan	88765	29.743	4619
7	T. N.	275553	103.594	21212
	Total	713042	260.937	106582

f) Rainwater Harvesting Scheme

Centrally sponsored rain water harvesting scheme was implemented all over India during 2004 to 2007 for SC/ST farmers in providing irrigation facilities to their homesteads / farmlands in order to augment their income generating capacity. Implementation of the scheme started during 2004-05. The scheme ended by 31 March 2007. An amount of Rs 2,360 lakh has been utilized as against Rs 2,450 lakh released by Gol to NABARD. About 18,016 units of water harvesting structures have been constructed in 28 States and all union territories benefiting total area of 8,807.5 Ha.

g) The Million Shallow Tube-well Programme (MSTP) of the Government of Bihar

The Million Shallow Tube-well Programme (MSTP) was implemented in Bihar for bringing additional 20 lakh Ha of farm land of the State under assured irrigation over a period of 5 years (2002 to 2007). The programme envisaged construction of two types of irrigation structures viz., Cavity Boring (100 mm dia and 25 m depth) and Shallow Tube-well (100 mm dia and 30m/45m depth depending upon suitability of the area) with 4.5 / 5 HP diesel pump set. At the end of March 2007, 4,07,758 units (58%) had been achieved against a target of 6,97,111, with subsidy utilization of Rs 31,297 lakh (57.5%) against Rs 54,464 lakh released by Gol to NABARD.

h) Bihar Ground Water Irrigation Scheme(BIGWIS)

The **BIGWIS** which is under implementation aims at providing irrigation to 9.28 lakh hectare of agricultural land in Bihar by installing 4.64 lakh units of private shallow tubewells/dugwells with pump sets. The programme envisages constructing mainly two types of irrigation structures viz., shallow tube wells and dug wells (depth depending upon suitability of the area) with various capacity of pump sets as below:

- i) Shallow Tube wells (4"dia) up to a maximum depth of 70m & Pump sets for plains.
- j) Dug-wells of 3 m diameter and 12 m depth with Pump sets mainly for hilly areas.
- k) Pump sets (BIS mark Electric / Diesel driven pump sets) 3 to 5 HP only (Kerosene oil driven pump sets not allowed).

The programme is envisaged to cover all the districts and commences from the year 2009-2010 and would be completed by 2011-12. The estimated subsidy for the programme is Rs 105,588 lakh

I) On-farm Water Management for Increasing Crop Production in Eastern States

The Scheme was implemented in all Districts of Arunachal Pradesh, Assam, Bihar, Chattisgarh, Jharkhand, Manipur, Mizoram, Orissa States and 35 Districts of Eastern Uttar Pradesh and 9 Districts of West Bengal.

The objective of the scheme to develop irrigation facilities by tapping the ground water resources of the Eastern States in a planned manner so as to achieve substantial increase in agricultural production, productivity and per capita income of farmers in the region. The eligible activities/components of the Scheme were (a) Shallow Tube-wells with pump sets, (b) Community lift irrigation points for groups/individuals, (c) Electric /non-electric water pumping sets and (d) Dug wells.

State	Dug well, Nos.	Shallow Tube Well with pump sets, Nos.	Low Lift Irrigation Point, Nos.	Pump sets, Nos.	Total, Nos.	Financial Achievement, Rs as of 31 March 2009
Arunachal Pradesh	0	0	388	0	388	33,09,950
Assam	0	559	150	540	1249	72,92,107
Bihar	259	4775	6	9131	14171	8,00,42,443
Chhattisgarh	1336	3441	107	3764	8648	6,15,54,620
Jharkhand	2886	443	254	13743	17326	6,73,02,625
Manipur	0	0	652	0	652	29,33,140
Mizoram	0	0	765	0	765	57,31,820
Orissa	5336	1691	0	762	7789	6,57,62,641
Eastern U.P.	0	82336	5555	19124	107015	67,23,59,655
West Bengal	449	604	4443	8445	13941	6,91,36,292
Total	10,266	93,849	12,320	55,509	171,944	1,03,54,25,295

The implementation started in 2002-03 and ended by 31 March 2006. An amount of Rs 10,354.25 lakh has been utilized against Rs 11500 lakh released by Gol to NABARD.

m) Minor Irrigation Schemes under Bundelkhand Package

Under the Bundelkhand Package, funds have been provided to the State Governments of U. P. and M. P. for water resources development. The MI activities in 13 districts in the two States are as given below:

New Minor Irrigation Schemes: 93 schemes costing Rs 417 crore have been taken up in M. P. Work on 41 schemes has been completed and remaining 52 schemes are at different stages of completion. On completion an area of 30,462 Ha will be irrigated.

Completion of On-going Minor Irrigation schemes: 52 On-going Minor Irrigation Schemes with an allocation of Rs 125 crore have been taken up in M. P. Of these 12 schemes have been completed and work is under progress on rest. An area of 18,397 Ha will be irrigated on completion of work.

Lift Irrigation Schemes: 33 Lift Irrigation Schemes have been taken up for reconstruction and maintenance in U. P. with an allocation of Rs 52 crore. The water is being lifted from the Yamuna River during the rainy/post rainy season for irrigating the kharif as well as rabi crops. Repair work on 6 lift irrigation schemes has been completed and work is under progress on remaining 27 schemes.

Distribution of Pump Sets: In M. P., pumps for lifting ground water from dug wells are being provided under convergence to the SC/ST and OBC farmers. About 28,000 dug wells constructed under MNREGA and supplemented with water lifting devices to turn these wells into productive assets.

Repair, Renovation and Restoration of Water bodies: 28 water bodies for minor irrigation are being repaired and restored in U. P. with an amount of Rs 46 crore. On completion, an area of 19,851 Ha will be irrigated.

Restoring capacities of canals, including repair and remodelling: out of the 39 schemes, sanctioned for Rs 150 crore in UP, 8 Schemes have been completed. On completion of all the schemes, 31,834 Ha will be brought under irrigation

Being a drought prone area, repair, renovation/completion and construction of new Minor Irrigation schemes will help in irrigating crops, mitigating drought conditions and distress in the region. The Package is being implemented under the guidance and monitoring of National Rain-fed Area Authority, Planning Commission, New Delhi.

n) Promotion of Micro Irrigation and Best Practices

The Government of India launched a Centrally Sponsored Scheme on Micro Irrigation (MIS) in January 2006. Keeping in view the demand of the Micro Irrigation Technology, the scheme has been constituted during XI Plan period in a Mission Mode as "National Mission on Micro Irrigation (NMMI)". Under this scheme, Central subsidy is provided @ 60% of the total cost of the system for

small and marginal farmers and @ 50% for general farmers, including 10% of State share. Some of the States are providing more subsidy, ranging from 20-50%, to lessen the burden on farmers. Since inception, there is achievement of 3 mHa under Micro Irrigation. NMMI includes latest technologies like different types of valves, filters and fertigation component etc. so that there will be an increase in water use efficiency, productivity of crops and savings of use of fertilizers, water and electricity.

The NMMI scheme is implemented in the entire country including North Eastern States and Himalayan States where the hilly terrain has much demand for MI system. During 2010-11 NMMI achieved an area of 6 lakh Ha with its strong promotional activities in all the States. The farmers whether small, marginal or general are now aware of the benefit of the technology and even farmers having half a hectare land are applying this technology to get more production and more income. This MI system has increased the cropping intensity, productivity and income of the farmers. The cultivation of crops has the effect on crop diversification from low value crop to high value crop through this technology. The NMMI has promoted cultivation of vegetables with close spacing of laterals and use of micro sprinkler and mini sprinkler in the field which saves water and increases production within a short time so that the farmers get more income by using the same land by taking three crops per annum.

o) Water Resources Strategy for 31 Distressed Districts

Consequent to the large scale suicides committed by the farmers in 31 districts spread over the States of Andhra Pradesh, Maharashtra, Karnataka and Kerala due to failure of crops for various reasons, the Government of India identified these districts as distressed districts. To address the issue, Government of India has taken several steps including Prime Minister's Special Rehabilitation Package. Accordingly, Central subsidy of Rs 76.65 crore and State subsidy of Rs 19.16 crore has been released during 2005-06 under the National Micro Irrigation Projects in these districts.

The Ministry of Rural Development is implementing Swaranjayanti Gram Swarozgar Yojana (SGSY) with the objective of providing open irrigation wells to the poor, small and marginal farmers free of cost under other Centrally-sponsored schemes also like Rashtriya Sam Vikas Yojana (RSVY) which target social and regional imbalances in the country financial assistance is provided for minor irrigation schemes.

4.3.1.2 Institutional Investments During X and XI Plans

Development of minor irrigation particularly groundwater schemes are largely dependent upon mobilization of institutional investment and to a lesser extent on private investment. NABARD has been serving as an apex refinancing agency, steering various irrigation developmental policies and programmes with a view to boosting ground level credit (GLC) flow through various rural financing institutions. The total GLC under Minor Irrigation during the Tenth Five Year Plan period (2002-03 to 2006-07) was Rs 26,148 crore of which Rs 3,396.91 crore of refinance was disbursed by NABARD during the above period. Thus the average percentage of NABARD to GLC was 12%. The corresponding figure during the first three years of the Eleventh Five Year Plan for GLC is Rs 11,217 crore and for NABARD refinance 1,446.26 crore, which is 12.89%. Details of Year-wise refinance disbursed by NABARD under Minor Irrigation and GLC during Tenth FYP and during the first three years of the XI Plan is given in Table 4.3.1.2.1

Table 4.3.1.2.1: Ground-level credit and Refinance by NABARD, Rs Crore

Plan Period	Ground-Level Credit	NABARD Refinance
X Plan(2002-2007)		
2002-2003	1975.00	855.00
2003-2004	2730.00	651.00
2004-2005	4214.00	679.04
2005-2006	8663.00	540.90
2006-2007	8566.00	670.97
Total Xth Plan	26148.00	3396.91
XI Plan (2007-2012)		
2007-2008	2840.00	403.68
2008-2009	3180.00	545.85
2009-2010	5197.00	496.73
Three year Total	11217.00	1446.26

4.3.1.3 Reasons for low performance

In eastern and north eastern parts of the country, mainly in the states of Assam, Bihar, West Bengal and parts of U.P., the stage of ground water development is less than 47%. The major reason for low development in these states is poor economic status of small and marginal farmers, fragmented

holdings and lack of rural electrification. Parts of Andhra Pradesh, Chhattisgarh, Gujarat, Jharkhand, Karnataka, Kerala, Maharashtra, Orissa, Tamil Nadu and part of Madhya Pradesh and Rajasthan are in hard rock terrain and presence of ground water is subject to availability of secondary porosity i.e. joints, fractures, fissures and weathered residuum. In such hard rock areas, probability of targeting ground water resource is low and sustainability of water supply through successful wells is also low due to low recharge rate.

The over draft in over-exploited and critical areas has caused depletion of water tables which has resulted in failure of wells, shortage of water supply and water quality problems. High concentration of salts, fluorides, iron, nitrates, arsenic and pathogens are also serious limitations of ground water use especially for drinking.

4.4 SHORTCOMINGS OF MINOR IRRIGATION SECTOR

Though small irrigation structures play a dominant role in the development of irrigation potential in the country, it has largely been the irony of the minor irrigation sector that it is neither managed nor monitored in a consistent manner by the local or State governments. State Governments have been apathetic towards appropriate institutional arrangements and sustainable development of surface water in the minor irrigation sector. Part of this neglect is due to very meager public investment. The financial institutions (which are the major investors in the sector) also ignore proper monitoring of the schemes in this Sector.

One of the reasons for the negligence of the sector on the part of the Governments may be the low stake of the Governments in the sector of around 33% only. Majority of the funding is received from the institutional and private sector. As the institutional funding is governed by commercial interest, little attention has been paid to prevent over exploitation of ground water resources. With a short-sighted approach to development, the perceived progress turns counter-productive in the long run.

The investment has been non-uniform, inconsistent and uncoordinated. While large part of the Government investment comes from the Ministry of Water Resources and is reflected in the Central and State Plan outlays, investments from other Central Ministries including the Planning Commission are not directly allocated to the concerned Ministry of the State Government. Under such programmes, funds are allotted through the district authorities who exercise the discretion of earmarking funds to related sectors for overall

development of the region. In principle, 20% of sanctioned outlay is required to be invested in water resources sector, which largely constitutes minor irrigation and rural water supply. However, diversion of funds from one sub-head to the other is a common feature and there is no clear-cut accountability of the expenditure incurred on specific minor irrigation schemes and potential created thereof.

Minor irrigation has been managed by a plethora of agencies, including Central and State government departments in, Panchayats, NGOs and financial institutions, etc. This makes coordination and planning for a harmonious development more difficult. In view of these shortcomings in the sector, there is need to create a regulatory mechanism for minor irrigation sector at the Central and State level to look after all the aspects of development of this sector.

4.4.1 Problems Faced in Specific Areas

While the above discussion holds good for Minor irrigation in general, there are identified problems in specific areas which require to be addressed. Among surface water schemes, only 34% are working without constraints and the rest have problems of siltation, reduced inflow and discharge, mechanical breakdown, channel breakdown, etc. Problems of less water discharge and channel breakdown are more common. In groundwater schemes, only 30% of units work without any constraint and issues of low water yield and inadequate power are common. The problems faced in the specific areas of MI Development are described in the following.

a) Tank Irrigation

Tank irrigation is a traditional and important component of the MI sector which has been practiced in this country for quite a few centuries. In the regions where minor irrigation through tanks has been the ruling resource, almost every village has a tank, managed by local communities initially. Tank administration was taken over by the colonial establishment for generating revenue which led to slow deterioration due to alienation of local communities and absence of investment by them. As per 2001 census, 12.4 lakh of surface water schemes including storage and diversion schemes out of which 2.32 lakh tanks and 1.20 lakh storages are in use along with about 68,800 permanent diversions. 72,198 MI tanks and storage structures have gone into disuse resulting in loss of irrigation potential of 0.94 mHa. The technical reasons for low utilization of tanks are attributed to silting up of the supply channels, damage to head sluice or other masonry works, silting up of the old tanks, encroachment of the foreshore lands, non-functioning canal

sluices, substantial seepage losses, etc. The decline in tank-fed agriculture has become more rapid during the last three decades, severely affecting agricultural production in several places. The deteriorating tanks have forced the marginal and small farmers into a cycle of deprivation and debt and left them increasingly at the mercy of the vagaries of monsoon.

b) Ground Water Irrigation

As per Groundwater Estimation Methodology (GEC, 1997), the replenishable groundwater resources have been estimated and the country has been classified into categories of Over Exploited, Critical, Semi critical and Safe from the groundwater development point of view. However, due lack of sufficient information on groundwater development and recharge, true situation in groundwater development is difficult to assess. Further, due to Easement Act, there is no legal framework to ensure that groundwater development takes place only in safe areas. Unguided and unregulated groundwater development by private investors is a major threat to sustainability and equitable development and management of the resource.

In-situ salinity has led to restriction in groundwater development in parts of Haryana, Punjab, Delhi, Rajasthan, Gujarat, UP, Karnataka and Tamil Nadu. Occurrence of concentration of dissolved ions above permissible limits in groundwater is also a constraint in groundwater development. Occurrence of high concentration of Arsenic (beyond the permissible limit of 0.05mg/L) in groundwater has been reported from 79 blocks of 8 districts of West Bengal, viz., Bardhaman, Hoobli, Howrah, Malda, Murshidabad, Nadia North and South 24 Paragnas. Arsenic contamination has also been reported from Bhojpur and Patna Districts of Bihar and Balia district of Uttar Pradesh, which is associated with sediments in the Ganga Basin. Use of arsenic contaminated water for irrigation is in vogue and there is a possibility of increased concentration of these constituents in the food products which may lead to detrimental effects on health of the local population.

The factors responsible for poor groundwater development in irrigation sector are generally non availability of assured power supply, lack of public funding and lack of guidance to stakeholders with scientific and technical support / knowledge, subsidized water rates for surface water irrigation etc. Further, use of non conventional energy systems for irrigation pump sets is yet to come to the optimal level of techno economic viability. There is further need to look into groundwater estimation as certain areas which have aquifers of poor yield and are generally not suitable for large scale groundwater development have been categorised as safe areas which gives a wrong

impression about the remaining areas which have scope of groundwater development. Such areas are to be categorised / indicated separately for the use of planners. New strategies to develop groundwater in hilly terrain for irrigation need to be framed and encouragement shall be given to such states to implement groundwater development schemes.

c) Poor efficiency of pumping sets and ground water irrigation

Most of the irrigation pump-sets operate at poor efficiency. There are many parameters, which directly or indirectly affect the efficiency of pumps, viz., depth to water level, improper accessories, irregular maintenance, poor supply voltage, use of non standard pumps, improper pump sizing, etc., which could affect the efficiency of the pump-sets. With increase in number of stakeholders for groundwater in agriculture sector, the land-man ratio has declined from over 0.4 ha/person in 1900 to less than 0.1 ha/person in 2000. The supply of electricity for irrigation is at very low (below-cost) rates for over two decades. Currently, electricity for irrigation is being supplied free/ subsidized rates. This has resulted in overloading of transmission facilities and frequent disruption in power supply. The erratic power supply has made farmers to install automatic power switch to start the pumps as when the power supply is resumed without actually considering the actual water requirement, resulting in over-irrigation. Such an electricity-water supply scenario has led to: a) overcapitalization of agriculture; b) constrained the growth of agriculture; c) resulted in inefficient use of water, energy and equipment; d) led to a reduction in farm profitability; and e) has increased pollution through increases in CO₂ emissions into the environment from the burning of diesel. Alternatively, many farmers are also using local non-standard pumps resulting in reduction in power use efficiency. It has also been observed that farmers install higher capacity pumps instead of required low capacity pumps due to lack of knowledge and non availability of technical guidance. Agricultural sector is estimated to use about 23% of utility-supplied electricity in the country.

NABARD has been using control of institutional financing for development of wells in overexploited areas. But this approach has by and large been ineffective in checking overdraft due to large-scale private financing in the development of wells. Similarly, the State Electricity Board's denial of new agricultural power connections in overexploited areas and in critically developed areas when regulations in relation to spacing of wells are violated, has been ineffective due to the use of old power connections for newly drilled wells. Since groundwater development depends directly on energy, management of energy supply and pricing are suggested as more effective

indirect options for keeping watch on groundwater extraction in sensitive areas.

The efficiency in groundwater irrigation can be ushered in by improvement in efficiency of the pumping system and in adopting water conservation measures in irrigation. There is a need to specify the capacity of pumps for different types of wells on the basis of depth to water level, type of wells and the yield of the wells in different hydro-geological settings. Smart irrigation practices, viz., drip irrigation and precision farming techniques need to be adopted by farmers and capacity building/awareness programme such as Farmers Action Participatory Programme are to be up scaled country wide.

d) Constraints in Credit Support

The major constraints in the accelerated growth of credit support for the development of minor irrigation are:

- Inadequate technical guidance to farmers for site location and construction of works especially for bore wells and tube wells.
- Cumbersome loan appraisal procedure and consequent delay in loan disbursement.
- Insufficient technical expertise with financing banks to identify suitable investment and favourable areas for investments.
- Poor recovery of loans extended by banks leading to reduced lending eligibility.
- Lack of co-ordination among different departments and agencies connected with the programmes resulting in poor extension services.
- Incomplete land records.

The issue of credit/subsidy applies in general to groundwater schemes. In surface water schemes, which are generally funded by Government agencies, credit policy is barely an issue. Exceptions are there, however, as some cooperative lift irrigation schemes are sponsored by sugar factories. As private sector involvement is encouraged in farming sector, constraints in credit support could be felt for surface water schemes as well.

4.5 STRATEGY FOR MINOR IRRIGATION IN XII PLAN

4.5.1 Strategy for Surface water Development and Management

a) Change in nomenclature

The sub-group suggests that the nomenclature of "Minor Irrigation" be changed to "Small Scale Irrigation". Since it has been called "minor", the tendency so far has been to see it as "minor" in all respects. It gives a mindset

to consider this is not important and gets reflected in low investments, poor technical support, low utilisation of the potential created, poor operation and maintenance, poor data gathering and availability, etc. It is considered “Minor” in all sense in relation to large and medium projects.

b) Overall approach

The major shift in approach is the integration of small dispersed water bodies and irrigation systems by convergence, wherever possible, with the medium and the large irrigation projects. There are innumerable examples that show that once water from a large or medium project comes to an area, all the smaller water bodies or the traditional smaller irrigation systems become dysfunctional. Efforts are not made to integrate these systems into the larger/newer irrigation systems. In fact, the Mid Term Appraisal (MTA) of the 11th Plan also mentions this issue as a serious one and to quote from the MTA, “CAD must carefully integrate traditional water harvesting systems already existing in the command. The construction of canal irrigation must not lead to their decline; rather their deep complementarities must be harnessed”. The finances from schemes like MGNREGA, RKVY, IWMP, etc. are new opportunities for developing such local resources through convergence.

One of the criticisms of the water sector has been that it works in “silos” of different departments without much coordination and communication. Along with departmental integration and coordination, the sub-group suggests that the XII plan should make efforts at resource integration. These dispersed and smaller water bodies could be the link in integrating large and small (meaning the major, medium, minor and micro watershed development) sources. One of the main strengths of these water bodies is that they can play a dual role or function, namely, one, they harvest rain water from the local catchment, say, a micro watershed; and two, they can also receive and store water from the large and medium projects. The sub-group recommends that these smaller water bodies receive certain quantum of water from larger sources, wherever possible. This can stabilize these smaller water bodies. One of the reasons for the low performance of the minor irrigation schemes is that these water bodies are not as dependable (not as assured) as the large and medium projects because they are much more sensitive to fluctuations in rainfall as they harvest water from small, local catchments and as a result these water bodies do not get filled. Coupled with this, in many of the states (for example in Maharashtra), especially in drought prone regions, MI tanks/sources are planned with 50% dependability. Since they are planned with 50% dependability in most of the years (at least

for 50% of the years) they do not get fully filled up and the efforts would be to utilise the “extra” capacity created by providing water from larger sources as supplementary water. Opportunities need to be explored to divert water during the monsoon and the immediate post-monsoon period to these systems using the existing dams and canal network. With proper rehabilitation of these water bodies and with assured fillings from larger sources, the country can have a large storage potential which is decentralised and without creating any fresh submergence and displacement.

This suggested approach is not new and in fact the system tanks in Tamil Nadu are good examples of this. The system tanks harvest water from their own catchments as well as get water that is diverted from larger sources. There are studies that show that the system tanks have been able to perform much better as compared to “stand alone tanks” mainly because of the “assuredness” provided by the water they receive from the larger sources.

This also calls for a restructuring of how the larger sources (large and medium projects) are managed. Here one can adopt a two phase strategy. In the short run, wherever possible, a fixed proportion of water in the larger storages, say 5 to 10% to begin with would be used to fill the smaller sources (MI tanks) and also use the existing dams and canal network to divert monsoon and post monsoon flows into these smaller storages. In the long run the conventional “command” area concept needs to be re-designed and the main canals, instead of performing the present day water distribution function, becomes conveyance systems, meaning they convey water to these smaller systems and water distribution takes place from these smaller storages. This type of an integrated system would allow for more user control over water management and can also plan the water distribution system as per crop requirements and so on. This is very close to the Chinese irrigation system of “melons on the vine” where the melons are the small water bodies and the vine is the canal conveyance system. The Ozar WUAs in Nashik district of Maharashtra have also tried something similar. These WUAs are formed on the Waghad medium irrigation project and the WUAs have taken a conscious decision to put part of the water that they receive from the Waghad irrigation project into 18 check dams that they have built (with the resources from the then soil conservation department of the Government of Maharashtra) in the command area itself. This helped to recharge the wells and stabilised the local water regime and the WUAs designed a system in which they alternate water rotation from the canal water they receive and the water from their own wells (a good example of conjunctive use of surface and ground water). This helped in crop diversification as they could provide

irrigation at a much closer interval. This improved both water use efficiency and productivity.

The sub-group recommended that MI system (for that matter the entire irrigation system) to be re-oriented on the above lines. Recognising the fact that this cannot be done overnight because of various constraints, the sub-group recommends that the XII plan be seen as a departure point and a great opportunity to make a beginning in this line and take up pilots where ever possible.

c) Institutions and management

One of the strengths of the MI systems is that they are amenable to direct control by the users or the local community as they are small, decentralised systems. Alternative institutions of Panchayats, NGOs and corporates social responsibility projects should be allowed to implement the scheme/project. Alternatively, these systems should be handed over to PRIs and depending on the size and boundaries of these systems it could be decided PRI of which level should take over the MI system. If a particular MI system is within the boundaries of a Gram Panchayat then that particular GP can take over the system. If its command area cuts across the boundaries of one or more GPs then either the PRI of the immediate next order can take over or can have the same institutional arrangements as suggested by the Common Guidelines for Watershed Development (2008).

However, for its day to day management (water distribution, operation and maintenance, tariff collection and so on) the PRI should constitute a WUA within the legal framework of participatory irrigation management framework existing in a particular state. Here the difference would be that the WUA would be accountable to the PRI. If the command area is not manageable by one WUA or the command area cuts across more than one gram Panchayat then more than one WUA could be constituted, as per requirement, with the condition that they would be federated and the whole system would be managed by this federation or the single WUA as the case may be.

Studies as well as experience show that almost all of these water bodies have multiple uses. These water bodies are used by the village community for various domestic water uses (like washing, hygiene, bathing, etc.), irrigation, livestock, and as sites of cultural and religious practices and so on. However, the tendency has been to treat them primarily as irrigation sources though in terms of number of people who use these sources for various domestic uses

(including livestock) is much larger as compared to irrigation users. The institutions like Water Users' Associations (WUAs) are formed primarily taking into account only the irrigation use and only the irrigators become the members. Taking into account the multiple uses of these water bodies the sub-group recommends that the WUAs around these water bodies should be broad based to include all uses and users. In the case of creation of new surface water sources, it is suggested that the concerned PRI (and also the WUA/s, if they are formed) be involved right from the planning stage of the project.

d) Operation and maintenance of the system

Operation and maintenance of the system has been one of the perpetual problems and this has been one of the main reasons for the under performance of this sub-sector. Once the system is handed over to the PRI, ultimately it would be the responsibility of the concerned PRI to see that the system (the inlet channels, storage and distribution system) is properly maintained through the WUA/s. Silting of the inlet channels and the storage itself has been one of the important reasons for many of these systems becoming dysfunctional. Periodic, say once in two years, de-silting needs to be taken up. The local people could be encouraged to take the silt and apply it in their fields either free or for very nominal charges. Part of the water fee collected also could be used for the regular maintenance. Similarly resources also could be mobilised from MGNREGS (and also from watershed development programmes as silt application is one of the activities that could be taken up under watershed programmes) for regular maintenance and upkeep of the system. Some indirect regulations like prescription of community decided cropping pattern, restricting paddy transplanting date, awarding electric connections or debarring loans etc. may check over-exploitation.

e) Equitable access and efficient use

The first priority should be for the various domestic water uses and for livestock and only the remaining water should be used for irrigation. In the case of these MI systems irrigation needs to be seen as more as providing certain number of "critical irrigations" to stabilise kharif and rabi crops based on minimum water norms. Also, importance should be given to low water intensive crops. This would help in creating water access to as many people as possible. The emphasis should be on extensive irrigation as against the intensive irrigation. The WUAs, with the help of the PRIs, should be able to build up consensus amongst the village community about water use

prioritisation, water use norms, access, pricing, maintenance and so on. Based on this consensus the WUAs can also work out a water use plan for the project.

Concerted efforts also need to be made to increase water use efficiency. Apart from the adoption of micro irrigation technologies (like drips, sprinklers or some of the locally available low cost methods like Shriram Fertigation method popular with the horticultural farmers of Maharashtra) efforts should also be made for demand management through proper crop planning and adoption of better agronomical practices to improve the water holding capacity of the soil.

These measures would involve both one time capital cost as well as recurring costs by way of labour (especially for the soil amelioration practices). The sub-group recommends that 50% of the capital cost should come as subsidy (the remaining 50% would be user contribution) and the labour cost can be met through the MGNREGS. The efforts would be to see about 50% of the area under irrigation through the surface MI systems adopt water efficient technologies and methods by the end of XII plan.

f) Financial resources and pricing

The responsibility of the water resource department is mainly source creation as a one time investment and then it is to be handed over to the PRI/WUA. In the case of existing systems, the water resource department should do a comprehensive repair and maintenance prior to the handing over of the system. Once the system is handed over then it is the responsibility of the PRI/WUA to raise the required financial resources for the regular operation and maintenance of the system through user charges, and leveraging resources from the MGNREGS and so on. As a principle there should not be any government subsidy to meet the recurrent costs. The PRI/WUA would have the freedom to decide on the water charges from users. As a principle the water charges should be able to cover O&M costs and not capital costs. Users would also have the freedom to contribute in kind (through material, labour and so on).

g) Data and monitoring

This is an area that needs strengthening as one really does not know what is actually happening as the data is not systematically collected or there is no regular monitoring. Since the MIS systems are dispersed and decentralised it is not advisable to collect data in a centralised manner. Instead it is recommended that the data be collected in a participatory mode (with the

help of high schools/colleges, gram panchayats, NGOs and so on). Though Participatory Rural Appraisal (PRA) type of method is useful to capture qualitative information, it is advised that more quantitative methods that use village cadastral maps to capture information be used for data gathering. Participatory Resource Mapping (PRM) is a good example in this regard. The Water Resources Department should also come up with a format and a protocol for data gathering that can be used by all. In fact the recommendations of the working group on data and data management would be useful here. Since the data is gathered on the basis of cadastral maps and with a common format and protocol it is easy to aggregate the data and also take it on a GIS platform, thus creating a larger data base on surface MI systems. The sub-group recommends that the data thus gathered be made available on public domain.

The data gathered should be fed into both developing optimum water use plans as well as the basis for periodic monitoring. There needs to be two types of monitoring, namely, internal and external. The internal one can be done by the WUA itself, may be twice a year, and the results need to be presented in the gram sabha and also be displayed in the gram panchayat office (something like the "nirak-parak" done under the Rajiv Gandhi Watershed Mission in MP). The external evaluation should be done by credible external agencies on the basis of a minimum 5% sample. It would be better to have a common format and protocol for the external evaluation also as it would be easier for data consolidation at large units or scale. The financial resources required for both data gathering and monitoring and evaluation should be made available by the state Water Resources Departments.

h) Capacity building and piloting

Since the overall approach for the surface MI systems, calls for a departure from the conventional thinking and practice, it is important that extensive capacity building is taken up if the approach has to be grounded in a progressive manner. The capacity building should cover all aspects of water management that include planning, construction, operation and maintenance, water use planning, demand management, micro irrigation technologies and methods, accounts, data collection and monitoring, institutional issues, running of the WUAs and so on. The capacity building should cover department officials, members of the PRIs, office bearers of the WUAs and water users. The Water and Land Management Institutes and NGOs with experience in the water sector could be brought in to take up capacity building.

The sub-group also recommends taking up pilot projects that can ground the suggested integrated approach. This needs to be done in an action research mode so that they provide valuable lessons for scaling up in terms of cost norms, constraints, institutional arrangements, capacity building requirements, policy support and so on. It would be advisable to take up at least 2-3 pilots in each of the agro-climatic zones of each of the state. It may be better to entrust the task of implementing these pilots with credible NGOs but with active participation from the concerned departments, agricultural universities and WALMIs. The XII plan should make a definite financial commitment for this and needs to be coordinated either by the Planning Commission or the Ministry of Water Resources.

i) Convergence

Massive and committed investments have become available in the rural sector under employment guarantee, rural livelihood, watershed development, micro-irrigation, BRGF, etc. Productive assets can be created and self employment guaranteed by using these schemes. Guidelines of these schemes provide for convergence of resources and capacities and should be made full use of. This is the only way of harnessing inter-sectoral complementarities.

4.5.1.1 Implementation of Surface water (Minor) Programmes during XII Plan

a) Accelerated Irrigation Benefit Programme (AIBP)

Considering the good achievement of targets under AIBP during XI Plan under MI, the target for creation of irrigation potential from surface MI schemes under AIBP has been recommended as 1 mHa for XII Plan. Out of this, 0.3 mHa will be created from the MI schemes having Culturable Command Area (CCA) up to 100 hectare and the remaining 0.7 mHa will be created from MI schemes having CCA from 100 to 2,000 hectare.

Development cost is one of the eligibility criterion for inclusion of surface minor irrigation schemes under AIBP. Development cost of the scheme per hectare is up to Rs 2 lakh with the condition that wherever the estimated cost of the project is more than Rs 1.50 lakh per hectare, the AIBP assistance would be limited to cost norm of Rs 1.5 lakh per hectare only. Requests have been received from several States to increase the ceiling. The analysis of date received from Himachal Pradesh, Tripura and Andhra Pradesh indicates that development cost ranges from Rs 2.50 lakh to Rs 3.70 lakh per hectare. Further, the Task Force constituted to examine the AIBP norms has

recommended raising of the present cost norms of minor irrigation projects from Rs 1.5 lakh hectare to Rs 2.0 lakh per hectare in June, 2009. The development cost has also been worked out taking escalation at the rate of 8% per year. The new development cost works out to be Rs 2.938 lakh per hectare. Based on these analysis, it is seen that the actual development cost ranges from Rs 2.5 lakh to Rs 3.7 lakh per hectare. Therefore, Sub-Group has recommended the following development cost for minor irrigation schemes under AIBP:

S.No. Size of the MI Scheme	Development Cost
(1) up to 100 hectare:	Rs 1.00 lakh
(2) 100 to 2,000 hectare:	Rs 2.50 lakh
(3) Mountainous area	Rs 3.00 lakh

The Sub-Group has also recommended the reduction in size of the MI schemes for inclusion under AIBP. For Special Category States, the individual size of the MI schemes should be reduced from 20 hectare to 10 hectare and group of schemes within a radius of 5 km from 50 hectare to 20 hectare. For Non-special category States, the individual size of the MI schemes should be reduced from 50 hectare to 20 hectare.

b) Restoration of Water Bodies

The new scheme for implementation of Repair, Renovation and Restoration. (RRR) of water bodies is under preparation. Number of public water bodies with size upto 2000 hectare is 3.02 lakh, out of which 2.39 lakh are in use and 63,000 are not in use. Investment required for covering 50% of the public water bodies is about 28,500 crores (@ Rs 1 lakh per hectare). Total investment required including capacity building and strengthening of implementation mechanism, concurrent evaluation & impact assessment is a sum of Rs. 30000 crore may be kept for the new scheme for XII Plan area and approximately 2.4 Mha is likely to be restored.

c) Database for Efficient Management

Minor Irrigation is a thrust area of national development. The input of water is vital for realising the full potential of this sector. The optimum development and efficient utilisation of Water Resources, therefore, assumes great significance. Further to make a meaningful move forward, dependable database is of paramount importance. At present there are three main sources of irrigation statistics. These are:

i. Census of Minor irrigation schemes

The Ministry of Water Resources conducts Census of Minor Irrigation Projects on quinquennial basis under the Centrally sponsored Plan Scheme "Rationalisation of Minor Irrigation Statistics (RMIS)". The first census of Minor Irrigation schemes with reference year 1986-87 was conducted in the States/UTs and the report was published in November 1993. The second census with reference year 1993-94 was initiated in September 1994 and the report was published in March 2001. The information in respect of adoption of newly developed technology of Water and Energy Conserving Devices such as Sprinkler and Drip Irrigation System and use of Non Conventional Energy sources such as Solar Pumps and Wind Mills was collected in this round. For the first time the census data was computerized with the help of National Informatics Centre and the results were put on Web Site of the Ministry. The 3rd census of M.I. Schemes with reference year 2000-2001 was conducted in 33 States/UTs and the report was released in November 2005. The 4th Census of MI Schemes has been conducted with the reference year 2006-07 and the report based on data collected from 33 States / UTs will be published soon. This census will further update the information in respect of number of minor irrigation schemes in use, their potential created / utilized, reasons for schemes going out of use etc.

The 5th Census of Minor Irrigation Schemes is prepared to be conducted with reference year 2011-12. The field work of the census is scheduled to be taken up from the month of July 2012 .

ii. Quarterly Progress Report

The Ministry of Water Resources collects data on development of Minor Irrigation (MI) in each State in the form of Quarterly Progress Reports. The Statistical Cells created in the nodal Department of each State/UT under the RMIS Scheme are instrumental in collecting the required information from all the Departments contributing towards the development of Minor Irrigation within the State/UT, getting it scrutinised/consolidated and forwarding the same to the Ministry of Water Resources. However, as some of the States/UTs (where the statistical cells have not been created) do not furnish the above reports, the total picture of Minor Irrigation development is not reflected exactly as the data in respect of such States/UTs are estimated. Efforts are being made to create Statistical Cells in the remaining States/UTs. The main limitation of these reports is that they cover only Govt. funded minor irrigation schemes and that too which were completed during the relevant quarter. The schemes which are taken up by the farmers with the help of their savings

and bank loans are not covered by these reports. Further the area benefitted due to Govt. MI schemes is generally based on adhoc norms.

During the XIIth Plan, it is proposed to complete the 5th Minor Irrigation Census which has began in the last year of XIth Plan. It is proposed to update the information annually through various reports submitted by the nodal states Statistical Cells. In the last year of the XIIth Plan, some studies can be conducted for conceptualizing the next 6th MI census and have improvement over the previous census and to make preparatory efforts for the 6th MI census. It is proposed the modernize the statistical cell once again before the beginning of next census. The total fund requirement during XIIth Plan for RMIS is Rs 127 crore. This includes Rs 56.5 crore towards the Statistical Cells, Rs 66.5 crore towards the 5th MI census and Rs 3 crore towards the studies for 6th MI census.

4.5.2 Strategy for Groundwater Development & Management for Irrigation

a) Change in nomenclature

Groundwater resources are preferred by the farmers in irrigation particularly being available in-situ and can be withdrawn any time depending upon the requirement. However with availability of subsidies in energy, fertilizer, seeds and irrigation systems etc., reliance on groundwater in irrigation sector are increasing tremendously leading to negative impact on ground water resources. However, there are also under- utilized areas where its development needs promotion. Presently, groundwater irrigation is included in Minor Irrigation with surfacewater-minor. It is recommended that "Groundwater Irrigation" is categorized separately to give due attention to the sector in coming years.

b) Overall approach

There is need to bring in strategies for sustainable ground water development with coordinated efforts of central and state organisations so as to effectively manage the precious water resources. The future strategies should focus on sustainable groundwater development in under-developed areas, such as the eastern parts of the country which have aquifers with good yield potential. Schemes of ground water development in under utilized areas, conjunctive use of surface water and groundwater in water scarcity, blending of poor quality with good quality water, artificial recharge through dug wells and enhancing water use efficiency should be the integral part of water resources development in XII plan.

Groundwater resource assessment estimation further needs to give details on feasible areas of groundwater development indicating number of new groundwater schemes possible. Areas in which groundwater development is too low and not feasible for large scale development need to be indicated separately in assessment of the resources and excluded during preparing schemes on groundwater development for irrigation. The groundwater potential created in earlier Plans has been lost in many areas due to non-functioning of old structures. Such structures are also to be looked at for repair or replacement, if positioned in safe areas. A scheme on restoration / replacement of dysfunctional tube-wells / dug-wells is recommended to be launched.

Unutilised ground water resources in hilly terrain also are to be paid attention for proper mapping, exploration and development for creation of irrigation potential. Strong emphasis on IEC activities in XII plan is required to create awareness among farmers for water conservation and community regulation of development. Farmers' participatory approach in sustainable development and management of ground water for irrigation purposes should be encouraged by States on priority basis to bring in involvement and commitment of stakeholders.

Community Tube Wells should be encouraged instead of separate groundwater structures for each farmer in the programs of the Plan. The government shall also take pilots for irrigation infrastructure development and implementation on PPP model of Build Operate and Transfer (BOT) by involving private agencies / farmer communities / Water User Associations with viability gap funding in groundwater irrigation sector. New scheme of groundwater development should also ensure electrification of the area and assured energy supply.

c) Groundwater Regulation

Regulation of ground water extraction through legal means is an effective mechanism to check over-exploitation of ground water under extreme situations. Ground water regulatory measures in India are implemented both at Central and State levels. The Central Ground Water Authority, constituted under Environment (Protection) Act of 1986 is playing a key role in regulation and control of ground water development in the country. Based on data generated through various studies carried out by Central Ground Water Board, the Authority has notified 82 areas in the country for regulation of ground water use. In these areas, construction of new ground water abstraction structures is regulated. In XII Plan, CGWA would further pursue

States to adopt model Bill for groundwater management and regulation and to form State Groundwater Authority (SGWA) for groundwater regulation in over exploited and critical areas, creation of awareness on water conservation, augmentation by stakeholders and emphasis on participatory management by the stakeholders.

d) Data collection and monitoring

Ground water level monitoring is presently being undertaken by CGWB as well by respective State agencies looking after ground water and all the wells broadly fall under the category of Baseline. As a national apex Department CGWB conducts national level ground water monitoring of about 15,000 observation wells which includes dug wells as well as Piezometers in which water level is being monitored four times a year (Jan, April/May, Aug and Nov). Data has been computerized and is available for public use on demand. Further, attempts are being made to provide the data online through internet platform. In addition, about 42,000 observation wells are also being monitored by respective State agencies and they are the custodian of the data in different formats.

During XII Plan, the strengthening of ground water monitoring network should be taken up with following broad objectives:

1. Integration and optimization of the ground water observation network in the country
2. Increasing data collection density and frequency in view of the increasing thrust on community level management of ground water. The number of observation wells need to be increased to at least one observation well for a cluster of 6 villages in the country. Considering the approximate number of 6 lakh villages, the number of Ground water observation wells works out to be about 1,00,000.
3. Establishing suitable mechanism for real time water level / quality data acquisition and dissemination for ground water governance at local level.

The activities involved in achieving the above objectives are:

- Validation of historical data of existing observation wells of CGWB and State Government observation wells
- Integration of state and center observation well networks.
- Construction of purpose-built piezometers to have the desired density of about one observation well for a cluster of about 6 villages
- Optimization of network density & classification of observation wells into Baseline, Trend and Trend cum surveillance stations for monitoring of water levels and water quality.

- Establishment of mechanisms for data processing & data dissemination
- Use of new and emerging technologies for monitoring of water levels, data compilation, processing and dissemination.

Automated data collection and transmission system need to be dovetailed with monitoring mechanism. This technology provides the facility to automatic measurement and automatic transmission of data to centrally located server at a defined interval. The server can be linked to website for data dissemination. The DWLRs can be installed in remote locations fitted with telemetry systems such as GSM cards / with separate batteries for data collection operation and transmission system. The functioning status of the equipment can be monitored from the central server.

e) Capacity Building

Looking at the role of groundwater resources on the supply side, the challenges involved are its development, management, protection, augmentation and regulation for its sustainability, given its vital role in food production. Various issues such as finding new areas for development of ground water resources, accelerated groundwater development in areas with abundant resources, augmentation of groundwater through rainwater harvesting and artificial recharge in water stressed aquifers, protection from salinity ingress and anthropogenic hazards, regularisation of indiscriminate withdrawal and awareness of the stakeholders are important issues which need immediate attention in various parts of the country. Under such circumstances, role of the ground water departments / organizations / stakeholders is important.

As much attention is focused on groundwater resource (in respect of its quantitative and qualitative management) anticipating that water demands at local level in respect of various sectors would be solved up to some extent by sustainable development and management of groundwater resources, the role and responsibilities of groundwater organisations at State and Central levels need a paradigm change to enable them to perform new functions.

Institutional strengthening and strengthening of technical capabilities of groundwater departments, irrigation departments, stakeholders need to be taken care in view of new challenges in groundwater sector in various parts of the country. A threshold level placement of technical staff at survey and monitoring level is essential in each department as all baseline surveys / work cannot be outsourced. Similarly, technical capabilities of the existing staff

need improvement through training and on field application of skills learned during training. Exposures to various successful case studies through field visits and learning together at field level are important issues in capacity building of existing manpower for enabling them to be effective in their new roles in data integration, analysis, groundwater protection and management.

Community participation and creation of mass awareness are also very crucial in for which, in general, groundwater / MI organisations are not well versed and lack ability to mobilise stakeholders. Hence, it is important that technical staff in these organisations be trained on social issues related with groundwater to set their linkage with various categories of stakeholders.

f) Convergence

There is a gap between the irrigation potential created and that utilized. For integrated development, the convergence of MGNREGS with schemes of water resources and agriculture for gap filling and value addition can be made. Dug wells, field channels, various rainwater harvesting structures can be made under MGNREGA and cost of artificial recharge structures, spring development and micro irrigation systems can be accounted from schemes of water resources. Since the DPC/ District Collector / CEO Zila Parishad is coordinator of the programmes at district level, therefore, DPC should converge all these programmes, beginning from planning to monitoring for integrated development of the area.

g) Research & Development

For effective and economical management of our water resources, the frontiers of knowledge need to be pushed forward in several directions by intensifying research efforts in various areas. In the irrigation sector, the science and technology input mainly consists of scientific approach for survey, investigation, design and construction of minor irrigation projects. In the operation and maintenance stage, R&D studies will be required on measured water supply for optimal crop production and higher irrigation efficiency. The Research and Development in the field of controlled irrigation is necessary for soil water management, conservation of surface water, in-situ soil moisture conservation, conjunctive use of surface and ground water and watershed management. It is recommended that extensive research and development activities to be conducted on pilot projects considering agro-climatic zones, hydro-met data, soil classification, moisture retention properties and drainage. Energy management in irrigation sector is another aspect for R&D efforts. There is a dire need for conservation of energy for

agricultural needs. Intensive R&D studies need to be made in the field of renewable and non-conventional energy sources.

Some of the basic fields of R&D studies which would facilitate effective management of ground water resources are sustainable management of groundwater, aquifers protection from deterioration of the water quality and remediate the quality in areas where it has been degraded, effects of climate change on groundwater and strategies for adaptation and setting up possible ground water repositories and sanctuary wells.

4.5.2.1 Implementation of Groundwater programmes during XII Plan

a. State Plan Groundwater Development Schemes

Size of the XII Plan for groundwater irrigation has been worked out on the basis of information collected from the State Governments as well as concerned Central Institutions. All the concerned State Minor Irrigation / Water Resources Departments were requested to send XII Plan proposals along with their position of likely financial and physical performance of XI Plan in prescribed format. Information furnished by the states is indicated as **Annexure 4.1**. The information received has been utilized for working out the State Plan proposals. While analyzing the available data, it is noted that groundwater development per hectare varies from alluvial, hard rock and hilly terrains and has been classified in three categories as Rs 0.50 lakh, Rs 0.80 lakh and Rs 1.50 lakh per hectare in alluvial, hard rock and hilly terrains respectively. However, it may be given due attention that proposed ground water development does not take place in areas having over-exploited / critical and semi critical stage of groundwater development and states monitor the groundwater scenario in program implementation areas so that implementation areas should not reach to critical stage of groundwater development. Similarly, recharge practices in agricultural areas and other feasible recharge areas are implemented by the states with complete technical feasibility and guidance.

1. Scheme on Sustainable Groundwater Irrigation in Potential Areas

The objective of the scheme is to promote development of ground water using tube well / bore well / dug well for providing additional irrigation water in areas with sufficient groundwater potential; to provide additional sustainable irrigation for supporting food security in the long run and enhance farm income and livelihood of the farmers. The development can be envisaged in places, where groundwater development is very low and groundwater development can be brought up to 50% of the annual

replenishable resources. It is proposed to have a ground water development plan/scheme in tribal and drought prone areas with central government subsidy.

Under the scheme, 840656 number of ground water abstraction structures / schemes (Dug well, Tube well and bore wells) and installation of 112481 sprinkler systems and drip irrigation systems are envisaged to be implemented in five years of the XII Plan. It is proposed to provide central funding as 70% subsidy on cost of installation of TW/BW and DW (including pumps and accessories) and cost drip or sprinkler systems. Emphasis has been given to establish dedicated ground water system and data centre in each state with fund allocation of 2 % cost of the scheme. Provision of impact assessment with socio-economic component and establishment of Farmer Water Schools at village level for Knowledge strengthening of farmers are also recommended with central funding to states. Vibrant NGOs at local level are proposed to play role of motivating and educating farmers on sustainable ground water development and management in the scheme. Further, to protect farmers from incurring losses due to failure of wells it is proposed to waive off 10 % farmers contribution. A risk provision to compensate the farmers contribution is proposed under the scheme for such cases which will be 1% of the total cost of the scheme.

A provision of Rs 9000 crore has been proposed under tribal and drought prone areas as centrally sponsored scheme and 1.12 mHa ground water irrigation potential will be created.

2. Artificial Recharge Schemes for Additional Potential Creation

i) Scheme on Artificial Recharge to Groundwater through Dugwells

Looking at the performance of old scheme on Artificial Recharge to Groundwater through irrigation dugwells in which more than one lakh dugwell recharge structures have been constructed even though the cost of the recharge structure was too low (Rs 4000/- average) and subsidy was released through NABARD to farmers' bank accounts, a new scheme on "Artificial Recharge of Groundwater through Dug wells" is recommended as centrally funded state sector for implementation by states in XII Plan keeping target of constructing 34.3 lakh dug well recharge structures on existing irrigation dug wells and providing 17.16 lakh micro irrigation systems (on 50% of the dugwells on which recharge structure would be constructed by the farmers). The focus area of scheme is OE/ Critical/ Semi-Critical Blocks falling in states of AP, MP, TN, Maharashtra, Gujarat, Karnataka, Rajasthan, Kerala, Chhattisgarh and Bundelkhand region of UP & MP.

The objectives of the scheme are facilitation of ground water recharge through existing irrigation dugwells particularly in hard rock terrains by involving farmers' / stakeholders for improvement in ground water situation in the affected areas. Implementation can help in increasing the sustainability of dugwells during lean period and can improve the overall irrigated agricultural productivity, drinking water availability, socio economic conditions and quality of life of the people. Salient features of the scheme proposed are 100 % subsidy to all categories of farmers @ Rs 15000/- per dug well recharge structure, 50% subsidy to Small & Marginal farmers on drip irrigation, cost of O&M of recharge structures and provision of convergence between IWMP, MGNREGA, NHM, National Food Security Act by the states.

The scheme also envisaged to facilitate the strengthening of the institutional framework, creation of awareness and capacity building of beneficiaries and overall community involvement in water resource management and creation of additional Ultimate Irrigation Potential of the order of 1.43 mHa. A provision of **Rs 10,425 Crore** is proposed for State Plan for implementation during XII Five Year Plan.

ii) **Scheme on Accelerated Artificial Recharge to Groundwater**

A scheme Accelerated Artificial Recharge to Groundwater is also proposed with 100% funding for construction of artificial recharge and rainwater harvesting structures for up scaling artificial recharge countrywide. The objectives of the scheme are to focus on up scaling artificial recharge of groundwater as a national programme, sustainability of groundwater resources at shallow depths and supplement additional groundwater resources for irrigation and drinking water for future food security in the country. The areas proposed to be emphasized under the scheme would be the districts having groundwater Overexploited /Critical blocks / Semi-Critical areas, drought prone areas, urban areas, salinity ingress inland and coastal areas, hilly terrains and low groundwater quality areas.

It is proposed to implement recharge scheme/ projects by Panchayati Raj Institutions / Urban local bodies / Water Users' Associations or otherwise deptt. / organisation / NGO or primary stakeholders of water resources. Capacity building of engineers/ hydrogeologists / PRI / Water Users' Associations / Urban local bodies implementing artificial recharge / rain water harvesting techniques, impact assessment of artificial recharge and performance evaluation of the scheme is also proposed to be made integral of the scheme.

A provision of **Rs 15,000 crore** are proposed under State Sector Scheme for implementation of the scheme in XII Five Year Plan.

3. Scheme of Groundwater Management & Regulation

The development activities over the years have adversely affected the ground water regime in many parts of the country. There is a continuous growth in overexploited and critical areas in the country. There is need for scientific planning in development of ground water under different hydrogeological situations and to evolve effective management practices for better ground water governance. Ground water management is the foremost challenge being faced by the organizations dealing with ground water in the country. The activities of the organizations need to reflect the priority issues with the overall objective of providing water security through ground water management in major parts of the country. Central Ground Water Board with vast experience in the ground water sector has taken up the proactive role in identifying various key issues on ground water management.

The major activities proposed during XII plan will be as follows-

- i)** Aquifer Mapping
- ii)** Strengthening of Ground Water Monitoring Observation Well
- iii)** Participatory Ground water Management
- iv)** Technological Up-gradation
- v)** Restructuring and Strengthening of CGWB.
- vi)** Other Activities like Ground Water Resource Assessment, Publication, Information Dissemination, Regulation, Technical assistance to State and Central Organizations

i) Aquifer Mapping

It is proposed to take up aquifer mapping to delineate the aquifers as units for water management in the country. Aquifer mapping is a multidisciplinary scientific process wherein a combination of geologic, geophysical, hydro-geologic, hydrologic, and quality data are integrated to characterize the quantity, quality, and distribution of ground water in aquifers. This will provide much needed information for aquifer management, planning and development of the ground water resources of the country. It also envisages to develop a web based Aquifer Information and Management System (AIMS) on GIS platform for sustainable management of ground water resources. The major activities of Aquifer mapping will be as follows:-

- Aquifer mapping at 1:50,000 scale shall be taken in priority areas.
- Preparation of aquifer maps in GIS platform by depicting in aquifer geometry in 2D/3D.

- Developing aquifer wise ground water management plan.
- Developing Aquifer Information Management System to facilitate aquifer-wise management.

The total cost of aquifer mapping project proposed is 4000 Crore.

ii) Strengthening of Ground Water Observation Well

Monitoring of ground water levels and water quality parameters through a well established and optimal ground water monitoring network is of critical importance for any ground water development and management program. CGWB maintains a national level of ground water monitoring of about 15000 observation wells which includes dug wells as well as purpose built Piezometers in which water level is being monitored four times a year (Jan, April/May, Aug and Nov). Data has been computerized and is available for public use on demand.

The strengthening of ground water monitoring network is proposed to be taken up for increasing data collection density and frequency in view of the increasing thrust on community level management of ground water. Establishing suitable mechanism for real time water level / quality data acquisition and dissemination for ground water governance at local level is also proposed.

During XII plan 10,000 piezometers are proposed to be constructed by CGWB in priority areas and 10% of the wells shall be fitted with DWLR and telemetry system. The increased wells are to be monitored in participatory mode involving Panchayati raj institutions and civil society. The proposed ground water level and water quality monitoring network with well-established monitoring protocols would provide base for planning development of ground water as well as adopting timely suitable management measures. As envisaged under XII plan 10,000 piezometer are proposed to be constructed with the tentative cost of Rs 145 crore.

iii) Participatory Groundwater Management

Participatory ground water management is proposed to focus on 1) Community participation for management of ground water resources; 2) define the principles of participatory groundwater management; 3) establish a framework for a programme of participatory groundwater management in ground water stressed areas and 4) facilitate capacity building of stakeholders for sustainability of such programmes and up scaling of the

same by state agencies. Pilots in five states are being proposed to be taken up in few blocks/districts of Rajasthan, Karnataka, Maharashtra, Tamil Nadu, Bundelkhand (UP). The proposed framework is envisaged to be a flexible and living document that will assimilate lessons from new initiatives and as well as new lessons from existing ones. The framework is based on the principles from the integrated water resources management approach for stakeholder analysis and assessing total water availability. The pilot projects has been bifurcated in three phases of activities which will targets for achieving the development of the following in each phase are given as below:

- Phase 1: Information tools for decision-making and local institutional capacity development.
- Phase 2: Capacity Building, Surveys and Analysis.
- Phase 3: Sustainability and Scale up.

The cost proposed is **Rs 76 crore**.

iv) Technology Up-gradation

The emerging challenges of ground water being faced in the country and the available techniques and equipment with which CGWB is pursuing for scientific management of ground water resources needs to be upgraded. The technological advancements being utilized worldwide should be introduced in CGWB to upgrade the institutional, infrastructural and human resource capabilities and bring CGWB to an international level with best possible techniques and technologies for better management of ground water resources in the country.

For ground water exploration purposes, existing fleet of rigs of CGWB has become obsolete and outdated. It is proposed to acquire new drilling rigs for alluvial, hilly and hard rock terrains to enhance the efficiency and output of drilling. Latest software like ARC GIS software, Mapinfo, MODFLOW, ERDAS, CORAL DRAW, AUTOCAD, are proposed to be procured and utilized during the Plan. Total cost of technological upgradation of CGWB is estimated as **Rs 304 Crore**

The total cost proposed for scheme of "Groundwater Management & Regulation" is Rs **4655** crore.

4.6 RECOMMENDATIONS

4.6.1 Recommendations of the Sub-Group on Minor Irrigation

The Working Group of Minor Irrigation & Watershed Management made the following recommendations in respect of minor irrigation.

i) Change in the nomenclature

Distinction is to be made between surface water (Minor Irrigation) schemes and groundwater irrigation schemes. The name of the surface water minor irrigation schemes may be changed to "Small Scale Irrigation Schemes" having CCA from 100 to 2,000 hectare and "Tiny / Mini Irrigation Schemes" having CCA up to 100 hectare and "Groundwater Irrigation" may be classified separately.

ii) Modifications suggested in AIBP-SW (MI) component

- ❖ The development cost for surface small scale irrigation schemes under AIBP be enhanced from Rs 2.0 lakh per hectare to 2.5 lakh per hectare and for tiny / mini irrigation schemes, it would be Rs 1 lakh per hectare. For mountainous area cost should be Rs 3 lakh/ha.
- ❖ Small scale irrigation schemes / tiny / mini irrigation schemes falling in desert area be also funded at par with projects in DPAP areas under AIBP and these projects would be eligible for 90% grant under AIBP.
- ❖ For special category states i.e. North-Eastern States, Hilly states (Himachal Pradesh, J&K and Uttarakhand) and undivided Koraput Bolangir and Kalahandi (KBK) districts of Orissa and the LWE districts, the size of individual small scale surface irrigation / tiny / mini surface irrigation schemes be reduced from 20 hectare to 5 hectare and size of cluster of surface small scale irrigation / tiny / mini irrigation schemes within a radius of 5 km be reduced from 50 hectare to 20 hectare for inclusion under AIBP.
- ❖ For Non-special category states (all other states not covered in special category states), the size of the individual surface small scale irrigation / tiny / mini irrigation schemes be reduced from 50 hectare to 5 hectare.
- ❖ Efforts to be made to integrate the smaller, dispersed water bodies and irrigation systems, wherever possible, with the medium and the large projects.
- ❖ The tiny / mini irrigation schemes (CCA 0-100 hectare) should be implemented by PRIs not State Government.
- ❖ A system of monitoring at the level of Panchayats should be developed by integrating with the scheme of computerization of Panchayats.

- ❖ About 5 to 10% of the capacities of large and medium projects to be diverted to the small water bodies during the monsoon and post monsoon period so as to increase the dependability of these water sources and the irrigation systems.
- ❖ Emphasis should be given to utilisation of the already built up potential as compared to new potential addition as the gap between potential created and utilised has been widening at an alarming rate over time.
- ❖ All the small surface irrigation systems should be brought under the purview of WUAs during the plan period. The WUAs have to be accountable or a sub-committee to the PRIs.
- ❖ The membership of WUAs set up on these systems should include all the non-irrigation users also as all these systems are multi-use systems.

iii) Operation & Maintenance

The operation and maintenance (O&M) should be fully entrusted to the WUAs (and to the PRIs). The village community should be allowed to take the silt from the water storage areas and the inlet channels of these water bodies as per the norms and procedures set by the WUA in consultation with the concerned PRI. Similarly funds from MGNREGA and watershed development could also be used to partly pay for the labour costs for silt removal and applying it to the field as an activity. This could be taken up under MGNREGA. The WUA and the PRI should make efforts to bring in more equity in distribution of water from these small water bodies by going for extensive irrigation and not intensive irrigation.

iv) Data collection and Information System

Systematic data collection needs to be collected with the involvement of the people on the basis of a commonly agreed protocol so that the data can be aggregated at different scales. There is also a need to map all small surface water bodies, recharge structures, bore and dug wells, etc. using GIS. Regular monitoring and evaluation also need to be done. All the collected data and evaluation reports needs to be put on public domain. A provision of 1% of total outlay of this sector should be made available for this purpose.

v) Capacity Building

There is a need for a good and extensive capacity building to improve water use efficiency, deficit management (particularly during droughts), data collection, aquifer mapping, monitoring, water use planning, demand management, O&M, process and procedures of WUA, and participatory management. Capacity building of the different stakeholders – starting from the users, office bearers of WUAs, PRIs, NGOs involved in the sector, to the

department officials – needs to be taken up seriously. The training and capacity building should include areas like and so on. Dedicated agencies in the form of Support Resource Organisations (SROs) – in the model of the Support Voluntary Organisations under the CAPART watershed programme – needs to be identified for this. About 2% of the total outlay of the sector should be earmarked for this.

vi) Groundwater Development of Underdeveloped Areas

Areas where ground water is not developed should be prioritized for development in states. The development can be envisaged in places, where groundwater development is very low and groundwater development can be brought up to 50% of the annual replenishable resources. It is proposed to have a Ground Water Development Scheme for Irrigation in tribal and drought prone areas with central government subsidy.

vii) Artificial Recharge through Dug-wells

It is proposed to have new scheme on “Artificial Recharge to Groundwater through Irrigation dugwells” in OE/ Critical/ Semi-Critical Blocks falling in states of AP, MP, TN, Maharashtra, Gujarat, Karnataka, Rajasthan, Kerala, Chhattisgarh and Bundelkhand region of UP & MP with central subsidy.

viii) Accelerated Artificial Recharge

Accelerated Artificial Recharge to Groundwater is proposed with the objectives to focus on sustainability of groundwater resources at shallow depths and supplement additional groundwater resources for irrigation and drinking water for future food security in the country

ix) Pilots on participatory groundwater management

Community Tube wells instead of separate groundwater structures for each farmer is to encouraged in programs of the XII Plan

x) Strengthening of ground water monitoring network

Strengthening of ground water monitoring network is proposed for increasing data collection density and frequency in view of the increasing thrust on community level management of ground water. Up-scaling of participatory groundwater monitoring by involving PRI & Civil Societies and developing Aquifer Information Management System to facilitate Aquifer wise management

xi) Institutional strengthening and strengthening

Institutional strengthening and strengthening of technical capabilities of groundwater departments, irrigation departments, stakeholders need to be taken care in view of tackling new challenges in groundwater sector in various parts of the country. Minimum emplacement of technical staff at is

essential in each department as all baseline surveys / work cannot be given for outsourcing.

xii) PPP Pilots irrigation infrastructure development

Pilots are proposed for irrigation infrastructure development and implementation by involving private agencies / farmer groups / Water User Association with viability gap funding in groundwater irrigation sector.

xiii) Mapping of groundwater in hilly areas

Unutilised ground water resources in Hilly terrain also to be paid attention for proper mapping, exploration and development for creation of irrigation potential.

4.6.2 RECOMMENDED PHYSICAL / FINANCIAL TARGETS FOR XII PLAN

All the states were requested to furnish their physical & financial targets for XII Plan. The physical and financial targets have been received from 15 states indicating a cumulative target of 2.0 mHa for surface water and 4.13 mHa from groundwater. The target for creation of irrigation potential from Ground MI schemes under two schemes has been recommended as 2.55 mHa. Keeping in view the Achievement received during first three years of XI Plan for Surface Minor Irrigation Schemes, a target of 1.50 mHa for the XII plan has been proposed from Surface Minor Irrigation. Out of this a target of 1.0 mHa has been kept from Minor irrigation schemes under AIBP and remaining 0.5 mHa has been kept for Minor irrigation schemes to be implemented by States from own resources. The target for creation of irrigation potential from Ground MI schemes has been proposed as 6.55 mHa. Thus, the target for creation of minor irrigation potential for the XIIth Plan has been kept as 8.05 mHa.

It has been stressed earlier that restoration of water bodies and the ERM of surface MI schemes would require due attention in future in view of burgeoning gap in utilization. A target of 2.4 mHa has been set from the proposed new schemes for Repair, Renovation and Restoration. (RRR) of water bodies in XII Plan.

Thus, the target for creation of minor irrigation potential for 12th Plan has been kept at 10.45 mHa.

Table 4.6.2 Proposed Physical & Financial Targets for MI for XII Plan

S. No	MI Sector	Physical target (Mha)	Development cost (Rs. lakh)	State Plan	Central Plan	Total investment required (Rs. crore)
1	Surface Water Under AIBP Schemes from 100 to 2000 ha Schemes upto 100 ha By States ----- Sub Total	0.7 0.3 0.5 ----- 1.5	2.5 1.0 2.5 -----	12,500.00	17,500.00 3,000.00	33,000.00
2.	Ground Water Development Schemes / Programs by States Alluvial Hard Rock Hilly Area Sustainable ground water irrigation development programme in NE States Artificial recharge of ground water through irrigation dugwell in hard rock areas Scheme of Groundwater Management & Regulation ----- Sub Total	3.4 0.5 0.1 1.12 1.43 ----- 6.55	0.50 0.80 1.50 0.75 0.72 -----	17,000.00 4,000.00 1500.00 9000.00 10355.00	4655.00	46510.00
3.	Repair, Renovation & Restoration of Water Bodies (*Area bridging the gap between potential created and potential utilized)	2.4	1.00	30000.00		30000.00
4.	Investigation, R&D and Awareness Programme	LS		40.00	10.00	50.00
5.	Best practices Pilots on Stream tank integration Scheme on Accelerated Artificial Recharge to Groundwater in feasible areas	LS LS		50.00 15000.00		50.00 15000.00
6.	RMIS	LS			127.00	127.00
	Grand Total	10.45		99440.00	25292.00	124732.00