Executive Summary

Water Security

The term, 'Water Security' implies provision of easy access to water, making it available where it is needed to the growing population, in a timely, adequate and affordable manner. It is defined quantitatively in terms of annual per capita availability of fresh water to fulfill different sectoral needs. About 1,700 cubic metres per annum per head is considered as the minimum provision to provide water security for a nation.

Water Security in the Global and National context

The present status of availability of water in the global context is rather alarming. Only 2.5 percent of the total quantity of water on the earth is fresh and only a fraction of that is accessible. Presently 1.1 billion people of the world population lack access to clean drinking water and more than 2.4 billion people lack adequate sanitation. In another 25 years, two-thirds of humanity may live in nations running short of water. In the Indian context, about 100 to 140 litres per day per head is needed for drinking, bathing, cooking and other basic needs. Water scarcity impacts on health, availability of food, fodder, biomass and the conditions in which the people and all other living beings co-exist.

Status of water security in Tamil Nadu

Tamil Nadu receives an average normal rainfall of 979 mm. About 60 percent of the ground water potential has been utilised already. Surface water potential has also been utilised to an extent of 97.5 percent. For the year 2004, the total demand for different sectors is 32,665 Mm^3 and is likely to go up to 35,820 Mm^3 in 2050. But available total water potential is only 28,361 Mm^3. Hence, the deficiency of 4,303 Mm^3 in 2004 is likely to go up to 7,459 Mm^3 in 2050. The 66 reservoirs in 17 river basins and about 39,000 minor irrigation tanks are inadequate to meet the total demand for water in Tamil Nadu and as such, Tamil Nadu comes under the category of water-starved States.

Project Evolution

Lack of adequate water has become a major constraint for development. The planners and decision makers in charge of water resources are fully aware of the water security aspects and are presently engaged in finding innovative solutions through development initiatives. As DHAN Foundation, a Professional Development Organisation, based at Madurai, has been executing projects successfully in the area of micro watershed development, the State Planning

Commission has entrusted the preparation of a project report on water security in the State with a focus on the following:

- ❖ Creation of water bodies for harvesting of water in micro-watersheds
- ❖ Rehabilitation of existing water bodies and
- ❖ Soil and water conservation measures on watershed basis

Methodology

The DHAN research team adopted a variety of methodological approaches starting from review of literature, secondary data collection from government departments / Organisations, academic, research institutions and by interaction with selected people /community groups, browsing from internet, consultations with renowned experts like Dr. M.S. Swaminathan, Prof. A. Mohanakrishnan, Prof. R.K. Sivanappan, Er. S.M. Ratnavel, discussions with administrators namely Secretary Agriculture, Member Secretary, State Planning Commission, Director of Rural Development (Training) and a few District Collectors. The DHAN research team has also received guidance and input from the advisory group constituted within DHAN Foundation in order to add value.

Before getting into an assessment of micro-watershed development in an integrated manner in the State so as to ensure water security, the research team reviewed the present status of development like coverage in terms of area treated, number of watersheds developed, investments made and source of funding, especially at block level, in the three areas namely, Surface Water, Groundwater and Watershed Development.

Water Resources Initiatives in Tamil Nadu: A Review

Tamil Nadu has a long tradition of water resources development from the age of kingdoms ruled by Cheras, Cholas, Pandyas and Pallavas. From then onwards, different stakeholders got involved in the development of water resources in the State over a period of time. The present Water Resources Organisation, carved out from Public Works Department played a significant role in the development of major and medium irrigation projects. As almost all the possible sites for locating reservoirs have been utilised, government had to pay attention to rehabilitate, modernize and increase the efficiencies of existing irrigation systems. The World Bank provided its assistance to National Water Management Project, Water Resources Consolidation Project and National Hydrology Project. Similarly USAID came forward to support the initiatives of government to establish a training institute for water management. The European Union sponsored the rehabilitation of minor irrigation tanks

managed by Water Resources Organization (WRO) in three phases commencing from 1984 to 1999. While providing the financial support to government, the World Bank suggested to the State to enact Tamil Nadu Farmers' Management of Irrigation Systems Act, in order to pave way for 'Turn over' of the irrigation system for joint management by the WRO & the community.

As there exists little scope for undertaking new major and medium irrigation projects, the State provides ample scope for developing minor irrigation potential through rehabilitation of tanks and improving their system performance. The performance improvement of tanks is very essential to stabilize tankfed agriculture in rural Tamil Nadu. Tanks irrigate nearly 6.33 lakh hectares of cropped area directly and they also contribute to the recharge of ground water in dug wells and tube wells. The monitoring and evaluation study commissioned by Centre for Water Resources, Anna University to evaluate the European Economic Commission assisted tank rehabilitation works in Phase-II extension programme, supports the necessity of taking up rehabilitation of tanks through people's participation on a massive scale.

The groundwater sector in Tamil Nadu at present experiences two major forms of 'negative externality' namely, the 'depletion' due to fast and indiscriminate extraction of groundwater and the 'degradation' due to pollution of different kinds. The electricity consumption by pumpsets for agriculture purpose has been soaring up since 1970-71 due to the government policy of providing free electricity. This has caused not only revenue loss to State owned Electricity Board, but more importantly, deprivation of access to groundwater to the poorer sections of the farming community who could not afford to invest on wells. The groundwater regime can be improved only by designing recharge structures wherever possible, rehabilitating existing water bodies like tanks and ponds and undertaking watershed development works.

Watershed Development Initiatives in Tamil Nadu: A Review

There are about 11 schemes of site specific and contextual nature taken up since 1970's. The Watershed Development Programmes in the State have been implemented by different Project Implementing Agencies, concentrating on soil and water conservation and rainfed area development. But the efforts made by various Project Implementing Agencies till 2001-2002 led to treatment of 18.38 lakh hectares in 3,340 micro watersheds with an investment of Rs. 867.20 crores. There are 19,240 micro watersheds in Tamil Nadu

The post project reviews of the watershed development programmes implemented by various Project Implementing Agencies have brought out the following deficiencies: -

i) *Lack of Professional Competence in Planning and Implementation*
ii) *Absence of appropriate management system*
iii) *Failure to make an integrated approach*
iv) *Inadequate people's participation*
v) *Lack of monitoring and evaluation*
vi) *Frequent change of senior staff*
vii) *Lack of co-ordination among the agencies working in the watershed*

The watershed development projects implemented in the State so far and now under implementation cover only 10 percent of the area of drylands and the wasteland development projects cover only one percent.

Inference from the Literature Review

The research team, based on the three thrust areas given for the preparation of project report on water security, inferred that Tamil Nadu should go in for a massive development of all micro watersheds in different ecosystems for ensuring water and food security and also poverty alleviation in a sustained manner. Since the prime source of fresh water is rainfall, water harvesting becomes highly important which should be in-built in micro-watershed development interventions. The aim of water harvesting is to mitigate the effects of temporal shortages of rain, so called dry spells to cover household needs as well as productive use.

Ensuring water security through development of all micro-watersheds in the State should be seen as an ever-evolving situation to get the most out of limited water resources potential of 28,691 Mm^3 by optimum utilization. Water security, to be meaningful, has also to be sustainable. The rate of replenishment of natural assets will have to be kept constantly higher than that of their depletion to meet the emerging needs. Sustainable water security implies a whole range of public policies and concerted public action for safeguarding, conserving and enhancing resources, laying down the direction of investments, selecting the right technologies and bringing about the required institutional and attitudinal reforms.

People led Water Security

From the past experiences and learnings on watershed development and a few selective success stories facilitated by the NGOs, namely Ralegaon Siddhi, Tarun Bharat Sangh, DHAN Foundation etc., it is concluded that water security warrants "People's Lead". To make this happen, a shared vision among the planners and policy makers (who are responsible for drafting as well as implementing different schemes on micro watershed development) is considered essential.

As a follow-up of workshop on Vision Building, the research team under the guidance of the advisory team drafted Shared Vision, Mission Statement and Propositions for People led water security, which are indicative. These are broad concepts, principles and guiding philosophies to formulate suitable schemes.

VISION 2025: Shared Vision for People led Water Security

Warrant as well as ensure clean, hygienic, adequate and sustainable supply of water to the people of Tamil Nadu (living both in rural and urban areas) with adequate provision for livestock.

Assure rational water use through reallocation of water between intra and inter sector to fulfill the future demands with restricted supply.

Treat all micro-watersheds situated in the various eco-systems through community stake owned processes and systems in a nested institutional set-up, with effective coordination.

Enforce stringent measures to prevent degradation and decimation of the present water resources including traditional water bodies like tanks, ponds, temple tanks and others from pollution, over-exploitation of groundwater and wastage.

Revive all the small-scale common water sources (tanks, ponds, springs, swamps, etc) and defunct private infrastructures (wells) and fulfill their ecosystem functions without jeopardizing their future use by adopting simple, cost-effective, manageable, eco-friendly technology.

The shared vision on People Led Water Security should have the following five elements:

i) *Livelihood and Conservation*

ii) *Re-look at water use (towards surface based civilization)*

iii) *Building Social Capital for Local Management*

iv) *Pro active management of droughts and floods*

v) *Enabling policies, research (database) and gender balanced water development programmes*

Mission Statement

From the Shared Vision, the following Mission Statement is evolved.

> ***"With the Active Participation of all Stakeholders and making WATER everyone's concern, let us all strive to meet the demand for water from various sectors without degrading the ecosystem within two decades, so as to make the living conditions better for all."***

Propositions

The research team has also evolved the following propositions for the People led Water Security, which in turn would guide the State to evolve policies and strategies.

- *Participatory programs perform best*
- *Integration of Gender and Development process*
- *Watershed Plus is the need of the hour*
- *Addressing inequalities should be mandatory*
- *Augment collaboration by inviting Public-Private Partnership*

Eco-System based Watershed Classification

The land is traditionally classified under various situational conditions and ecosystems following the ancient land classification principles as given below.

Kurinji	Hilly and Hillside lands
Mullai	Forest, interface rainfed agricultural, barren and wastelands
Marudam	Plains, cultivated wet and rainfed lands
Neithal	Coastal lands
Palai	Desert lands

The team undertook a strenuous exercise of classifying all micro watersheds spread over 385 development blocks in the State, based on the watershed boundary from the Watershed Atlas and on the land use pattern in each block. After grouping the watersheds based on 500 ha treatment area, the total watersheds in each eco-system have been distributed among the cross cutting themes as shown in Table 1.

Table 1. Eco-System based Watershed Classification

(Units: Number of micro watersheds)

Sl. No	Ecosystem	Total Number of watersheds	Cross cutting Themes						
			Canal command watershed	Tank based watershed	Ground water Intensive watershed	Rainfed agriculture watershed	Wasteland watershed	Exclusive Forest watershed	Coastal watersheds
1.	Hilly & Forest based micro watersheds	3370	50	300	370	1050	400	1200	
2.	Irrigated watersheds	4450	1300	950	2200				
3.	Rainfed Agriculture based watersheds	9040		1560	1650	2340	3490		
4.	Coastal micro watersheds	1930	290	395	70	465			710
5.	Urban watersheds	450							
	Total	**19240**	**1640**	**3205**	**4290**	**3855**	**3890**	**1200**	**710**

The futuristic eco-system based watershed development with a focus on water security, integrated with local issues could be developed, based on the figures shown above. The State's immediate effort may well be on development of a unique plan of saturating all micro watersheds through long term (say 20 years) development by taking each one based on its situation and integrating issues within them for a holistic development and sustainability. The common guidelines, norms and time prescriptions would not be relevant for the State because of the watersheds being situated in five different eco-systems with cross cutting themes like rainfed agriculture, wasteland, tank based, ground water intensive, canal irrigation intensive watersheds. Eminent Agricultural Scientist and Vice Chairman of State Planning Commission Dr. M.S. Swaminathan has also reiterated that every Gram Panchayat needs to develop a water management strategy according to its context with the three components of water conservation, its sustainable use and equitable sharing. This would be possible only when People's participation and implementation of watershed development take place as a "Movement" in place of contemporary target oriented, technology driven and top-down approach by the government agencies.

Perspective Plan for Integrated Micro Watershed Development

The perspective plan for micro watershed development envisages the conservation of water and land resources in a holistic manner. The research team termed the eco-system based watersheds, which are to be developed, as New Generation Watersheds. The treatment of these watersheds would ensure water security.

Relevance of New Generation Watersheds

- No deviation/ minimum deviation between ideas and action while implementing watershed programmes
- In order to have Sustainability and long Shelf Life, each watershed would require at least 7-10 years instead of the present 5 years constant term.
- When the period of implementation extends upto 7-10 years, the additional resources needed can be met by having a judicious mix of grants and loans; Private and Public finance (eg.) Rural Infrastructure Development Fund)
- New Generation Watersheds need to be driven more by development focus rather than technology alone.

The New Generation Watersheds must look into integration of Tanks, Ponds, Streams and Springs (TAPSS) because TAPSS are 'Living Eco-system' situated within the micro watershed. Many of them are in a dilapidated condition. It therefore provides ample scope for undertaking tank based micro-watershed development at cascade/sub-basin level. Development or rehabilitation of tanks, ponds and other water bodies existing in the micro

watersheds will provide immediate benefit to the people and livestock and in the long run, enhance the surface and groundwater potential which is the prime objective of any watershed development programme. The ground water storage so augmented must be reserved for drinking water and protective irrigation.

Finally, the watershed should integrate all developmental issues of the concerned watershed. Each micro watershed must be developed by the people formed into a watershed association instead of the present guidelines driven myopic watershed committee having selective representations within the watershed. Through incorporation of the 'missing links' in conventional watershed development, the New Generation Watershed might address issues like groundwater disaster and water rights.

Capacity Building for New Generation Watersheds

There is a need to define capacity building in the context of watershed management to different stakeholders involved in this task. Capacity building needs to be related to the operational domain of the following three streams. The functions of the three streams are given in the following sections.

Demand stream	Building Social Capital
Supply stream	Investment for Development
Enabling stream	Facilitation for Institution Building and People's Movement

Demand stream

Demand stream includes the villagers who are mainly the unorganized. Capacity building of demand stream includes orienting the villagers towards watershed concept, stake building, facilitating their contribution towards physical infrastructure development, organizing them into either SHGs or functional groups like tank association, dry land farmers association, etc and building the capacities of the people's organizations promoted within watershed for successful interface and collaboration with the supply stream.

Supply stream

Supply stream includes both Central and State governments, apex banks like NABARD and other financial institutions, funding agencies, academic institutions etc involved in facilitating watershed development through Project Implementing Agencies and also ensuring adequate funding for physical infrastructure development focusing on soil and water conservation.

Enabling stream

Enabling stream includes the NGOs involved in promotion and development of user groups, functional groups and watershed associations through social intermediation. The regulatory and government bodies, and policy-making institutions also form part of the enabling stream as they play a critical role in providing favourable policy framework and supportive environment enabling the development of the micro watershed.

Proposed Approach and Strategies in New Generation Watersheds

Sl. No	Cross cutting Themes / Ecosystem	Approach	Strategies
1.	Hilly & Forest based watersheds	• Preservation, • Conservation	• Soil & water conservation • Afforestation
2.	Canal Irrigation based watersheds	• Conservation, • Effective use of water & management	• Improving water use efficiency and land drainage
3.	Tank based watersheds	• Conservation, • Development & use • Equitable water management.	• Water conservation • Revival of tanks & ponds • Water management
4.	Ground water based watersheds	• Effective water management, • Pumping regulation • Staggered power supply	• Water management, • Revival of defunct wells, • Artificial recharge
5.	Rainfed Agriculture based watersheds	• Conservation	• Improved agriculture • Water conservation
6.	Coastal area watersheds	• Conservation, Development & use	• Creation of additional water harvesting structures
7.	Urban watersheds	• Conservation, • Effective management & use of water	• Roof water harvesting • Revival of urban tanks & ponds • Desilting of temple tanks • Clearing waterways and channels from encroachments
8.	Wasteland / barren land dominated watersheds	• Development & use	• Afforestation • Fuel and fodder development • Water conservation

Proposed Budget for New Generation Watershed Development

No development is possible without mobilization of adequate and timely financial resources as well as their effective utilization towards the purpose for which they are intended. Accordingly, the budget lines have been prepared for both hardware interventions and non-physical development interventions.

Table 2. Budget required for Physical infrastructure development in New Generation Watersheds

Sl. No	Ecosystem / Cross cutting themes	Total number of micro watersheds	Unit cost in Rs. per hectare	Total budget required in crores
1.	Hilly & Forest based watersheds	1200	25,000	1500.00
2.	Canal irrigation based watershed	1640	8,000	656.00
3.	Tank based watershed	3205	15,000	2403.75
4.	Groundwater based watersheds	4290	12,000	2574.00
5.	Rainfed Agriculture based watersheds	3855	10,000	1927.50
6.	Coastal areas watersheds	710	20,000	710.00
7.	Urban watersheds	450	25,000	562.50
8.	Wasteland dominated watersheds	3890	10,000	1945.00
Total		**19240**		**12,278.75**
Treated watersheds		3340		867.20
Net amount required				11,411.55
Rounded to				**11,500**

A budget of Rs. 11,500 crores would be needed for developing all the micro watersheds, which would include the cost for stabilizing the already developed watersheds.

Total Budget required (at 2004 price levels) is Rs. 11,500 crores

The 'hardware' component of watershed development generally outweighs the software aspects. The absence or low allocation to watershed development activities other than technology driven interventions, will create constraints in the sustainability of the whole programme. Hence, the water security through integrated micro watershed development must integrate the following activities along with physical infrastructure development and the fund required for each of the activity is presented below.

Table 3. Budget for non-physical infrastructure development in New Generation Watersheds

Sl. No	Activity	Unit Cost in crore Rupees	Number of Units	Total Investment in Crores
1.	Setting up DATA BASE Maintenance and MIS UNIT at State level	10	1	10
2.	Research and Development for improvement in each ecosystem (the research should be completed within initial 4-5 years)	20	5	100
3.	Capacity Building for Government, NGOs, People	0.05	19,240	962
4.	Community Mobilisation-Promotional Cost (10%)	0.125	19,240	2405
5.	Revolving Fund/ Sustainability Fund	0.02	19,240	4861.8
6.	Livelihood Support for Marginalised and Vulnerable Communities	0.05	19,240	962
7.	Monitoring, Impact Assessment and Documentation	0.01	19,240	192.4
Total				**5016.2**
Rounded to				5000.00

Total requirement of funds

Physical Infrastructure Development = Rs. 11,500 +

Non-physical Infrastructure Development = 5,000

= Rs. 16,500 crores

Source of Fund for New Generation Watershed Development

Tamil Nadu being one of the progressive States in the country with limitations for water resources development should be considered by the Central Government as one of the most preferred States for channelising watershed development fund. The Working Group of Government of India on Watershed Development has envisaged an outlay of Rs. 72,750 crores towards a 20-year Perspective Plan for treatment of watersheds from the Tenth to Thirteenth Plan. The State should be allotted at least 10 to 11 per cent of total outlay. Assuming 11 percent allotment (11% of Rs. 72,750 crores) Tamil Nadu share would be Rs. 8,002.50 crores (rounded off to Rs. 8,000 crores). But the State, in order to address water security through watershed development, has to invest a total Rs.16,500 crores as shown earlier. Hence, we need additional sources for fund mobilization. This can be done as suggested below.

Table 4. Source of fund for New Generation Watershed Development

Sl. No.	Source of Fund and Funders	Amount to be Mobilised in Rs. Crores	Key Focus
1.	Central-State-People share under suitable Watershed Development Schemes from 10th to 13th Plan	8,000	As per Guidelines under Hariyali, NABARD and NWDPRA
2.	Encouraging Philanthropic and Private Investment by Corporates, Citizen Forums, FICCI, CII etc	2,500	Social Responsibility/ Public Private Partnership
3.	Bilateral Grant and Loan from agencies like ADB, USAID, European Union, UNESCO, JICA, DFID, ODI, KfW and UNDP	4,000	Fulfilling Millennium Development Goal in South Asia to address Water Issue (Water-Poverty Nexus)
4.	Invitation to invest through Innovative Schemes like NRI investments, Water Security Bonds (Tax Free), Penalising Over users of Ground Water and Polluters and the like.	2,000	Policy Formulation, Acceptance by all, Political Willingness and Effective Implementation
	Total	**Rs. 16,500 crores**	

A Decade Pathway and Shared Vision for New Generation Watersheds

The research team suggested a Ten-Year road map for fulfilling the water security under the shared vision.

Features	***Phase 1***	***Phase 2***	***Phase 3***
1. Theme title	**People-led watersheds**	**Public – private partnership**	**Self growth**
2. Period	2004 – 2006 Three years	2007 – 2010 Four years	2011 – 2013 Three years
3. Focus	Community Organisation and strengthening People Institutions in the Ecosystem based watersheds namely *Rainfed Watersheds* *Irrigated Watersheds* *Forest based Watersheds* *Coastal Watersheds* *Urban Watersheds*	Gearing up People led Watershed implementation according to the techniques and concept in all the Ecosystem based watersheds namely *Rainfed Watersheds* *Irrigated Watersheds* *Forest based Watersheds* *Coastal Watersheds* *Urban Watersheds*	Creating sustainability through People based Governance and participatory monitoring and evaluation and bringing additional investment by the people through mix of Grant and Credit in *Rainfed Watersheds* *Irrigated Watersheds* *Forest based Watersheds* *Coastal Watersheds* *Urban Watersheds*
4. Resources	Approx. Rs.2500 crores	Approx. Rs.3700 crores	Approx. Rs.2600 crores
5. Partners	Central Government State Government People's investment through Banks	Central Government State Government People's Investment through Banks, and by bilateral donor agencies	Central Government State Government People's Investment through Banks, and by bilateral donor agencies

Recommendations

General

- All the concerned heads of Ministries and Departments may please debate the Shared Vision, Mission, Propositions, a Decade Plan, etc., discussed earlier and if needed the statements could be changed or modified so as to ensure close coordination.

- Water is part of a larger eco system. A watershed is an eco system with various interacting natural components. Harvesting water from within and outside the watershed should focus on protecting ecological functions and processes that maintain the watershed's health and enhance productivity of water and the land. The goal of water resources management must be to harvest adequate quantity and quality of water in a sustainable manner. Well managed and healthy watersheds will retain every drop of water necessary for maintaining each life cycle within the eco system of the watershed and drain out the excess water safely.

- Integrated watershed development through extensive soil and moisture conservation, catchment area treatment, preservation of forests and increasing the vegetative cover should be promoted. Participation of all stakeholders in the development and management plan of the watershed should be ensured for sustainability of the watershed health.

Policy

- Tanks and ponds have to be included in the Tamil Nadu Farmers Management of Irrigation Systems Act 2000. The Tamil Nadu Groundwater Water Act 2003 needs to be put into practice. The Panchayat Act should include the representatives of watershed associations, user groups and tank associations to function as working groups of the Panchayats.

- Because of the resources crunch, watershed development works can be taken up only in a phased manner. With minimum financial input, maximum impact could be obtained in some watersheds. Geographical Information System technology is recommended in conjunction with the Hydrologic Digital Database to prioritize the Blocks for taking up the implementation of watershed development programme in the most economic way.

- Suitable measures should be adopted to ensure that water sources in the state are not polluted. The permissible limit of soluble & suspended chemicals and particles in water bodies should be widely disseminated and strictly enforced.

- Roles and responsibilities of the concerned departments as well as Panchayat Raj Institutions should be clearly defined in planning, execution, operation, maintenance and management of the water resource project.

- Micro-watershed development should incorporate the rehabilitation and /or renovation of small water bodies like tanks, ponds, streams, temple ponds, and percolation ponds in the on going soil and water conservation programmes or as converging programmes in the overall watershed development.

Technical

- The ultimate water potential is finite while the demand from the various sectors is continuously on the increase. It therefore becomes imperative that while our efforts to augment the water resources towards the ultimate potential are important, it is all the more necessary to take appropriate measures to curtail the water demand. We need to examine in which sectors the demand can be curtailed without adversely affecting the threshold need of each sector. Expert bodies in each sector should recommend steps to reduce water demand on scientific basis.

- A possible way by which the water demand can be minimized is by avoiding the wastage and leakage of water through the irrigation sluice outlets having no shutters or defective shutters in the tanks and reservoirs. Irrigation being the largest consumer of water, the aim should be to get optimal productivity per unit of water. More economic and efficient use of water in agriculture through adoption of micro irrigation, water conservation and management practices can, in our opinion, minimize the need of agriculture sector by a substantial amount upto 10 percent (a reduction from the present 80 percent to 70 percent) without affecting the increased production potential of food crops.

- There is scope to create new water storage bodies in coastal watersheds to capture monsoon flash floods that drain into sea and also in the forest watersheds.

- In projects where a large volume of water is proposed to be diverted from its original course a minimum flow of water should be left unexploited in streams / rivers to provide for its original role in local ecology.

- Priority should be given for rainwater harvesting both in rural and urban areas. There are various methods of rainwater harvesting depending upon local conditions. Proper methods should be selected after site investigation.

- The management of water resources in the state should be dealt with an integrated and holistic approach rather than being managed in the traditional compartmental approach, where water development as well as water use related activities are done by separate departments for drinking water, irrigation, agriculture, energy, environment etc.

- Another important aspect is water quality. Improvements in existing strategies and innovation of new techniques resting on a strong science and technology base are needed to eliminate the pollution of surface and groundwater resources. Science and technology, awareness campaigns and trainings for local people have to play important roles in water resources development and management.

- Water resources development will have to be planned for a hydrological unit. The hydrological unit can be a micro, mini or sub watershed, or watersheds and basins. The planning of such a hydrological unit should take into account the present state for development and consider surface and groundwater as a unitary resource, ensuring their optimal conjunctive use, wherein drainage is also considered as its integral part.

- It has been found that between 1998 and 2003, categorization of 40 blocks have changed from 'safe' to 'semi critical', 'semi critical' to 'critical', and 'critical' to 'overexploited'. These 40 blocks may be considered as priority Blocks. With minimum necessary inputs maximum benefits would be obtained while restoring them to their earlier classification.

Information and Database

- Institute of Remote Sensing, Anna University has prepared a comprehensive report indicating potential zones and types of structures for recharging of rain water at block level. Government may take action on the report in a phased manner for construction of the recharge structures as indicated in that report.

- The Department of Space, Government of India has prepared project reports on Action Plan for Water and Land Resources Development under the IMSD Project (Integrated Mission for Sustainable Development). Such reports are available for a number of river basins in Tamil Nadu. The maps in these reports contain site-specific recommendations for the management of land and water resources. These reports may be taken up for implementation.

- A well-developed information system for water related data in its entirety, at the state level, is a prime requirement for resource planning. All water resources big or small including traditional water sources should be enumerated and the inventory should be made available to all users/ stakeholders. A standardized state information system should be

established and continuously updated. Apart from the data regarding water availability and actual water use, the system should also include reliable projections for future demands of water for various sectors and purposes.

- There should be periodical reassessment of ground water potential on a scientific basis, taking into consideration the quality of the water available.

Administrative and Financial

- Planning and implementation of water resources projects involves a number of socio economic issues such as traditional rights and customs of water use by village communities. Participation of local community in management of water resources, right from conceptualizing, planning, implementing, operating, maintaining and managing the resources should therefore be ensured.

- Funds for maintenance of water resources development projects have to be generated from revenue collection from the users. The institutional management should be such that maintenance and functioning of existing water projects is given importance equal or even more than that of construction of new projects.

- Catchment area treatment should be an integral part of any water resources development project planning. Budget provisions should be made for catchment area treatments in all schemes. The planning of project in hilly areas should take into account the physical features and constraints of the basin such as steep slopes, rapid run off and the incidence of soil erosion. The economic evaluation of projects in such areas should also take these factors into account.

- Time and cost overruns and deficient realization of benefits characterizing most water related projects should be overcome by upgrading the quality of the project preparation and management.

- Above all, the water security efforts by government should be neither programmatic nor government implemented, but on the whole as a people led movement aiming to attain prosperity. Eco-system based management by the people is the need of the hour for attaining the Shared Vision on Water Security.

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