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**STANDING COMMITTEE
ON WATER RESOURCES
(2007-2008)**

FOURTEENTH LOK SABHA

MINISTRY OF WATER RESOURCES

**DEMANDS FOR GRANTS
(2007-2008)**

*[Action taken by the Government on the Recommendations/Observations
contained in the Seventh Report (Fourteenth Lok Sabha) of the
Standing Committee on Water Resources]*

EIGHTH REPORT



**LOK SABHA SECRETARIAT
NEW DELHI**

November, 2007 / Agrahayana, 1929 (Saka)

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Presented to Lok Sabha on 22.11.2007

Laid in Rajya Sabha on 22.11.2007



LOK SABHA SECRETARIAT
NEW DELHI

November, 2007/Agrahayana, 1929 (Saka)

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COMPOSITION OF THE STANDING COMMITTEE
ON WATER RESOURCES (2007-08)

Shri R. Sambasiva Rao—*Chairman*

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Lok Sabha

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3. Shri Bikram Keshari Deo
4. Shri Rajen Gohain
5. Shri Prakash B. Jadhav
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18. Vacant
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2. Shri N.K. Sapra — *Joint Secretary*
3. Shri C.S. Joon — *Director*
4. Shri P.V.L.N. Murthy — *Deputy Secretary*
5. Shri A.K. Yadav — *Committee Officer*

INTRODUCTION

I, the Chairman of the Standing Committee on Water Resources (2007-2008) having been authorised by the Committee to submit the Report on their behalf, present the Eighth Report on the Action Taken by Government on the recommendations/observations contained in the Seventh Report (Fourteenth Lok Sabha) of the Standing Committee on Water Resources (2006-2007) on Demands for Grants (2007-2008) of the Ministry of Water Resources.

2. The Seventh Report was presented to Lok Sabha on 28 April, 2007. The replies of the Government to all the recommendations contained in the Report were received on 08 August, 2007.

3. The replies of the Government were examined and the Report was considered and adopted by the Committee at their sitting held on 02 November, 2007.

4. An analysis of the Action Taken by the Government on the recommendations/observations contained in the Seventh Report (Fourteenth Lok Sabha) of the Committee is given in Appendix-III.

NEW DELHI;
19 November, 2007
28 Kartika, 1929 (Saka)

R. SAMBASIVA RAO,
Chairman,
Standing Committee on Water Resources.

CHAPTER I

REPORT

This Report of the Standing Committee on Water Resources deals with the action taken by the Government on the recommendations/ observations contained in their Seventh Report on Demands for Grants (2007-2008) of the Ministry of Water Resources which was presented to Lok Sabha on 28 April, 2007.

2. Action taken notes were received from the Government in respect of all the 20 recommendations/observations of the Committee which has been categorised as follows:—

- (i) Recommendations/Observations which have been accepted by the Government:

Para Nos. 1.18, 1.19, 1.26, 1.31, 2.14, 2.33, 2.37, 3.22, 4.14, 5.13, 5.24 and 6.26

(Total — 12)

- (ii) Recommendations/Observations which the Committee do not desire to pursue in view of the Government's replies:

Para Nos. 2.25 and 6.33

(Total — 2)

- (iii) Recommendations/Observations in respect of which replies of the Government have not been accepted by the Committee:

Para Nos. 7.18

(Total — 1)

- (iv) Recommendations/Observations in respect of which final replies of the Government are still awaited:

Para Nos. 2.26, 3.23, 4.15, 6.27 and 7.19

(Total — 5)

3. The Committee desire that final replies in respect of the recommendations/observations for which only interim replies have been given by the Government should be furnished to the Committee within three months of the presentation of the Report.

4. The Committee will now deal with the action taken by the Government on some of the recommendations/observations in the succeeding paragraphs.

A. Development of better technology to make unusable water utilisable

Recommendation (Para No. 2.14)

5. The Committee noted that though the annual precipitation (including snow melt) is 4,000 BCM (Billion Cubic Metre), the average annual water availability is assessed at 1,869 BCM only due to loss on account of evaporation. Of this, total utilizable water resource is assessed at 1,123 BCM (*i.e.* 690 BCM of utilizable surface water flow and 433 BCM of annual replenishable ground water). The per capita availability of water at national level has also reduced from 5,177 m³ (Cubic Metre) in 1951 to 1,820 m³ in 2001 with variation in water availability in different river basins. Admittedly, 746 BCM (or more than one-third) of water is lost annually to sea on account of the lack of suitable technology, and the Chairman, CWC had admitted, during evidence, that a better technology would minimise this loss of water. The Committee also desired the Government to find a better technology to make the un-utilizable water fit for use, and that research activities be undertaken immediately for the purpose. The Committee further desired the Government to seek the help of the Ministries of Science and Technology and other concerned Organisations and work in close cooperation with them in this regard.

6. The Ministry has, in its action taken reply, stated that it noted the direction of the Committee to fully utilize the allocations made in the Budget by advance planning of the activities required to be undertaken during the year 2007-08. The advice of the Committee regarding development of appropriate technology and taking up research had also been noted.

7. The Committee had recommended the Ministry to find a better technology to make fit for use the un-utilizable water of the country going into the sea and for achieving this objective, the Committee had also recommended the Ministry to undertake necessary research activities at the earliest and to seek the assistance and cooperation of the Ministry of Science and Technology and other concerned Organisations in this regard. However, the reply of the Ministry makes no mention as to what concrete steps have been taken or are proposed to be taken by the Government towards finding a better technology to make the country's un-utilizable water fit for use. The reply is also silent as to the steps taken or are being initiated to

achieve this goal by seeking the assistance of the Ministry of Science and Technology and other allied Organisations. The Committee, therefore, reiterate their earlier recommendation and desire the Ministry to take urgent concrete steps towards finding a better technology to make one-third of our un-usable water fit for use through appropriate steps.

B. Bridging gap between created irrigation potential and its utilization.

Recommendation (Para No. 2.26)

8. The Committee observed that with the sustained and systematic development of irrigation started from the First Five Year Plan, the irrigation potential from Major, Medium and Minor Irrigation Projects had increased from 22.60 million hectare in 1951 to 102.7 million hectare approximately as against the utilisation of irrigation potential so created ranged between 22.60 million hectare in 1951 and 87.23 million hectare approximately at the end of the X Plan. The utilisation of created irrigation potential stands at 84 per cent. The Government expected reduction in the gap between potential created and utilised by the Centrally Sponsored Schemes of CAD&WM which supports activities like construction of field channels, on-farm development, etc. Although the XI Plan had commenced, the Planning Commission has not finalised the State Plans for 2007-2008 as yet. The Committee desired that the State Plans for 2007-2008 be finalised without any further loss of time to enable the State Governments to commence/continue works during the current year. The Committee also desired that by using remote sensing technology, the gap between the created irrigation potential and its utilisation would reduce.

9. The Ministry has, in its reply, stated that the rate of creation of irrigation potential out-paces the rate at which area is presently being covered under field channels as States are facing difficulty in providing their matching share. The deferred maintenance of canals is also responsible for the gap in utilization of irrigation potential.

Regarding the use of remote sensing technology for assessing the actual utilisation of the created irrigation potential, it is to submit that Ministry of Water Resources has got a study done by NRSA in respect of 2 projects namely Teesta Barrage Project in West Bengal and Upper Krishna Project in Andhra Pradesh. Further, National Remote Sensing Agency, Hyderabad has been associated in the study for assessment of irrigation potential created under 53 AIBP funded projects in the country.

10. The Committee note that the reply of the Ministry regarding use of remote sensing technology to reduce the gap between the created irrigation potential and its utilisation in the country is not complete. The Ministry has also not apprised them of the results of the study conducted by National Remote Sensing Agency (NRSA) in respect of two projects, *viz.*, Teesta Barrage Project in West Bengal and Upper Krishna Project in Andhra Pradesh. The Committee, therefore, desire that they may be apprised of results of the remote sensing studies carried out by NRSA on the above stated projects at the earliest. They also desire to be informed of the outcome of the study undertaken by NRSA, Hyderabad for assessment of irrigation potential created under 53 AIBP funded projects.

C. Artificial Recharge of Ground Water through dug wells

Recommendation (Para No. 3.23)

11. The Committee observed that the Finance Minister had proposed a new scheme on Artificial Recharge of Ground Water through 'dug wells' in 1,065 over-exploited or critical blocks at a cost of Rs. 4,000 per dug well covering 100 districts in 7 States, *viz.* Andhra Pradesh, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan and Tamil Nadu. The Scheme would provide 100% subsidy to the small and marginal farmers and 50% subsidy to other farmers. It was to be finalised shortly in consultation with the concerned State Governments, NABARD and CGWB. The Committee had desired finalisation of all preparatory work for the said Scheme at the earliest, and that they might be apprised of the action taken and the progress made in the matter at frequent intervals.

12. The Ministry has, in its reply, stated that subsequent to the announcement of the scheme on the artificial recharge of ground water through dug wells in hard rock areas in the budget speech of Finance Minister on 28.02.2007, a meeting was taken by Secretary (WR) on 23.03.2007 with representatives from concerned State Governments, officers from NABARD, Central Ground Water Board and Ministry of Water Resources. Thereafter, a draft note for consideration of Cabinet Committee on Economic Affairs (CCEA) was prepared and circulated to all concerned Ministries/Departments *viz.* Ministry of Finance (Department of Economic Affairs and Expenditure), Department of Drinking Water Supply, Department of Agriculture and Cooperation, Ministry of Panchayati Raj, Planning Commission and PMO for their comments. The proposed scheme covers 1180 over-exploited, critical and semi-critical blocks, falling mainly in hard rock areas in the States

of Andhra Pradesh, Gujarat, Karanataka, Madhya Pradesh, Maharashtra, Rajasthan and Tamil Nadu at an estimated cost of Rs. 1871.10 crore. The net cost of the scheme works out to be Rs. 1723.87 crore, which includes subsidy component and other charges. The scheme envisages ground water recharge through 4.455 million existing irrigation dug wells.

13. The Committee note that Secretary, Water Resources held a meeting on 23 March, 2007 with the representatives of concerned State Governments, Officers of NABARD, Central Ground Water Board and Ministry of Water Resources in the aftermath of the announcement of the Scheme on Artificial Recharge of Ground Water through dug wells by the Finance Minister. They further note that a draft note for consideration of Cabinet Committee on Economic Affairs (CCEA) was reportedly circulated by the Ministry to all concerned Ministries/Departments, *viz.*, Ministry of Finance (Department of Economic Affairs and Expenditure), Department of Drinking Water Supply, Department of Agriculture and Cooperation, Ministry of Panchayati Raj, Planning Commission and the PMO for their comments. However, the reply of the Ministry is silent as to the responses received from concerned Ministries/Departments and the time frame in which the scheme is proposed to be finalised/operationalised. The Committee desire the Ministry to finalise in a time bound manner the details of the Scheme for implementation which would be of great help in the over-exploited or critical blocks located in Andhra Pradesh, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan and Tamil Nadu so as to benefit the marginal and other farmers. The Committee desire to be apprised of the progress made in this regard.

D. Enactment of PIM Legislation

Recommendation (Para No. 4.15)

14. The Committee observed that National Water Policy 2002 laid great emphasis on participatory approach in Water Resource Management. The participation of the farmers in management of irrigation includes transfer of responsibility for O & M and collection of water charges for the Water Users' Associations (WUAs). The Committee also observed that Participatory Irrigation Management (PIM) legislation had not been enacted in many States. So far, 11 States had either enacted exclusive legislation or amended their Irrigation Act for involvement of farmers in irrigation management. The Committee desired the Ministry to review the progress of

implementation of PIM in the context of National Water Policy 2002 and report the matter to the National Water Resources Council (NWRC) for appropriate directions. They also desired that PIM legislation be enacted in the remaining States at the earliest. The Committee also desired to be informed of the outcome of the review and the directions given by the National Water Resources Council in this regard.

15. The Ministry has, in its reply, stated that necessary action as desired by the Committee, shall be initiated in the matter, *inter-alia*, pursuing the issue of enactment of PIM legislation by the remaining States. The matter shall be placed before the National Water Resources Council as and when its meeting takes place.

16. The Committee note that though they had recommended the Ministry to review the progress of implementation of PIM in the context of National Water Policy 2002 and report the matter to the National Water Resources Council for appropriate directions, the Ministry in its reply merely stated that necessary action would be initiated on the issue of enactment of PIM laws by the remaining States, and that the matter would be placed before the National Water Resources Council when its meeting takes place. They had also desired that PIM Legislation be enacted in the remaining States at the earliest. The reply is silent as to when NWRC is likely to meet and discuss the issue. There is also no mention of the efforts being made by Government to persuade the remaining States to enact the PIM Legislation. The Committee, therefore, desire the Ministry to furnish full and complete reply in future. They desire that this matter may be placed before NWRC at the earliest. The Committee also desire to be apprised of the details of the steps taken by the Ministry to induce these States for enacting PIM legislation.

E. Early processing of Review Report of the Ministry of Statistics and Programme Implementation on AIBP

Recommendation (Para No. 6.27)

17. The Committee observed that the Ministry of Statistics and Programme Implementation had taken up evaluation of AIBP during 2004 with the help of ten different Consultancy Firms who evaluated the AIBP performance in the whole country. The draft report was submitted during December 2006 which has been under examination. Further, the Planning Commission also proposed to take up a similar study during 2007. The Committee had recommended the Ministry to expeditiously process the Review Report submitted during December 2006. The Committee further recommended the Government to initiate

the remedial measures suggested by the Review Report to further improve and streamline the processes and procedures governing the implementation of AIBP.

18. The Ministry has, in its action taken reply, stated that the Report on review of AIBP submitted by the Ministry of Statistics and Programme Implementation is under consideration of the Ministry of Water Resources. The State-wise and project-wise recommendation would be taken up with the State Governments for taking necessary corrective measures.

19. The Committee are anguished to note that despite the passage of almost a year since the Review Report was submitted in December 2006, the Ministry of Water Resources has not been able to process the Review Report on AIBP of the Ministry of Statistics and Programme Implementation. The Committee are unable to comprehend the reasons for such a delay in this regard and wonder as to when the State-wise and project-wise recommendation would be taken up with the State Governments for taking necessary corrective measures pertaining to the implementation of AIBP as stated by the Ministry in its reply. The Committee, therefore, recommend the Ministry to take urgent steps to process the Review Report of the Ministry of Statistics and Programme Implementation on AIBP. They desire to be informed of the progress made in this regard.

F. Changes in the National Environment Policy 2006 to increase storage capacity

Recommendation (Para No. 7.18)

20. The Committee observed that the review of the Ministry of Water Resources carried out by the Planning Commission as a part of its Mid Term Review of the Five Year Plans of the Ministry suggested that shortfall in achievement of targets is a reflection of the fact that funds for irrigation in the State Sector had fallen short of the envisaged levels which itself was a result of lower levels of potential created earlier. The Working Group of Eleventh Plan further reviewed the position, according to whom, this situation points to a deeper malaise afflicting the Plans. The Committee, therefore, recommended the Ministry and the Planning Commission to order an independent evaluation of the system of target fixation, if need be, by a reputed professional/research organisation to achieve the desired results in future plans.

The Committee further observed that the existing storage capacity was Rs.71.70 BCM. It was proposed to create storage capacity amounting to 30.57 BCM through the projects under construction and additional storage of 71.34 BCM could be created through the projects under consideration. Further, the Ministry had suggested for modification of clause relating to mandatory environmental clearance for major Projects to the Ministry of Environment and Forests. However, the Ministry informed that the National Environment Policy 2006 approved in May 2006 did not include the suggestions of the Ministry of Water Resources. The Committee opined that in order to increase the storage capacity, the suggestions of the Ministry from the environmental angle need to be re-looked as more than one-third of the utilisable water is going into the sea. The Committee also desired the Ministry to pursue the matter with the Ministry of Environment and Forests to make suitable changes in the National Environment Policy 2006.

21. The Ministry has, in its reply, stated that the Ministry of Environment and Forests had already been requested for necessary action in the matter.

22. The Committee are constrained to observe that the reply of this recommendation is also incomplete as has been observed in respect of other recommendations in earlier paras of this Report. They find that the reply has been given in a very casual manner. The reply is silent on their earlier recommendation that the Ministry and the Planning Commission order an independent evaluation of the system of target fixation, if need be, by a reputed professional/research organisation to achieve the desired results in future plans. However, the reply does not indicate the view taken by Government on this recommendation of the Committee. Besides, the Committee had also noted the proposal to increase the storage capacity by 30.57 BCM through projects under construction and by 71.34 BCM through projects under consideration. On the Ministry's suggestion for modification of clause relating to mandatory environmental clearance for projects to the Ministry of Environment and Forests, which were glaringly ignored in the National Environment Policy 2006, the Committee had desired in its Report, that in order to increase the storage capacity, the Ministry may pursue the matter with the Ministry of Environment and Forests to make suitable changes in the National Environment Policy 2006. The reply furnished does not indicate the response of the Ministry of Environment and Forests to the suggestions of Ministry of Water Resources. The Committee, therefore, reiterate their earlier recommendation and desire the

Ministry to apprise them of the action taken in regard to the setting up of an independent evaluation of the system of projection of targets in successive plans, and also to pursue with the Ministry of Environment and Forests to make suitable changes in the National Environment Policy 2006. The Committee would also advise the Ministry to desist against the tendency of providing incomplete replies to their recommendations in future.

G. Policy on National Projects

Recommendation (Para No. 7.19)

23. The Committee also observed that irrigation water charges in most states were not even adequate to recover the O&M cost except Gujarat and Maharashtra which have been able to meet full O&M cost from the revenue earned through water tariffs. In the context of water tariffs, the need for regulatory mechanism to ensure sustainability of resources and facilities created had been discussed in the 12th Meeting of the National Water Board. The Committee desired the Ministry to impress upon the States to set up the regulatory mechanism for optimum, judicious and equitable management, allocation and utilisation of the limited water resources available. The Mid Term review had proposed to set up an Expert Group comprising officials of Ministries/Departments, NGOs etc. to review the issue of ground water ownership in line with international practices and suggest a line of action for implementation during Eleventh Plan. The Expert Group on ground water was to submit its report to the Planning Commission on 31 May 2006 which was, however, delayed due to extensive consultation required in the matter and the report was expected shortly. The Committee had urged the Ministry of Water Resources and the Planning Commission to process the suggestions/recommendations of the Expert Group on ground water expeditiously.

The Committee came across a suggestion for declaring the Teesta Barrage Project as a National Project fully funded by the Central Government. In this context, the Ministry informed that the suggestion of West Bengal Government had been received and the concept of the National Project was under consideration of the Ministry. The Committee desired the Ministry to formulate a policy for declaring major irrigation projects as 'National Projects' at an early date.

24. The Ministry has, in its action taken reply, stated that the concept of the National Project had been incorporated in the Cabinet Note for continuation of AIBP in the XI Plan and the same was under

Inter Ministerial circulation. Further action would be taken on approval of Union Cabinet to the Cabinet Note. The Report of the Expert Group constituted by the Planning Commission had been finalised and would reportedly be submitted to Planning Commission shortly.

25. The reply of the Ministry is silent on many aspects of this recommendation too. The action taken by Government to impress upon the States to set up the regulatory mechanism for optimum, judicious and equitable management, allocation and utilisation of the limited water resources available has not been indicated in the reply. The Committee is disappointed that the Ministry has furnished only a partial reply to the recommendation of the Committee, and therefore, desire that relevant information pertaining to the Committee's recommendation on the setting up of regulatory mechanism for use of water resources may be furnished at the earliest. They would also like to be informed of the details of the decision taken by Government on the concept of 'National Projects' under consideration of the Union Cabinet at an early date. They further desire speedy remedial action on the recommendations contained in the Report of the Expert Group on Ground Water. They desire to be apprised of the recommendations and the action taken by Government thereon.

CHAPTER II

RECOMMENDATIONS/OBSERVATIONS WHICH HAVE BEEN ACCEPTED BY THE GOVERNMENT

To augment plan outlay for irrigation, to project outlays in more realistic terms and to expedite DPR of Ken-Betwa link project

Recommendation (Para No. 1.18)

The examination of the Budgetary provisions of the Ministry of Water Resources contained in Demands for Grants (2007-2008) shows a provision of Rs. 898.16 crore excluding the funds earmarked for AIBP and other water resources programmes. This is 9.02 per cent less, *i.e.* Rs. 100 crore less on the Plan side than that provided in BE 2006-2007. It shows an overall reduction in allocation of Rs. 89.15 crore, while there was an increase of Rs. 87.65 crore in BE 2006-2007 over the corresponding figure of 2005-2006. The Plan outlay (Revenue Section) in BE 2007-2008 at Rs. 570 crore shows a decline of 14.81 per cent though the outlay on Non-Plan at Rs. 283.01 crore shows an increase of 10.39 per cent over the respective outlays in 2006-2007. Similarly, the provision in the Capital Section, both Plan and Non-Plan put together at Rs. 45.15 crore shows a decline of 26.9 per cent. The Committee note that as in the previous three Financial Years, the BE provision (Rs. 669.11 crore) in 2006-2007 too was reduced at the RE stage to Rs. 520.86 crore showing a 22.15 per cent reduction. This reduction was primarily due to revision in the estimate of DPR of Ken-Betwa link and also due to delay in getting permission from the Ministry of Environment and Forests among others. A perusal of the budgetary allocation in percentage terms in respect of the Irrigation Sector from the First Five Year Plan at 23.22 per cent to Tenth Five Year Plan at 6.33 per cent reveals a progressively declining trend though the expenditure incurred (by both State and Central Governments) on irrigation in the country in absolute terms has increased from Rs. 455.07 crore in the First Plan to Rs. 95,743.52 crore (anticipated) at the end of the Tenth Plan. The Ministry has reportedly discussed the issue of the progressive reduction of outlays as a percentage of GDP with the Planning Commission though the Planning Commission has not made any commitment in this regard. The Committee view very seriously the declining trend of outlays for irrigation as a percentage of GDP even though in absolute terms there has been a manifold

increase in the expenditure in this sector in successive Five Year Plans. The Committee, therefore, strongly recommend that the share of outlay in respect of irrigation in the overall plans needs to be augmented substantially to attain the level of outlay as existing during the First Five Year Plan from the present level of outlay of 6.33 per cent. The Committee desire the Ministry to project their outlays at the BE stage in more realistic terms to avoid the pitfall of reductions at the RE stage. The Committee also desire the Ministry to finalise the revised estimate of DPR of Ken-Betwa link expeditiously and complete the preparation of DPR in the shortest possible time. They further desire to be apprised of the action taken in the matter.

Reply of the Government

The direction of the Committee for projecting outlays in more realistic term have been noted and will be strictly adhered to while preparing budget estimates. Necessary instructions are being issued to all concerned.

The present estimated cost of DPR of Ken-Betwa Link is Rs. 36.30 crore and the work of DPR is scheduled to be completed in June 2008.

Need of keeping allocation for schemes to be implemented during XI plan at reasonable levels to attain their intended objectives

Recommendation (Para No. 1.19)

Further, the Committee observe that with a view to rationalize the plan schemes of the Ministry, the schemes with similar activities have been clubbed and an effort has been made to reduce the number of schemes. This exercise resulted in bringing down their number from 68 schemes in the Tenth Plan to 20 schemes during the Eleventh Plan. These 20 schemes cover all the on-going activities of the Ministry and also provide for all new programmes envisaged during the Eleventh Plan. Some of the activities which were covered under Central Sector Schemes or Centrally Sponsored Schemes now stand transferred to the State Sector. According to the Ministry, this has resulted in reduced outlay for 2007-2008. The Committee note that two new schemes—one on Information, Education and Communication and the other on River Basin Organisations/Authority are likely to be introduced during the year 2007-2008. Besides this, 11 schemes/projects which were approved for the Tenth Plan and have achieved the set targets have been discontinued in the Eleventh Plan. The Committee desire that the allocation for the 20 schemes be kept at reasonable levels so as not to hinder their outcome adversely. The Committee also desire the Ministry

to launch at the earliest the two new schemes proposed for introduction in 2007-2008 to attain their intended objectives. The Committee would like to be apprised of the action taken in this regard within three months of presentation of this Report.

Reply of the Government

Appropriate allocations have been made for various schemes with a view to meet the immediate requirement of all identified activities planned during 2007-08 and the intended outcome is likely to be achieved as per schedule. Actions have already been initiated for preparation of SFC/EFC memorandum in respect of the two new schemes and the matter is being followed up with all concerned.

Private sector participation in water management and project planning

Recommendation (Para No. 1.26)

The Committee note that the National Water Policy 2002 recommended private sector participation, *i.e.* Public-Private Partnership in planning, development and management of water resources projects for diverse uses wherever feasible, with greater emphasis on publicity measures through electronic, print and other media in an inter-active manner. As the activities of the Ministry are mostly related to investigation, planning, design and research and development, it involves private sector and NGOs in certain activities related to awareness programme. The Ministry also provides support in specific activities such as organization of workshop, seminar etc. on issues related to water resources. Apart from involvement in Mass Awareness programmes, the private sector and NGO participation is being encouraged in Irrigation Management, Artificial Recharge of Groundwater, Renovation of Water Bodies and Research & Development. However, the Guidelines for private sector participation in water management have not been brought out by the Ministry. The Committee also note that the Ministry of Water Resources organized a Symposia in New Delhi to celebrate 'World Water Day' on 22 March 2007 which was inaugurated by the Prime Minister wherein he called for collective wisdom to resolve water conflicts and appealed for making water conservation a national obsession. The Committee, therefore, recommend the Ministry to issue the Guidelines for private sector participation in water management for not only making their involvement and participation broad based but also benefit from the vast pool of talent and expertise available in the private sector so that the benefits of the Schemes/Programmes percolate to a large section of the population. The Committee also recommend the Government to

take suitable steps to increase the private sector participation in project planning and other related activities which in their opinion would go a long way in the successful implementation of schemes like Artificial Recharge of Ground Water, etc. and the clarion call of the Hon'ble Prime Minister would become a reality in the near future. The Committee would like to be informed of the steps taken in this direction.

Reply of the Government

Appropriate action has already been taken by the Ministry of Water Resources regarding involvement of Non-Governmental Organisations (NGOs) with several activities. The NGOs are being associated with the research activities in water sector. The Ministry of Water Resources has put the guidelines of submission of projects on web site and the Indian National Committees have been advised to pursue with various organisations for submission of proposals in prescribed format and furnishing all necessary details. This will help to increase the participation of Non-Governmental Organisations in an interactive manner. They will also be associated in disseminating information on water policy and water decision. Similarly NGOs have been actively associated with the mass awareness programmes.

Audit objections contained in C&AG's Reports on the issue of diversion/misutilization of Central Loan Assistance (CLA) under AIBP.

Recommendation (Para No. 1.31)

The Committee are happy to note that as a result of their continuous prodding and the efforts made by the Ministry, 13 of the 15 State Governments have responded to the Audit Observations contained in the Report of C&AG (No.15 of 2004) on the issue of diversion/misutilisation of the Central Loan Assistance (CLA) under AIBP which were discussed by the Committee in their Third and Fifth Reports on Demands for Grants 2005-2006 and 2006-2007 respectively. The Committee further note that some of the State Governments have agreed to reversal of expenditure incurred on non-intended uses while some have claimed that expenditure has been incurred on the project components which are eligible for funding under AIBP. The Ministry now proposes to take up the matter with each of the State Governments after analyzing their response. The State Governments have, however, not specified any reason for delay in submission of their response. The Committee, therefore, urge the Ministry to advise the State Governments to accord the highest priority for resolving the Audit Observations contained in the C&AG's Reports and settle the matters

urgently. They desire the Ministry to analyze the responses of the State Governments on priority basis and intimate the outcome of the efforts made in this regard at the earliest.

Reply of the Government

In order to resolve the issue, the Secretary (WR) convened a meeting of the concerned States on 3rd April 2007. In the meeting, emphasis was given by the Secretary (WR) to accord highest priority for resolving the Audit Observations contained in C&AG's Report. Following the meeting, compliance reports have been received in the Ministry and the same are under scrutiny. The Ministry of Water Resources is pursuing the matter with concerned States for resolving the audit observations and is also monitoring the utilization of funds very closely to avoid any diversion of funds.

Need of advance planning for full utilization of allocations and development of appropriate technology to minimize fresh water going waste into the sea.

Recommendation (Para No. 2.14)

The Committee observe that though the average annual precipitation (including snow melt) is 4,000 BCM, 2,131 BCM is the loss on account of evaporation and the average annual water availability is assessed at 1869 Billion Cubic Metre (BCM). Of this, total utilizable water resource is assessed as 1,123 BCM, *i.e.* utilizable surface water flow is 690 BCM and annual replenishable ground water is 433 BCM. The per capita availability of water at national level has also reduced from 5,177 m³ (Cubic Metre), in 1951 to a level of 1,820 m³ in 2001 with variation in water availability in different river basins. Admittedly, more than one-third, *i.e.* 746 BCM of water is not utilizable and goes to sea on account of the lack of suitable technology. It has further been admitted by the Chairman, CWC during evidence that a better technology will ensure that the loss of 746 BCM could be minimised. The Committee are, however, constrained to observe that on the one hand the allocation of Rs.114.01 crore provided in BE 2006-07 was reduced by about Rs. 44 crore at the RE stage on account of less expenditure under National Water Development Agency (NWDA) due to revision in the estimate of Detailed Project Report (DPR) of Ken-Betwa link and also delay in getting permission from the Ministry of Environment and Forests (MoEF) and late initiation of the Hydrology Project, on the other the allocation in BE 2007-08 at Rs. 132.50 crore is Rs. 18.49 crore more allocation than the BE 2006-2007 is considered nominal. Surprisingly, the allocation under

“Major and Medium Irrigation” of the Ministry of Water Resources is primarily for investigation, planning, design and research activities and is not for completion of the on-going major and medium irrigation projects which is met out of the State Plans by the State Governments. The Committee desire the Government to fully utilise the allocations made in the Budget by advance planning of the activities required to be undertaken during the year. The Committee are unhappy to note that more than one-third of our fresh water available on the surface is going waste into the sea merely for want of a better technology. They, therefore, desire the Government to find a better technology to make the un-utilisable water fit for use. Research activities for the purpose should be undertaken immediately. This is very much essential because a vast majority of the rural - urban population and agriculture to a large extent are deprived of the availability of water. The Committee further desire the Government to seek the assistance of the Ministries of Science and Technology and other concerned Organisations and work in close cooperation with them in this regard. They desire to be apprised of the progress made in the matter at quarterly intervals.

Reply of the Government

The direction of the Committee has been noted to fully utilize the allocations made in the Budget by advance planning of the activities required to be undertaken during the year 2007-08. The advice of the Committee regarding development of appropriate technology and taking up research has also been noted.

Comments of the Committee

(Please *see* Para No. 7 of Chapter-I of the Report)

To fill up vacant post in the Central Water Commission (CWC)

Recommendation (Para No. 2.33)

The Committee note that the Central Water Commission (CWC) is entrusted with the general responsibility of initiating, coordinating and monitoring of schemes in consultation with the State Governments for control, conservation and utilisation of water resources in the country. A perusal of the Plan allocation in respect of the CWC reveals a disturbing trend wherein the allocations at the BE stage are reduced considerably at the RE stage and BE in subsequent years is again increased. However, the BE for 2007-2008 has drastically come down to Rs. 2 crore from Rs. 28.68 crore in BE 2006-2007. The reason given for lesser allocation at RE stage was on account of less expenditure

due to vacant posts and delay in receipt of payment from consultants carrying out specialised studies. The Ministry in a subsequent reply furnished to the Committee indicates that the total allocation for the schemes proposed to be implemented through CWC is Rs. 53 crore for 2007-2008 which, however, is not reflected in the Budget documents adequately. The Committee desire the Ministry to fill up the vacant posts and devise a system of timely receipt of release of payments from consultants.

Reply of the Government

During XI plan period the number of Central Sector/Centrally Sponsored Schemes have been rationalized by clubbing the schemes with similar objectives. The allocation for Central Water Commission is accordingly reflected in Demands for Grants (2007-08) of the Ministry of Water Resources under various schemes, namely Development of Water Resources Information System, Hydrology Project, Investigation of Water Resources Development Schemes, National Water Academy, Dam Safety Studies and Planning, Flood Forecasting, River Management Activities and works related to Border Areas and Infrastructure Development.

Actions have already been initiated by the Central Water Commission for filling up the vacant posts at the earliest.

A time bound programme for completion of studies and release of payment etc. are included in the proposal while awarding such works to consultants. Central Water Commission have been advised to adhere to such action plans strictly.

Research and Development Programme

Recommendation (Para No. 2.37)

The Committee note that the Ministry provides financial assistance by way of grants to academicians/experts in the Universities, IITs, and recognised R&D Laboratories/Institutes to promote research work in the field of water resource sector. Grants are also provided to the organisations to take up research schemes on specific problems related to thrust areas and identified regional problems. The allocation for 2007-2008 for this at Rs. 30 crore shows an increase of Rs. 16.94 crore over the allocation of 2006-2007. According to the Ministry, there is no major enhancement in the allocation for the year as rationalisation of the plan schemes related to R&D programme of the Ministry and its attached offices/organisations has been attempted to by clubbing

them in the XI Plan. Further, the R&D Schemes entrusted to various research and academic institutions are approved after detailed scrutiny of the schemes by these organisations. However, due to non-submission of sufficient schemes and non-clearance of all the received schemes, the allocation of Rs. 13.06 crore for 2006-2007 was revised to Rs. 8 crore on this account. The Ministry has reportedly advised the Indian National Committees to vigorously pursue the organizations for submission of proposals which would help in improving the utilization of the allocated amount. The Committee urge the Ministry to obtain sufficient number of schemes and get them approved well in time to fully utilise the allocated amount of Rs. 30 crore for 2007-2008. The Committee would also like to be apprised of the results of various research activities undertaken by the organizations to whom grants have been provided by the Ministry during the last five years.

Reply of the Government

The Ministry of Water Resources has put the guidelines of submission of projects on web site and the Indian National Committees on various specialized topics i.e. Hydrology, Hydraulics, Irrigation and Drainage, Geo-technical Engineering and Construction Material & Structures have been advised to vigorously pursue the case with various organizations with a view to consider higher number of research proposal and fully utilize the allocations made during 2007-08. A brief note on the outcome of the research projects completed during the last five years is enclosed **(Appendix-I)**.

To step up allocation for minor irrigation.

Recommendation (Para No. 3.22)

The Committee observe that the majority of the Minor Irrigation Schemes relate to surface water sources funded from the public sector outlay. The ultimate irrigation potential from Minor Irrigation Schemes has been assessed as 81.42 m.ha. of which the surface water schemes contribute 17.3 m.ha. The Minor Irrigation Sector also includes Ground Water Schemes. Minor Irrigation Projects are planned and executed by the State Governments and also by the private sector as per their own requirement and priorities. However, the Government of India provides financial assistance under AIBP for Minor Irrigation Scheme proposed by the special category States, KBK districts of Orissa etc. The allocation (Plan) of Rs. 100.94 crore in BE 2006-2007 was reduced to Rs. 92.30 crore at RE stage and further reduced to Rs. 80.05 crore in BE 2007-2008. In spite of lesser allocation in RE 2006-2007 and BE 2007-2008, the Ministry claims that the overall objectives of the scheme would

not be adversely affected and the progress affected, if any, would be made up in the next year. Minor Irrigation potential likely to be created at the end of the X Plan is estimated at 60.42 m.ha against the target of 81.42 m.ha. The Working Group of the Eleventh Plan has recommended a target of 7 m.ha. of potential creation for the Eleventh Plan. To attain the said target of potential creation, the Ministry proposes to revise the stipulation of 100 hectares for surface water Minor Irrigation Schemes under AIBP to 50 hectares and the 10 per cent beneficiary contribution in cost for post construction maintenance is to be done away with. Viewed in this backdrop, the Committee cannot but conclude that creation of potential through Minor Irrigation has been adversely affected owing to lesser allocations therefor. The Committee, therefore, desire the allocation for Minor Irrigation to be stepped up during the Eleventh Plan to enable the States to attain the targeted 7 m.ha. of potential as recommended by the Working Group. They also desire to be apprised of the steps proposed to be taken for attaining the targeted potential.

Reply of the Government

With the approval of Union Cabinet, the stipulation of 100 ha for surface water Minor Irrigation Schemes under AIBP is reduced to 50 ha and 10% beneficiary contribution in cost for post construction maintenance has also been done away with.

In order to give boost to creation of irrigation potential through Surface Water Minor Irrigation Schemes, Working Group on Water Resources for XI Plan has proposed an outlay of Rs. 35,850 crore under MI Sector including minor surface water scheme, ground water, Restoration of water bodies, micro irrigation, artificial recharge and rain water harvesting. Under AIBP, surface water minor irrigation schemes in the special category states and schemes benefiting drought prone and tribal area in the non-special category states are being funded. Ministry proposed to keep an outlay of Rs. 5400 crore (Grant) under AIBP for funding Minor Irrigation Schemes as mentioned above to create irrigation potential of 7.50 lakh Ha.

The Government of India has also sanctioned a Pilot Scheme of "National Project for Repair, Renovation & Restoration of Water Bodies directly linked to Agriculture" in January 2005 with an estimated cost of Rs. 300 crore to be shared by Centre and State in the ratio of 3:1. The objectives of the scheme are to restore and augment storage capacities of water bodies and also to recover and extend their lost irrigation potential. The water bodies having culturable command area

of more than 40 hectares and upto 2000 hectares are included under the pilot scheme in one or two districts in each state. The Scheme has been approved for 26 district projects in 15 states, namely, Andhra Pradesh, Bihar, Chhattisgarh, Jharkhand, Karnataka, Madhya Pradesh, Orissa, Rajasthan, Tamil Nadu, West Bengal, Himachal Pradesh, J & K, Gujarat, Kerala and Maharashtra at an estimated cost of Rs. 299.92 crore and Central Share of Rs. 170.8301 crore has been released to the states till 31st March 2007. These projects cover 1098 water bodies with total original culturable command area of 1.72 lakh hectares. After Repair, Renovation and Restoration works, an additional irrigation potential of 0.78 lakh hectares is likely to be generated from present status.

Hon'ble Finance Minister in his Union Budget Speech on 28.02.2007, announced an scheme on "Artificial Recharge of Ground Water through Dugwells in Hard Rock Areas" in seven states *viz.* Andhra Pradesh, Maharashtra, Karnataka, Rajasthan, Tamil Nadu, Gujarat and Madhya Pradesh costing Rs. 1800 crore. The draft note for consideration of Cabinet Committee on Economic Affairs (CCEA) is under consideration in Ministry of Water Resources. The proposed scheme covers 1180 over-exploited, critical and semi-critical blocks, falling mainly in hard rock areas of these states at an estimated cost of Rs 1871.10 crore, out of which, central share would be Rs 1723.87 crore. The scheme envisages ground water recharge through 4.455 million dugwells. The scheme is expected to result in creation of additional irrigation potential through recharge of existing operational irrigation dugwells and rejuvenation of the irrigation dugwells, which have gone into disuse on various counts including lowering of ground water level below economic depth of pumping.

Moreover, during XI Plan a provision of Rs. 100 crore has been made in the scheme on "Ground Water Management and Regulation" for artificial recharge and rainwater harvesting studies to be taken up in the priority areas *viz.* over-exploited and critical assessment units, urban areas etc. Under this, 75 artificial recharge studies have been proposed to be taken up by Central Ground Water Board. The proposed studies would also help in creation of additional irrigation potential in the affected areas.

Command Area Development Programme – to make 10% contribution of farmers in selected activities non-mandatory.

Recommendation (Para No. 4.14)

The Committee observe that the Working Group of the Planning Commission for Tenth Plan, after detailed meetings and consultations

with State Governments and the administrators of CAD, restructured and renamed the CAD programme as Command Area Development & Water Management Programme with effect from 1 April 2004. The allocation for the programme was Rs. 205.70 crore in 2006-2007 against the actual expenditure of Rs. 199.90 crore in 2005-2006. However, the BE 2006-2007 allocation was marginally reduced to Rs. 191.08 crore at the RE stage 2006-2007 while in contrast BE 2007-2008 shows increased allocation at Rs. 300 crore, *i.e.* a substantial jump of 94.30 crore over BE of the preceding year. According to the Ministry, the reduction in allocation at RE stage was due to lower demand from the State Governments in the initial stage of financial year as also overall reduction in the RE outlay for the Ministry. The RE has, however, been restored to the BE level at the final stage. The Ministry further added that in view of the expenditure pattern of 2005-2006 and 2006-2007 it expects the allocated funds in BE 2007-2008 to be fully utilised and the scope of the programme is proposed to be scaled up.

The Working Group of the Planning Commission for Eleventh Plan has recommended upward revision of the Central share in the funding pattern, withdrawal of 10% mandatory contribution by farmer / WUA and scaling up the scope of the programme by addition of new projects. This necessitated the increased allocation in BE 2007-2008 though it expressed its inability to indicate the number of new projects which may be added to the programme during 2007-2008. The basis of the Working Group recommendation for withdrawal of 10% mandatory contribution by farmers/WUA's was the demand of the State Governments to that effect on the ground that majority of the farmers are marginal and small and hence not in a position to contribute, apart from the inability of some of the State Governments to collect 10% mandatory contribution resulting in non-receipt of Central assistance. The Committee agree to the recommendations of the Working Group of the Planning Commission for Eleventh Plan for making 10 per cent contribution of farmers non-mandatory and desired the Ministry to take an early decision in the matter. They desire to be apprised of the decision taken by the Government in this regard at the earliest.

Reply of the Government

In accordance with the recommendations of the Working Group of the Planning Commission for XI Plan necessary changes are proposed to be made in the Command Area Development & Water Management Programme including the mandatory requirement of 10% contribution by farmers in selected activities. The EFC Memo incorporating necessary

changes in the scheme has already been prepared and circulated to the concerned Ministries/Departments for comments. After receipts of comments the proposal shall be moved for approval of the Expenditure Finance Committee/Cabinet Committee on Economic Affairs.

Flood Control – streamlining of the process of making allocations and monitoring of physical and financial progress.

Recommendation (Para No. 5.13)

The Plan allocation for Flood Control has drastically come down from Rs. 248.22 crore in BE 2006-2007 to Rs. 66.45 crore in BE 2007-2008. Prior to that the Ministry could expend an amount of Rs. 162.21 crore against an allocation of Rs. 231.63 crore during the year 2005-2006. The Ministry attributed the shortfall in utilisation to delay in timely submission of sound technical proposals by the States and non-submission of Utilisation Certificates, the field investigation in respect of Saptakosi Hi Dam Project, effected by law and order problem in Nepal, non-completion of Zirat survey in respect of Pagladia Dam Project, etc. Similarly, the allocation for 2006-2007 was reduced to Rs. 175.27 crore at RE stage 2006-2007 due to delay in submission of sound technical proposals by the States of West Bengal, Bihar and Uttar Pradesh.

The Committee note with concern a disquieting trend in earmarking of BE of successive years at high levels even while the allocations for the previous years were brought down substantially at the RE stage and the final utilisations were less than the reduced RE allocations. A closer examination of this trend reveals that the Ministry failed to obtain the requisite details of proposals while deciding the allocation at the BE stage. This resulted in downward revision of the allocations by the Planning Commission/Finance Ministry at the RE stage. The outlay under the Flood Control during the Tenth Plan was Rs. 970.44 crore of which the total expenditure is expected to be Rs. 641.53 crore approximately which is way below the initial outlays projected for Flood Control before the Tenth Plan commenced. The Committee observed that all the schemes/works under Flood Control have been clubbed under two broad schemes, *viz.* (i) Flood Forecasting; and (ii) River Management activities and works related to border areas. Further, a separate plan scheme, *viz.* 'Flood Management Programme' has been proposed under the State Sector for the Eleventh Plan wherein major works of anti-erosion and flood control in flood affected States would now be supported from Central Plan Outlay for the flood sector.

The Committee, therefore, recommend the Ministry to streamline the process by which allocations in respect of Flood Control are decided and fix the budget estimates in such a way that there is minimal reduction of allocation at the RE stage. This also calls for improving the system of monitoring not only of the physical progress of works under Flood Control but also keep track of expenditure incurred, submission of Utilisation Certificates and, above all, submission of sound technical proposals from the State Governments. The Committee would like to be apprised of the steps taken in this regard at the earliest.

Reply of the Government

The observations of the Committee regarding earmarking allocations at BE stage at a higher level and need for utilization of the allocations have been noted for future compliance. One of the reasons for non- utilization of funds by Brahmaputra Board during 2005-06 and 2006-07, as already stated, was the non completion of zirat survey for the Pagladiya Project by Government of Assam due to the resistance from a section of project affected people. The matter has been taken up at the level of Chief Secretary of Assam to complete the zirat survey.

The recommendations of the Committee to streamline the process by which allocations in respect of flood control are decided and to fix the Budget Estimates in such a way that there is minimal reduction of allocation at RE stage have also been noted. In this connection, a time bound work programme (Action Plan for 2007-08) for implementation of different schemes by Brahmaputra Board has been prepared and placed in the 38th meeting of the Standing Committee of Brahmaputra Board held on 9.7.2007 at Guwahati for optimal utilization of allocation during 2007-08. For submission of schemes/proposals for flood control and river management works under Flood Management Programme (a State-sector scheme) guidelines are being prepared considering the different aspects like scope of the scheme, implementation arrangements, financial arrangements, monitoring and evaluation mechanism etc. In this regard, a meeting was taken by Secretary, Ministry of Water Resources with Secretaries of the States of Assam, West Bengal and other States on 27.6.2007 in which the State Governments were impressed upon to submit their sound proposals for funding under the State sector schemes at the earliest, so that the release of funds could be made in time and the funds could be fully utilized. The progress of expenditure is being monitored by the Ministry on periodical basis.

Brahmaputra Board — implementation of the Task Force Report

Recommendation (Para No. 5.24)

The Brahmaputra Board — a statutory body under the Ministry of Water Resources with jurisdiction of the entire 7 States in the North East Region including Sikkim and Northern parts of West Bengal under Brahmaputra and Barak Valley is assigned the work of survey/ investigation and preparation of Master Plans for control of floods, bank erosion and improvement of drainage congestion giving due importance to development and utilisation of water resources in the region. The Pagladia Dam Project, Harange Drainage Development Scheme, protection of Majuli Island are some of the important schemes being executed by the Board. The Government of India approved a scheme of Rs. 150 crore with 90% grant and 10% loan in December 2004 for taking up critical flood control and Anti-erosion schemes in Brahmaputra and Barak Valley. The Board as a part of its activities has prepared 36 Master Plans and the approved Master Plans have been circulated to the concerned State Governments for implementing specific works thereunder. The Secretary during evidence clarified that works for the Brahmaputra Board are covered under two different heads — one River Management activity and works related to border rivers under the Central Sector and the other — Flood Management Scheme under the State Sector for which Rs. 399 crore have been reflected in the State Sector. The works, therefore, would not be affected adversely for want of funds. The Secretary further informed that the Task Force Schemes will be included in Flood Management generic scheme during the Eleventh Plan and implementation of the Task Force Report formed by the Prime Minister in 2004 would not be discontinued. The Committee desire the Ministry to draw a time-bound programme for implementation of the Task Force Report and appraise them of the progress of the works under implementation.

Reply of the Government

The recommendations of the Committee to draw a time bound programme for implementation of the Task Force Report have been noted for guidance.

All the States in Brahmaputra & Barak Valley have already been requested to submit the schemes proposed to be executed during XI plan under flood sector. All the States (except Meghalaya) in Brahmaputra and Barak Valley (including Sikkim & West Bengal) have furnished the schemes for inclusion in the proposed “Flood Management Programme for Flood Control and River Management Works (a State sector scheme)”.

The schemes are under scrutiny with Brahmaputra Board for recommendations for inclusion under XI Five Year Plan.

The Task Force schemes will be included in the XI Five Year Plan on the basis of prioritization by the State Governments.

A time bound programme for implementing the schemes will be drawn after the schemes have been prioritized.

The recommendations of the schemes for release of funds will be made by the Empowered Committee headed by Chairman, Brahmaputra Board for those schemes which fulfil the prescribed criteria.

Accelerated Irrigation Benefits Programme (AIBP) — need of keeping a close watch on physical and financial progress.

Recommendation (Para No. 6.26)

The Committee note that in view of the precarious resource capability of the States, the Central Government had launched the Accelerated Irrigation Benefits Programme (AIBP) in 1996-97 to provide Central Loan Assistance (CLA) to approved major and medium irrigation projects to expedite implementation of these projects. The allocation was kept at Rs. 2,350 crore in BE 2006-07 against which proposals amounting to Rs. 3,795 crore were forwarded to Ministry of Finance. The Ministry, in a subsequent reply, informed that CLA of Rs. 3,795 crore has been released by the Ministry of Finance for AIBP as recommended by the Ministry of Water Resources. The releases are made by Ministry of Finance as the AIBP is a 'State Sector' Scheme. The time lag between forwarding of proposals by the Ministry and release of funds by Ministry of Finance is between 15 days and one month. The Committee also note that the Finance Minister in his Budget Speech has proposed to extend more budgetary support for irrigation projects under AIBP by enhancing allocation for 2007-2008 to the tune of Rs. 11,000 crore — an increase of Rs. 3,879 crore (54.47%) from Rs. 7,121 crore in 2006-07. Further, the progress in respect of on-going projects is being closely monitored and the Ministry of Water Resources has taken up the matter with all State Governments which has resulted in a relatively high achievement during this year. The Ministry expressed the hope that the enhanced allocation for 2007-2008 will be fully utilized. The Planning Commission does not make project-wise allocation. The AIBP grants are released for the individual projects based on the proposals submitted by the State Governments and appraisal carried out by CWC of the physical and financial progress

of the project. The Committee desire the Ministry to keep a close watch not only on the physical progress of the projects but also on the expenditure incurred thereon to obviate adverse criticism by C&AG and other such bodies as earlier taken note of by the Committee in their Third and Fifth Reports on Demands for Grants 2005-06 and 2006-07 respectively as some of the States have diverted/mis-utilised the CLA under AIBP in earlier years.

Reply of the Government

The Ministry of Water Resources is keeping close watch on physical and financial progress of the projects included in AIBP due to which, outcomes of the AIBP has been quite satisfactory in terms of potential creation during recent years. In order to avoid diversion of CA released under AIBP, the Ministry of Water Resources has made built in safeguards such as Utilization Certificate to be signed by the Secretary in charge of Water Resources/Irrigation Department and should contain not only financial achievements but also physical achievements as contained in MOU. In addition, the monitoring teams of the Central Water Commission during their field visit to the projects are also monitoring the status of utilization of the AIBP funds.

CHAPTER III

RECOMMENDATIONS/OBSERVATIONS WHICH THE COMMITTEE DO NOT DESIRE TO PURSUE IN VIEW OF THE GOVERNMENT'S REPLIES

To complete ongoing projects spill over to XI plan before taking up new projects

Recommendation (Para No. 2.25)

The Committee observe that according to the Report of the Working Group on Water Resources for the XI Five Year Plan, there are 471 on-going projects (169 Major, 219 Medium and 83 ERM) which have spilled over from the IX Plan with a balance cost of about Rs. one lakh crore at latest estimated cost including escalation in some projects. According to the Working Group, 178 projects (48 Major, 91 Medium and 39 ERM) are likely to be completed and the remaining 293 of these may spill over to the XI Plan. The Committee further observe that 300 new projects (78 Major, 136 Medium and 86 ERM) were taken up during the X Plan which takes the tally of total number of projects to 593 spilling over to the XI Plan. The Working Group has assessed that during the XI Plan period 337 projects (72 Major, 133 Medium and 132 ERM) are likely to be completed. The Committee fail to understand the rationale behind taking up new projects even while the projects started earlier have been spilling over from one Plan to another. According to the Ministry, the shortfall in the completion of projects as identified by the Working Group is attributed to the shortfall in the envisaged level of funding for irrigation in the State Sector. In addition, thin spreading of the available resources has also been cited as an important factor contributing to lesser number of projects being completed in successive Five Year Plans. To overcome these problems the Working Group has proposed higher plan allocation for the irrigation sector in State Plans as well as AIBP coupled with enhanced monitoring and interaction with the State officials. The Ministry also proposes to utilise remote sensing technology for monitoring of the projects which would help in verification of the project implementation and identification of bottlenecks. In view of the continuous spill over of the projects from one Plan to another, the Committee recommend that no new projects be taken up by Government during the XI Plan till completion of the 593 projects that have already spilled over to the XI Plan.

Reply of the Government

Irrigation is a State subject and planning and execution of the irrigation projects is within the purview of State Government. The Working Group on Water Resources for XI Plan has emphasized need of new storage projects stating that "In India, the rainfall pattern is widely varying in time and space. Bulk of the precipitation occurs during four monsoon months which amounts to about 75% of the total annual rainfall. As a result, the Indian rivers, particularly the non-perennial ones, carry very meager discharge during non-monsoon months. This situation warrants for creation of storages as much as possible to hold the excess flow of monsoon months in order to offset the imbalance arising out of skewed pattern of rainfall. In the process of planned development of water resources since independence, live storage in the country has been built up from 15.6 km³ at the time of independence to present level of about 213 km³. Even after attainment of such storage position, the per capita storage in the country is only about 210 m³, which is way behind the achievement in many of the developed and developing countries. Harnessing of 690 km³ utilizable surface water will only be possible if sufficient numbers of new projects are taken up across the country." The Standing Committee on Water Resources has also pointed out the need of new storage projects in the para 7.18 of their Report presented to Lok Sabha on 28th April 2007.

It is also to point out that most of the ongoing projects which are not getting completed due to some problems, have yielded benefits such as irrigation potential, drinking water, hydro power etc. Such projects are Sardar Sarovar, Gosikhurd, Teesta etc.

As far as AIBP is concerned, Group of Ministers while reviewing the Cabinet Note on "AIBP: Relaxation in criteria" in November, 2006, have suggested that 1:1 criteria for inclusion of new projects in AIBP in lieu of completion of one project in a State should continue but the projects included in Prime Minister's Package for agrarian distress districts, approved projects benefiting drought prone/Tribal area and approved projects in the States having irrigation development below National average may be included in AIBP in relaxation to 1:1 criteria of AIBP. Union Cabinet accepted the recommendation of GOM and accordingly Ministry is following the Cabinet decision.

Repair, Renovation and Restoration of Water Bodies

Recommendation (Para No. 6.33)

The Committee note that a Pilot Project launched in January 2005 with an estimated cost of Rs. 300 crore to be borne by the Centre and

the States in the ratio of 3:1 was to be implemented during the remaining period of the Tenth Plan and the projects were required to be completed within two years from the sanctioned date. So far, 2 works have been completed during 2005-2006, 267 number of works were completed upto December 2006 and 810 number of works are targeted to be completed by March, 2007. Some spill over works will be completed in 2007-2008 benefiting 26 districts in 15 States. The Finance Minister in his Budget Speech of 2007 has proposed that under the project, some State Governments have signed agreements with the World Bank for implementation of the Projects and some States are planning to do so. Further, an amount of Rs. 100 crore has been provided for 2007-08 in the State Sector under Central Plan Outlays. About Rs. 54 crore of this amount will be utilized for spill over projects under the pilot scheme. The remaining will be for providing 25% of the cost in the World Bank assisted projects. It is targeted to complete about 500 water bodies under the pilot scheme by March 2007 and the remaining 598 water bodies by March 2008. In the World Bank assisted project, the work will commence in the first phase of tanks and it is proposed to complete them by the end of two years. The Committee desire the Government to monitor the implementation of these projects by the States earnestly as they are aimed to increase the storage capacities which are quite low, as observed by them elsewhere in this Report since approximately 746 BCM of water is going waste into the sea. They further desire the Government to ensure that the projects targeted to be completed by March 2008 do not spill over to the next year which, in their opinion, would not only increase their cost but also delay in attaining the desired objectives. The Committee may be informed of the progress made in this direction at the earliest.

Reply of the Government

Out of total 1098 water bodies, work in 625 water bodies could be completed till March, 2007 in different States. Requests for extension of time for completion of remaining 473 water bodies have been received from different State Governments. Accordingly, keeping in view the requests made by the State Governments extension of time ranging from 6 months to 12 months is being accorded to the State Governments for completion of spill over work. As per the information provided by the State Governments all spill over activities under the Pilot Scheme on "National Project for Repair, Renovation & Restoration of Water Bodies directly linked to Agriculture" are to be completed by March 2008.

As regards monitoring the implementation of the scheme, it is mentioned that since this is a State sector scheme, the nodal

departments of State Governments have overall responsibility for planning, implementation, supervision and monitoring of the project. The project implementation is done at the district level through the District Level Implementation Committee (DLIC) chaired by District Collector. There is provision for involving the local community, reputed NGOs for monitoring, supervision, coordination with Panchayats etc. The DLIC is responsible for all aspects of implementation-execution at site, procurement of material, selection of NGOs, deciding involvement of contractors, NGOs, WUAs, etc. Executive Engineer is the nodal officer at the District Level for project implementation and functions as Member Secretary for the DLIC. The Ministry of Water Resources is also keeping track of overall monitoring and implementation of the scheme. The projects are being monitored in the States through Central Water Commission. On-site inspections are also being conducted by the officers of this Ministry.

CHAPTER IV

RECOMMENDATIONS/OBSERVATIONS IN RESPECT OF WHICH REPLIES OF THE GOVERNMENT HAVE NOT BEEN ACCEPTED BY THE COMMITTEE

Need of making suitable changes in the National Environment Policy 2006 as per the suggestions of MoWR in order to increase storage capacity.

Recommendation (Para No. 7.18)

The Committee observe that the review of the Ministry of Water Resources carried out by the Planning Commission as a part of its Mid-term Review of the Five Year Plans of every Ministry as well as the State Plans revealed that creation of irrigation potential in first 2 years of the Tenth Plan was significantly below the levels projected by State Governments and therefore, scaling down of targets was unavoidable. The review suggests that this shortfall in achievement of targets is a reflection of the fact that funds for irrigation in the State Sector fell short of the envisaged levels, which itself is a result of lower levels of potential created earlier. As a corollary, the Planning Commission scaled down the target for creation of irrigation potential at the Mid Term Appraisal stage from 9.936 million hectare to 6.5 million hectare for Major and Medium irrigation and from 6.807 million hectare to 4 million hectare for Minor irrigation. The Working Group of Eleventh Plan has further reviewed the position and has projected that a target of 5.29 m.ha for MMI and 3.52 m.ha for MI would be achieved by the end of Tenth Plan. According to them, this situation points to a deeper malaise afflicting the system of projecting targets in successive Plans. The Committee, therefore, recommend the Ministry and the Planning Commission to order an independent evaluation of this system of target fixation, if need be, by a reputed professional/research organization to achieve the desired results in future Plans.

The Committee further observe that a target of 16 m.ha. for creation of irrigation potential of which 9 m.ha. under MMI and 7 m.ha. under MI with a higher outlay of Rs. 1,97,750 crore through State and Central Plan has been proposed for the Eleventh Plan against an outlay of Rs. 84,735 crore for Tenth Plan. The present storage capacity is 71.70 BCM. It is proposed to create storage capacity amounting to

30.57 BCM through projects under construction and additional storage of 71.34 BCM could be created through the projects under consideration. The Mid Term Review also suggests for increase in cost limit of major projects from Rs. 100 to Rs. 250 crore and CCA limit from 10,000 to 25,000 hectare. Further, the Ministry suggested for modification of clause relating to mandatory environmental clearance for major projects to the Ministry of Environment and Forests. However, the Ministry has informed that the National Environment Policy 2006 approved in May 2006 does not include the suggestions of the Ministry of Water Resources. The Committee are of the opinion that in order to increase the storage capacity, the suggestions of the Ministry from the environmental angle need to be re-looked as more than one third of the utilisable water is going waste into the sea. The Committee also desire the Ministry to pursue the matter with the Ministry of Environment and Forests to make suitable changes in the National Environment Policy 2006.

Reply of the Government

The Ministry of Environment and Forests has already been requested for necessary action in this regard.

Comments of the Committee

(Please *see* Para No. 22 of Chapter-I of the Report)

CHAPTER V

RECOMMENDATIONS/OBSERVATIONS IN RESPECT OF WHICH FINAL REPLIES OF THE GOVERNMENT ARE STILL AWAITED

To reduce gap between created irrigation potential and its utilization

Recommendation (Para No. 2.26)

The Committee further observe that with the sustained and systematic development of irrigation started from the First Five Year Plan, the irrigation potential from Major, Medium and Minor Irrigation Projects has increased from 22.60 million hectare in 1951 to 102.7 million hectare approximately as against the utilisation of irrigation potential so created ranged between 22.60 million hectare in 1951 and 87.23 million hectare approximately at the end of the X Plan. The utilisation of created irrigation potential stands at 84 per cent. The Government expects reduction in the gap between potential created and utilised by the Centrally Sponsored Schemes of CAD&WM which supports activities like construction of field channels, on-farm development, etc. Although the XI Plan has commenced, the Planning Commission has not finalised the State Plans for 2007-2008 as yet. The Committee desire that the State Plans for 2007-2008 be finalised without any further loss of time to enable the State Governments to commence /continue works during the current year. The Committee also desire that by using remote sensing technology, the gap between the created irrigation potential and its utilisation would reduce. The Committee would like to be informed of the progress made as a result of the steps taken by the Government in this regard.

Reply of the Government

Out of the irrigation potential of 102.7 million ha. created so far, the area covered under the construction of field channels so far since 1973-74 is about 18 million ha., mainly under major and medium projects. The rate of creation of irrigation potential out-spaces the rate at which area is presently being covered under field channels as States are facing difficulty in providing their matching share. Moreover, deferred maintenance of canals is also responsible for the gap in utilization of irrigation potential. Efforts are being made to revamp the Command Area Development and Water Management Programme

to include 8 M.Ha. of additional area under field channels and 8.5 M.ha. area under correction of conveyance deficiency during XI Plan. Besides the programme is now proposed to be State friendly as Central share is proposed to be enhanced. Copy of EFC note is circulated to all Ministries and views of Planning Commission are awaited.

Regarding finalization of State Plan allocation, Planning Commission has been requested to look into the matter. Planning Commission has informed that the Annual Plan 2007-08 for all States/UTs except Goa and Uttar Pradesh have been finalized. The sector-wise outlays in Annual Plan 2007-08 for 20 States and 4 UTs have also been finalized and those of the remaining States/UTs are being finalized.

Regarding the use of remote sensing technology for assessing the actual utilisation of the created irrigation potential, it is to submit that Ministry of Water Resources has got a study done by NRSA in respect of 2 projects namely Teesta Barrage Project in West Bengal and Upper Krishna Project in Andhra Pradesh. Further, National Remote Sensing Agency, Hyderabad has been associated in the study for assessment of irrigation potential created under 53 AIBP funded projects in the country.

Comments of the Committee

(Please *see* Para No. 10 of Chapter-I of the Report)

To reflect allocations for CGWB in the budget document appropriately—artificial recharge of ground water through dug wells.

Recommendation (Para No. 3.23)

Further, the Committee observe that CGWB is entrusted with the task of surveys, investigations, exploration, augmentation and regulation of ground water resources of the country. Besides, the Board is also taking up special studies on R&D, artificial recharge, etc. The allocation for CGWB also shows a disturbing trend wherein the allocations at the BE stage were reduced considerably at the RE stage, which have been further reduced in BE in the next year. The BE for 2007-2008 has drastically come down to Rs. 1.50 crore from Rs. 91.34 crore in BE 2006-2007. However, the Ministry in a subsequent reply furnished to the Committee informed that the total budget for CGWB is reflected in the scheme 'Ground Water Management and Regulation'. The Committee desire that the allocations need to be appropriately reflected in the Budget Documents.

Furthermore, the Committee observe that the Finance Minister has proposed a new scheme on Artificial Recharge of Ground Water through 'dug wells' in 1,065 over exploited or critical blocks covering 100 districts in 7 States, costing Rs. 4,000 for each 'dug well'. The Scheme has proposed to provide 100 per cent subsidy to the small and marginal farmers and 50% subsidy to other farmers. The Scheme will be finalised shortly in consultation with the concerned State Governments, NABARD and CGWB. The scheme will be implemented in the States of Andhra Pradesh, Rajasthan, Maharashtra, Madhya Pradesh, Karnataka, Gujarat and Tamil Nadu. The Committee desire that all the preparatory work for launching the Artificial Recharge of Ground Water through 'dug wells' scheme be finalised at the earliest. They desire to be apprised of the action taken and progress made in the matter at frequent intervals.

Reply of the Government

With a view to rationalize plan schemes of the Ministry of Water Resources, schemes with similar activities have been clubbed. Accordingly the budget for CGWB is reflected in the scheme "Ground Water Management & Regulation" which is Rs. 75.50 crore. Rs. 1.50 crore has been separately kept for the scheme "Rajiv Gandhi National Ground Water and Research Institute".

Subsequent to the announcement of the scheme on artificial recharge of ground water through dug wells in hard rock areas in the budget speech of Finance Minister on 28.02.2007, a meeting was taken by Secretary (WR) on 23.03.2007 with representatives from concerned State Governments, officers from NABARD, Central Ground Water Board and Ministry of Water Resources. Thereafter a draft note for consideration of Cabinet Committee on Economic Affairs (CCEA) has been prepared and circulated to all concerned Ministries/Departments viz. Ministry of Finance (Department of Economic Affairs and Expenditure), Department of Drinking Water Supply, Department of Agriculture and Cooperation, Ministry of Panchayati Raj, Planning Commission and PMO for their comments. The proposed scheme covers 1180 over-exploited, critical and semi-critical blocks, falling mainly in hard rock areas in the States of Andhra Pradesh, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan and Tamil Nadu at an estimated cost of Rs. 1871.10 crore. The net cost of the scheme works out to be Rs. 1723.87 crore, which includes subsidy component and other charges. The scheme envisages ground water recharge through 4.455 million existing irrigation dug wells.

Comments of the Committee

(Please see Para No. 13 of Chapter-I of the Report)

Command Area Development Programme–implementation of PIM.

Recommendation (Para No. 4.15)

The National Water Policy 2002 laid great emphasis on participatory approach in Water Resource Management. The participation of the farmers in management of irrigation includes transfer of responsibility for O&M and collection of water charges for the WUAs. One time functional grant @ Rs. 600 per hectare to be shared between the Centre, State and farmers is being paid to outlet level WUAs as incentive, the interest from which is used for maintenance. In view of the declining interest rates over the past 3 years, the Working Group for the Eleventh Plan has recommended enhancement of the functional grant to the WUAs and Central grant for motivation activities, training and capacity building of farmers. The Committee also observe that PIM Legislation has not been enacted in many States. So far 11 States have either enacted exclusive legislation or amended their Irrigation Act for involvement of farmers in irrigation management while Gujarat had experimented with the idea of farmers' cooperative movement in this regard and the enabling Act for PIM is on the cards. The issue of implementation of PIM was discussed in detail by the National Water Board at its meeting held on 5 January 2007 due to which a separate National Level Workshop on PIM was not organised. It may, however, be pertinent to observe that the National Water Board while emphasising on the States to enact PIM Legislation at the earliest, has not recommended any time frame for doing so. The Committee desire the Ministry to review the progress of implementation of PIM in the context of National Water Policy 2002 and report the matter to the National Water Resources Council for appropriate directions. They also desire that PIM legislation is enacted in the remaining States at the earliest. The Committee also desire to be informed of the outcome of the review and the directions given by the National Water Resources Council in this regard.

Reply of the Government

Necessary action as desired by the Committee, shall be initiated in the matter, *inter-alia*, pursuing the issue of enactment of PIM legislation by the remaining States. The matter shall also be placed before National Water Resources Council as and when its meeting takes place.

Comments of the Committee

(Please see Para No. 16 of Chapter-I of the Report)

Accelerated Irrigation Benefits Programme (AIBP) — to process expeditiously the Review Report of the Ministry of Statistics and Programme Implementation on AIBP.

Recommendation (Para No. 6.27)

The Committee further observe that the Twelfth Finance Commission has recommended abolition of loan component and the States are incurring expenditure of State-share mostly from their Plan allocations. In order to achieve the target of completion of projects, the Ministry of Water Resources has stepped up monitoring of the projects. The Ministry has also taken up monitoring of creation of irrigation potential by the Remote Sensing Technology to confirm the actual achievement on site. An irrigation potential of 15 lakh hectare is proposed to be created of which 13.5 lakh hectare will be through major and medium irrigation projects and 1.5 lakh hectare through surface minor irrigation schemes under AIBP. A Fast Track Programme was launched in February 2002 to be completed in two working seasons those Major and Medium Irrigation Projects which are nearing completion. The Fast Track Programme has now been discontinued from 2006-07 as per the revised guidelines. This has been done as a part of the process to rationalize the procedure for release of funds under AIBP. The Ministry of Statistics and Programme Implementation had taken up evaluation of AIBP during 2004 with the help of ten different Consultancy Firms who evaluated the AIBP performance in the whole country. The draft report has been submitted during December 2006 which is under examination. Further, the Planning Commission has also proposed to take up a similar study during 2007. The Committee recommend the Ministry to expeditiously process the Review Report submitted during December 2006. The Committee further recommend the Government to initiate the remedial measures suggested by the Review Report to further improve and streamline the processes and procedures governing the implementation of AIBP in the coming years. They would like to be apprised of the action taken in this matter at the earliest.

Reply of the Government

The Report on review of AIBP submitted by the Ministry of Statistics & Programme Implementation is under consideration with Ministry of Water Resources. The State-wise and project-wise recommendation would be taken up with the State Governments for taking necessary corrective measures.

Comments of the Committee

(Please see Para No. 19 of Chapter-I of the Report)

Expeditious processing of suggestions/recommendations of the expert group on ground water — formulation of policy for declaring major irrigation projects as “National Projects.”

Recommendation (Para No. 7.19)

The Committee also observe that irrigation water charges in most States are not even adequate to recover the O&M cost except Gujarat and Maharashtra which have been able to meet full O&M cost from the revenue earned through water tariffs. In the context of water tariffs, the need for regulatory mechanism to ensure sustainability of resources and facilities created was discussed in the 12th Meeting of the National Water Board while the Maharashtra Water Regulatory Authority is already functional, the States of Himachal Pradesh, Madhya Pradesh, Rajasthan, Orissa, Tamil Nadu and Uttar Pradesh have stated that the process of setting up of the regulatory mechanism is under formulation. The Committee desire the Ministry to impress upon the States to set up the regulatory mechanism for optimum, judicious and equitable management, allocation and utilisation of the limited water resources available. The Mid Term Review proposed to set up an Expert Group comprising officials of Ministries/Departments, NGOs, etc. to review the issue of ground water ownership in line with the international practices and suggest a line of action for implementation during Eleventh Plan. The Expert Group on ground water was to submit its report to the Planning Commission on 31 May 2006 which was, however, delayed due to extensive consultations required in the matter and the report is expected shortly. The Committee urge the Ministry of Water Resources and the Planning Commission to process the suggestions/recommendations of the Expert Group on ground water expeditiously. Further, the Mid Term Appraisal also notes that Women Self Help Groups need to be promoted in a major way. The Committee are happy to learn that in pursuance of the provisions of National Water Policy, the guidelines for PIM emphasised upon the States to consider representation of women in WUAs at all levels and as a result thereof many of the State Governments have amended their Irrigation Acts or specific Acts on PIM have been formulated with provisions for participation of women.

The Committee have come across a suggestion for declaring the Teesta Barrage Project as a National Project fully funded by the Central Government. In this context, the Ministry has informed that the suggestion of the West Bengal Government has been received and the concept of the National Project is under consideration of the Ministry. The Committee desire the Ministry to formulate a policy for declaring

major irrigation projects as 'National Projects' at an early date. The Committee desire to be apprised of the action taken in this regard at the earliest.

Reply of the Government

The concept of the National Project has been incorporated in the Cabinet Note for continuation of AIBP in the XI Plan and the same is under Inter Ministerial circulation. Further action will be taken on approval of Union Cabinet to the Cabinet Note.

The Report of the Expert Group constituted by the Planning Commission has been finalized and reportedly will be submitted in Planning Commission shortly.

Comments of the Committee

(Please *see* Para No. 25 of Chapter-I of the Report)

NEW DELHI;
19 November, 2007
28 Kartika, 1929 (Saka)

R. SAMBASIVA RAO,
Chairman,
Standing Committee on Water Resources.

APPENDIX I
(Para No. 2.37)

**BRIEF NOTE ON THE RESEARCH SCHEMES COMPLETED
DURING THE LAST FIVE YEARS (SINCE APRIL 2002)
UNDER THE R&D PROGRAMME OF MoWR**

Thirty five (35) research schemes have been completed under the R&D Programme of MoWR during the last five years (since April 2002). A list of these schemes indicating the title of scheme, name of Principal Investigator (PI), name of the institute and the sanctioned cost is enclosed. A brief note on each of the completed scheme containing the objectives and findings of the study is also enclosed.

These research schemes, fully funded by MoWR, were successfully carried out at various Central and State Government research institute/ organizations, universities, IITs and WALMIs etc. The subject covered by these schemes span across wide spectrum of water resources and include irrigation, drainage, agronomy, water management, hydraulic structure, surface and ground water hydrology.

Further eighty-two (82) research schemes have been sanctioned during the past 5 years. Most of these schemes are ongoing.

**List of research schemes completed during the last 5 years
(since April 2002) under the R&D Programme of MoWR
(as on 20.7.2007)**

Sl.No.	Title of Project	Name of Institute	Name of PI	Sanctioned Cost (Rs.)
1	2	3	4	5
1.	Quantification and alleviation of Crop Losses due to Floods and Impact of Floods on Ground Water Recharge	Punjab Agricultural University, Ludhiana	Dr. H.S. Uppal	1001000
2.	Integrated Hydrological Studies in Kodaveeti Vegu Watershed	Nagarjuna University, Nagarjunanagar, Guntur	Sh. P. Sankara Pichaiiah	265000
3.	Developing Guidelines for EIA of a completed water resources project in Tamil Nadu	Pondicherry University, Kalapet	Professor S.A. Abbasi (Director)	864000
4.	Hydrological & Ecological Studies on the Oustery Lake Ecosystem	Pondicherry University, Kalapet	Professor S.A. Abbasi	1648700

1	2	3	4	5
5.	Development of Dynamic Flood Frequency Model	Indian Institute of Technology Roorkee	Dr. N.K. Goel	360000
6.	Water quality assessment and characterization in Pondicherry region	Anna University, Chennai	Dr. R. Ramesh	679800
7.	Ground water studies using satellite data, Helium and geophysical techniques—A pilot study project	Physical Research Laboratory, Ahmedabad	S.K. Gupta/ Dr. P.R. Reddy/ Dr. R.L. Dhar	1530000
8.	Feasibility of artificial recharge study through mathematical modeling in Kongal river basin, a hard rock region in Nalgonda District, AP	National Geophysical Research Institute, Hyderabad	Dr. V.S. Singh	1097000
9.	Ascertaining arsenic mobilisation in Soil-Water-Plant system and exploring the possible remedial measure, West Bengal	Bidhan Chandra Krishi Vishwa Vidyalaya, Nadia	Dr. Saroj Kumar Sanyal	957000
10.	The effect of water logging and intensive agriculture on ground water regime in deltaic region	Andhra University, Vishakhapatnam	Prof. M. Gangadhar/ Prof. C. Subbarao	938000
11.	Hydro-economic interaction between tank & Well water and possibilities for conversion of tank into percolation tank	Tamil Nadu Agricultural University, Coimbatore	Prof. K. Palanisami	669000
12.	Environmental studies of surface and ground water down stream of Pennar river Andhra Pradesh	Jawaharlal Nehru Technological University, Hyderabad, A.P.	Dr. M. Aniji Reddy	536380
13.	Impact of urbanisation on ground water—A study from Jaipur city and hinterland	University of Rajasthan, Jaipur	Prof. A.K. Sinha	634000
14.	Laboratory investigation on use of perforated hollow cylinder as a solution for coastal erosion problems	National Institute of Technology Karnataka, Surathkal	Dr. N.B.S. Rao	942000
15.	Studies on under water bodies in the combined wave and current field	College of Engineering, K. Rangarao University, Visakhapatnam	Dr. M.L. Narsimham	750000
16.	Scale effect in a mixed flow pump	Jadhavpur University, Calcutta	Dr. T.K. Saha	653000
17.	Scour protection around bridge piers and abutments	Indian Institute of Technology, Kanpur	Sh. T. Gangadhariah	695000
18.	Remote sensing aided idealisation of space time variant behaviour of channel geometry of river Brahmaputra	Indian Institute of Technology Roorkee	Dr. Nayan Sharma	1325280
19.	Preparation of a critical note on Lacey's method for predicting scour and updating of State of art report on scour around bridge piers	Indian Institute of Technology Roorkee	Dr. U.C. Kothiyari	25000

1	2	3	4	5
20.	A reviewing on the scour protection methods around bridge piers and abutments	Indian Institute of Technology, Kanpur	Dr. T. Gangadhariah	40000
21.	Development of Coastal Protective Structure in Tamil Nadu	Indian Institute of Technology, Madras	Dr. J.S. Mani	1788000
22.	Developing Drip Irrigation System for Field Scale Implementation for Orchard and Field Crops	Punjab Agricultural University, Ludhiana	Dr. H.S. Uppal	647000
23.	Geographic Information System Design for Environmental Impact Assessment of Irrigation Project A case study of Nagarjunasagar right bank canal command area	Jawaharlal Nehru Technological University, Hyderabad, A.P.	Sh. I.V. Murali Krishna	925000
24.	Studies for combating salinity problem in the Upper Krishna Project (UKP) area	Gulbarga University, Gulbarga	Dr. G.R. Naik	602000
25.	Performance Studies of Sprinkler Drip and Surface Irrigation Methods	Punjab Agricultural University, Ludhiana	Dr. N.K. Narda	458000
26.	Development of Simulation Model for Dynamic Regulation of Canal Network	Water Resoruces Engineering and Management Institute, Samiala	Sh. P.M. Modi	325000
27.	Determination of Optimal cropping Pattern and Release Policy for a Conjunctive use of Surface and ground water by linear programming	Water Resources Engineering and Management Institute, Samiala	Sh. D.T. Shete	294000
28.	Status Report on History of Irrgn. for Andhra Pradesh & Tamil Nadu	INCID, Bhikaji Cama Place, New Delhi	Sh. A. Narayana Rao	338000
29.	Improving water use efficiency of crops and cropping system	Water Technology Centre, Indian Agricultural research Institute, New Delhi	Sh. B.R. Sharma	56000
30.	Fabric based material for canal lining	Indian Institute of Technology, Delhi	Prof. B.L. Deopura	3896000
31.	Solar power trickle irrigation system for sandy tracts of coastal Andhra Pradesh	College of Agriculture, Andhra Pradesh Agricultural University	K. Yella Reddy	697400
32.	Modelling of Diffusion in Concrete Parameters and Determination	Indian Institute of Technology, Delhi	Dr. Bishwajit Bhattacharjee	442000
33.	Software development for 3-D finite element analysis of sub-structures in water charged rock masses for River Valley Projects	Indian Institute of Technology Roorkee	Dr. P.N. Godbole	1200000
34.	Nonlinear Finite Element Analysis for Design of Underground Openings	Central Building Research Institute, Roorkee	Dr. Prabhat Kumar	984000
35.	Evaluation of Compaction Control Method	Indian Institute of Technology, Delhi	Dr. Manoj Dutta	971000

1

Title of scheme	:	Quantification and Alleviation of Crop Losses due to Floods and Impact of Floods on Ground Water Recharge
Name of PI	:	Dr. H.S. Uppal
Institute	:	Punjab Agricultural University, Ludhiana
Sanctioned Cost	:	Rs. 10,01,000

Objectives

- To conduct surveys and estimate the extent and nature of damage to crops in relation to duration, intensity and time of occurrence of floods and identify production constraints of flooded lands.
- Quantification of crop damage estimates by crop cutting sampling approach
- Study the impact of floods on the ground water recharge
- To study the mode of damage to crops
- To develop agronomic, soil and nutrient management measures to mitigate the damage to crops due to floods
- To demonstrate and disseminate the soil-water and crop management technologies developed to cultivators in flood prone areas.

Findings:

- The extent and nature of damage to crops in relation to duration, intensity and time of occurrence of floods and identified production constraints of flooded lands were estimated.
- The impact of floods on the ground water recharge was studied.
- Research activities to study the mode of damage to crop.
- Agronomic, soil and nutrient management measures were investigated to mitigate the damage to crops due to floods.

2

Title of scheme : Integrated Hydrological Studies in Kodaveeti Vegu Watershed
Name of PI : Sh. P. Sankara Pichaiah
Institute : Nagarjuna University, Nagarjunanagar, Guntur
Sanctioned Cost : Rs. 2,65,000

Objectives:

- Deeper understanding of the hydrological cycle and thereby evaluating the causative factors of drought;
- Estimate the impact of drought on surface and groundwater resources.
- Identify methodologies for moisture conservation during cropping periods and extending them to larger areas.
- Bringing awareness among the people on the ecological friendly concepts of land and water management for enhancing productivity and increasing the recharge.
- Interact with various institutions for initiating long-term development plans in the region.

Findings:

Even though there is a scarcity of water in Kondaveeti Vegu watershed, there is no mechanism to manage and develop the water resources. So, water flowing through 'local vagus' should be stored near the village itself. It should not be allowed to add to the main course. For this water balance studies on individual vagus should be taken up.

3

Title of scheme : Developing Guidelines for EIA of a completed water resources project in Tamil Nadu
Name of PI : Professor S.A. Abbasi
Institute : Pondicherry University, Kalapet
Sanctioned Cost : Rs. 8,64,000

Objectives:

- Collecting and collating all available information on Sathanur dam.
- Assessing the beneficial as well as adverse impacts of each project;

Findings:

The water resources projects located upstream of the Sathanur reservoir have an indirect bearing on the Sathanur reservoir water quality by impacting the water quality of the feeder streams.

No exotic or endangered species of flora or fauna have been reported in the dry, deciduous reserve forest.

As per the criteria for seismicity (IS: 1993-1984), Sathanur dam is located in the zone II reflecting moderate risk of the area to the seismic hazards. But there have been no instances of tremors or landslides in the region since the Sathanur reservoir was created in 1958.

The dead storage space provided in the Sathanur reservoir was meagre 0.1232 Mm³ *i.e.* 0.05% of the reservoir capacity, which was very less according to the design criteria of reservoirs.

Due to the less capacity-inflow ratio in the Sathanur reservoir (0.35), much of the sediments are discharged over the spillways as the residence time of the sedimentladen water in the reservoir decreases.

The reservoir water can be categorised as highly eutrophic because of the (i) high EC (>200 umhos, Rawson, 1960; Berg et al., 1958), (ii) high alkalinity values (Phillipose, 1960; Spencer, 1974) and (iii) high bicarbonate values (Moss, 1973; Munawar, 1970). As per the criteria of Moyles (1946) the reservoir can be categorized as a hard water body due to the high alkalinity values.

An increasing trend has been observed during the summer months in the case of total solids, dissolved solids, calcium hardness, and chlorides, which could be explained due to the evapo-transpiration factor. However, the parameters—alkalinity, total hardness, magnesium, and sulfates—showed declining trends.

4

Title of scheme	:	Hydrological & Ecological Studies on the Oustery Lake Ecosystem
Name of PI	:	Professor S.A. Abbasi
Institute	:	Pondicherry University, Kalapet
Sanctioned Cost	:	Rs. 16,48,700

Objectives:

An in depth integrated study of the Oustery lake and its catchment leading to a (a) thorough understanding of the biotic and abiotic factors

contributing to the lake eco-system and their inter-relationship, with special reference to the community dynamics of the birds, fishes and commercially important invertebrates, (b) a precise assessment of the extent of disruption to the eco-system caused so far and the measures necessary for the eco-restoration of the wetland, and (c) delineation of strategies based on the funding of this study, for sustainable management of tropical wetland in general.

Findings:

Water of the lake can be classified as class 2, with moderate salinity. The pH of the lake is in the mild-to-alkaline range. Interestingly, the water of the lake at the north-east extreme has the highest pH. The pH of the soil and the bore well water was in the slightly acidic to mildly alkaline range.

The hydraulic retention time (HRT) of the water in Oussudu lake has altered drastically in the past few years. An increase in the residence time of Oussudu lake can be attributed to the following reasons (i) people in the catchment of Oussudu are now turning to borewells for irrigation water than relying on Oussudu lake and its channels, and (ii) the abundance of rains has kept the lake filled for the past three years, which is unusual for Oussudu lake. Thus the lake, being left disused, had slowly been accumulating the runoff nutrients and sediments becoming hypereutrophic.

The plankton population of Oussudu lake was dominated by diatoms due to the meso-eutrophic calcium contents and highly alkaline eutrophic nature of the water. The presence of a large number of phytoplankton, seven out of ten species, constituting about 80% of the phytoplankton density, are indicative of water pollution. A comparison of the two Communities during 1997 and 1999 construe that the plankton diversity, composition and structure has changed drastically. Also the decrease in the ratio of zooplankton to phytoplankton density is indicative of enhanced primary productivity and eutrophic nature of the lake.

A comparison of the primary productivity values of Oustery lake with that of the other lakes indicate that the lake is tending towards hyper-eutrophy.

The lake is well-mixed, and thus the chemical and thermal stratification of the lake are not very significant. The thermal and the O₂ profiles follow an orthograde curve.

Diurnal variation is pronounced and significant in the case of all the parameters except alkalinity, chlorides, total hardness, and total dissolved phosphorous. Except for phosphorous and nitrogen, no significant difference was observed in the concentration of water constituents in the epilimnion and hypolimnion.

5

Title of scheme : Development of Dynamic Flood Frequency Model
Name of PI : Dr. N.K. Goel
Institute : Indian Institute of Technology, Roorkee
Sanctioned Cost : Rs. 3,60,000

Objectives:

1. Estimation of parameters of stochastic rainfall models including regionalisation of rainfall parameters.
2. Development of various dynamic flood frequency models *i.e.* various combinations of stochastic rainfall, infiltration and rainfall runoff models.
3. Application of these models to more and more watersheds having long term reliable runoff data.
4. It is envisaged in the project to concentrate the efforts in above directions and finally suggest an alternate methodology for carrying flood frequency analysis based on the dynamics of the catchment and rainfall characteristics. The above objectives would require creation of catchment and meteorological data base and its processing for the selected region. It is proposed to use a GIS package for this. Limited field studies for infiltration and catchment parameters stochasticity are also proposed.

Findings:

1. A physically based flood frequency distribution has been derived using joint PDF of exponentially distributed rainfall intensity and duration, curve number for excess rainfall computation and kinematic wave as effective rainfall-runoff model.
2. Physically-based derived flood frequency distribution (DFFD) models offer a promising alternative to the conventional

approaches for estimating the PDF of flood flows at an ungauged site. DFFD methods are unique because they integrate knowledge of the physical processes with probabilistic analyses. The stochastic rainfall model used in this study accounts for correlation between rainfall intensity and duration which were earlier assumed to be either independent of each other or negatively correlated. The results of application of this model to four Indian watersheds and one watershed of United States indicate that correlation has an important impact on the estimated quantities.

3. Only nine gauging sites of subzone 3c, the upper portions of Narmada and Tapi basins of India have been found to be homogeneous with the region. Mean annual flood of various sites of subzone 3c can be found from regression equation between catchment characteristics (area and length of main stream) and mean annual flood.
4. Amount parametric methods of Regional flood frequency analysis, Generalized Pareto distribution based on L-moments was found best. Growth curves were developed for parametric methods and one non-parametric method (new application of ANN). After evaluation of growth curves it was noticed that growth curve developed by ANN closely fits with observed value and with best-fit distribution. Thus, the study demonstrates that the growth curve developed by ANN can be used to estimate flood quantiles at both gauged and ungauged catchments in the upper portions of Narmada and Tapi basins of India *i.e.* Sub zone 3C.

6

Title of scheme : Water quality assessment and characterization in Pondicherry region
Name of PI : Dr. R. Ramesh
Institute : Anna University, Chennai
Sanctioned Cost : Rs. 6,79,800

Objectives:

- To identify sources of pollutants affecting the quality of available water resources in Pondicherry region.
- To prepare inventory of different sources of contaminants.

- To assess the spatial and temporal variation of major and trace elements in the groundwater and surface water of Pondicherry Region and to understand the processes controlling the seasonal variation of these elements.
- To determine the spatial variation of the various forms of inorganic nutrients ($\text{NO}_3\text{-N}$; $\text{NO}_2\text{-N}$; $\text{NH}_4\text{-N}$ and PO_4) in ground water and to evaluate the impacts of agricultural activity on water quality in this region.

Findings:

The dominant cations and anions of the groundwater in Pondicherry region were found to be in the order of $\text{Na} > \text{Ca} > \text{Mg} > \text{K}$ and $\text{HCO}_3 > \text{Cl} > \text{SO}_4$ (meq/l) respectively. The predominant hydrochemical facies of groundwater were identified as $\text{Na} + \text{KHCO}_3$, CaHCO_3 and MgHCO_3 .

It is seen that the major ion concentrations are predominantly influenced by natural agencies than the anthropogenic activities. Also the findings reveal that the over exploitation of groundwater has invited the problem of sea water intrusion along the coast line and results in the increase of major ions such as Na and Cl.

The distribution of nutrient concentration indicates that leaching of the fertilizers applied to croplands resulted in the enrichment of nutrients in groundwater of agriculture area in Pondicherry region.

The study indicates that the trace elements are mostly derived from anthropogenic sources (industrial and municipal waste discharges), which are being delivered into the hydrological systems either directly or indirectly. The residual level of organochlorine pesticides are found to be 3 to 4 times more in agriculture area than in urban area.

The study reveals that the salt water has intruded into the coastal alluvial aquifer for about 3000 metres irreversibly. The zone between 3000 metres and 6000 metres from the coastline will always be under the dynamic influence of salt water and fresh water.

7

Title of scheme : Ground water studies using satellite data, Helium and geophysical techniques—A pilot study project

Name of PI : Dr. S.K. Gupta/Dr. P.R. Reddy/Dr. R.L. Dhar

Institute : Physical Research Laboratory, Ahmedabad

Sanctioned Cost : Rs. 15,30,000

Objectives:

1. To ascertain the potential of natural helium surveys in combination with remote sensing data and geophysical surveys for characterizing faults/fractures in hard rock areas, especially with reference to their groundwater potentials.
2. To conduct pilot studies for understanding direction and rate of movement of groundwater in hard rocks using artificially injected helium at selected locations with a view to determine transmission and dispersion properties of the aquifers and to recommend appropriate sites for construction of artificial recharge structures.

Findings:

Two prominent lineaments were identified from analysis of remote sensing data by NRSA and the helium survey was undertaken along and across these lineaments.

In general, the tubewells located along the major lineaments and dolerite dykes in the Kavadapalli area showed anomalous helium concentration. The groundwater helium anomaly became relatively less prominent in the locations away from the lineament. The soil-gas in the region did not show any significant Helium anomaly possibly due to weathered nature of the soil zone, which facilitates quick permeation and escape of Helium released from the fractures and fissures in the bedrocks. The groundwater, being closer to the fractures and fissures in the bedrocks, however, did successfully trap the Helium emanating from the lineament zone as reflected in higher Helium anomaly in groundwater.

Detailed electrical resistivity profiling, sounding and imaging was undertaken at selected locations along the major identified Deshmukhi lineament in the Kavadapalli area. The results indicated that regions with high groundwater helium anomaly did have deeper fracture zones and also thick weathered top layer. Tubewells in such regions also had relatively higher yield-suggesting that groundwater helium anomalies are associated with deeper fractures, but occurrence of groundwater also requires thick weathered zones connecting to these fractures.

This study has ascertained that Helium survey along and across the lineaments already identified by remote sensing can provide valuable information in terms of mobilisation and migration of water from deeper sources and also narrows down the search zone for geophysical surveys. This kind of information can not be obtained even with rigorous analyses of remote sensing data of high resolution.

8

Title of scheme : Feasibility of artificial recharge study through mathematical modeling in Kongal river basin, a hard rock region in Nalgonda District, AP

Name of PI : Dr. V.S. Singh

Institute : National Geophysical Research Institute, Hyderabad

Sanctioned Cost : Rs. 10,97,000

Objectives:

1. Characterization of groundwater flow regime in Kongal basin.
2. Assessment of dynamic groundwater potential through mathematical modeling
3. Artificial recharge feasibility study to augment the groundwater resources through mathematical modeling.

Findings:

In view of continuing demand for groundwater, detail geophysical, hydrogeological investigations and data analysis has been carried out and aquifer system in the basin has been conceptualized. The various geo-informations have been integrated through the application of GIS and an integrated groundwater potential map has been prepared. Geoelectrical soundings have been carried out to delineate depth to basement. The aquifer parameters have been estimated through pumping test. Various stresses on the aquifer system have been evaluated. Finally these inputs have been considered to construct mathematical model. The model has been calibrated against observed water level. The model is then used to predict the trend of water level for an additional recharge considering artificial recharge. It has been found that the depletion in the groundwater can be arrested even with additional 5% of recharge.

9

Title of scheme	:	Ascertaining arsenic mobilisation in Soil-Water-Plant system and exploring the possible remedial measure, West Bengal
Name of PI	:	Dr. Saroj Kumar Sanyal
Institute	:	Bidhan Chandra Krishi Vishwa Vidyalaya, Nadia
Sanctioned Cost	:	Rs. 9,57,000

Objectives:

1. To ascertain the arsenic contamination in soil/plant in deep tube well command area, with special emphasis on the role of soil separates to restrict the mobilisation of arsenic from soil to plant.
2. To establish technique for de-arsenification of arsenic contaminated ground water on storing in existing ponds.

Findings:

- From the observations recorded during the period from December 1, 2003 to March 31, 2005 under the present investigation, the groundwater in the areas of study was found to be highly contaminated with the toxin, i.e., arsenic.
- The total loading of arsenic in the field soils was moderate to high, while the Olsen-extractable arsenic (labile soil pool) was also considerable. The farmers of the given study areas had a tendency to include boro paddy in the cropping sequences practised.
- There was also a considerable build-up of arsenic in the crops cultivated in the present study areas supported by irrigation with contaminated groundwater, in which arsenic content in different plant parts generally fell in the order: root>stem>leaf>economic produce.
- On storing contaminated groundwater (from STW) in a pond, there was gradual lowering (on standing) of arsenic loading of the stored pond water, while its progressive build-up in the corresponding sediment samples.

- The arsenic sorption/desorption processes in the given experimental soils was thermodynamically unfavourable which would facilitate the presence of arsenic species in soil solution, thereby leading to its phyto toxicity and entry into the human food-web through plant uptake.
- The findings, based on the analysis of arsenic loading in different plant parts of several standing and harvested crops at different periods of time round the year, convincingly demonstrated the usefulness, as a potential remedial option, of adoption (by the farmers of the present affected areas of study) of the farmer-remunerative, comparatively lower water demanding cropping sequences, thereby cutting down the given toxin load in the soil-crop systems under examination. This also helps in bringing down the possibility of entry of arsenic in the human food-web.

10

Title of scheme	:	The effect of water logging and intensive agriculture on ground water regime in deltaic region
Name of PI	:	Prof. M. Gangadhar/Prof. C. Subbarao
Institute	:	Andhra University, Vishakhapatnam
Sanctioned Cost	:	Rs. 3,98,000

Objectives

- To study the quality of groundwater.
- To delimitate the intensity of water logging and its effect on ground water.
- To investigate the effect of intensive agriculture on ground water.

Findings

- From the observation wells data, it is noticed that the ground water build up in the command area has a close relationship to the location of the observation wells to the canal network system, then topographic situation and the geological terrain.
- The increasing trend of the electrical conductivity is an indication of the increase of the Total Dissolved Salts, which

is an index of the deterioration of the quality of ground water.

- It is recognized fact that there will be a ground water build up consequent to the supply of water by surface sources of irrigation and deterioration of the quality of the ground water.
- If crops with high water requirements like rice are always sown and imported water is used for irrigation, the chances are high that the area will become waterlogged. When such crops are to be raised, they should be rotated with other crops that require less water. Further, wet crops should not be raised on highly permeable soils.
- An area is considered as water logged when the water-air ratio in the pores of root-zone of the crop rise such that it adversely affects the yield of the crop and makes the soil progressively unproductive. That's why fertilizers are used enormously in this area for increasing the yield. Therefore the water logging and intensive agriculture are inter-related. Both are adversely effect the quality of ground water.

11

Title of scheme	:	Hydro-economic interaction between tank & well water and possibilities for conversion of tank into percolation tank
Name of PI	:	Prof. K. Palanisami
Institute	:	Tamil Nadu Agricultural University, Coimbatore
Sanctioned Cost	:	Rs. 6,69,000

Objectives:

- To study the interaction between tank and well water usage in different zones of Tamil Nadu.
- To explore the possibilities for conversion of tanks into percolation ponds.

Findings:

- Water requirements for different crops were calculated based on the survey data and the difference between recommended

amount of water and actual amount of water used by the farmers per acre was significant. paddy and sugarcane crops utilized more water in direct tank irrigation commands than in percolation tank commands. When compared to recommended water use, paddy and sugarcane used relatively more water in both the type of tank commands. The garden land crops such as chillies, cotton, tomato, turmeric, maize, tapioca, gingelly, ground nut, ashgourd and cumbu utilized even less than the recommended water in both types of tank commands which shows the efficiency of irrigation in summer periods (on-tank) rather than in rainy (tank) season in both the tank commands. In the case of rainy season, the tank water used by the farmers was more and consequently leading to quick drying of the tanks within two months.

- The amount of excess water used by the farmers compared to the recommended level in both of the tank commands was taken into account to work out the wastage due to over uses during tank irrigation periods. The wastage of tank water was determined based on the average amount of water used by percolation tank farmers. Out of 36 irrigation tank commands, about 60228 ha. cm. of water could have been wasted out every year in normal rainfall situations. This wastage should have been saved through percolation ponds by way of assured recharges in the wells.

12

Title of scheme	:	Environmental studies of surface and ground water down stream of pennar river Andhra Pradesh
Name of PI	:	Dr. M. Aniji Reddy
Institute	:	Jawaharlal Nehru Technological University, Hyderabad, A.P.
Sanctioned Cost	:	Rs. 5,36,380

Objectives:

- To establish a monitoring network for determining the quality of surface and shallow ground water.
- To identify potential coastal aquifers and mapping of these aquifers in order to assess the ground water resources and groundwater draft.

- To monitor chemical quality and prepare depth-wise-quality maps to show salinity distribution at various levels. The specific aim of this study is to assess the impact of existing or proposed human activities on saltwater intrusion and to develop seawater-freshwater interface model to predict the intrusion.
- To conduct solute transport modelling studies with a view to propose movement of saltwater and freshwater interface.

Findings:

The surface water resources possess high silt load during monsoon period resulting in acute drinking water scarcity problems in the rural environment. Similarly, the industrial and irrigation water supplies are adversely affected since these regions are situated in the tail end portions of the irrigation water system.

The groundwater occurs in the study area under unconfined and semi-confined conditions, though rainfall is the principal source of recharge, a secondary source of recharge is expected through the lateral percolation from Pennar River during monsoon and flood periods. Besides, a major portion of the recharge to the ground water is contributed through return seepage of irrigation water. The ground water is mostly utilized for irrigation purposes.

Among the cations and anions present in the ground water sodium and chloride are predominant in the study region. Total hardness is largely influenced by Mg content. Non-carbonate hardness is present in the entire study area.

From the present study it is clear that saltwater intrusion on surface water is the main problem in the study area. Seawater from the Bay of Bengal is the main contributor to salinity, and this is caused by the reduction in the Pennar water flow which lowers the River and canals water level and ultimately paves the way for saline water intrusion in to the fresh water zone of the study area. The problem gets severe during the dry period when the Pennar and its tributaries choked because of the drastic fall of fresh water supply in the River and its canals. This situation is increasingly worsening and in the future it will lead to a terrible environmental hazard unless a suitable ambitious approach is made. The surface waters in the coastal line of study area mostly used for drinking purposes. However the people near the coast and people along the drains face serious drinking water problems. Also the deeper aquifers of beach ridges are highly inflected by seawater intrusion.

13

Title of scheme	:	Impact of urbanisation on ground water— A study from Jaipur city and Hinterland
Name of PI	:	Prof. A.K. Sinha
Institute	:	University of Rajasthan, Jaipur
Sanctioned Cost	:	Rs. 6,34,000

Objectives:

- Evaluation of water resource availability and its sustainability.
- Assessment of impact of urbanization on the water resources and quality of the water.
- Identification of pollutants, their source, mobility and delineation of ground water zones affected by pollutants particularly by nitrate and fluoride.
- To identify measures for harvesting the rainwater in order to augment availability of water resources.
- To enhance awareness among the city dwellers regarding rooftop recharge methods and safety of recharge zone.

Findings:

- The main reason for over exploitation of natural resources especially ground water is population, urbanization and industrialization.
- The main reason for the deterioration of quality and depletion of quantity are urbanization, industrialization and indiscriminate use in the agricultural practices.
- Due to urbanization and industrialization, recharge area has reduced and it is producing adverse effect on quantity and quality.
- The VES-1, 2, 4, 5, 6, 8, 9, 14, 17, 18, 19 are suitable for dug well construction as well as for dug-cum-bore well and bore well construction.
- Groundwater development stage has increased from 152.73% in 1998 to 255.01% in 2002.
- Rechargeable open space has decreased from 41.6% in 1970 to 11.2% in the same area as in 1970 and in 2001.
- Total ground water prospects area of the area has decreased from 1507.75 sq. kms. in 1970 to 1345.75 sq. kms. in 2001.

14

Title of scheme	:	Laboratory investigation on use of perforated hollow cylinder as a solution for coastal erosion problems
Name of PI	:	Dr. N.B.S. Rao
Institute	:	National Institute of Technology Karnataka, Surathkal
Sanctioned Cost	:	Rs. 9,42,000

Objectives

To conduct detailed experimental studies to understand the performance characteristics of perforated hollow pile breakwater.

1. Two rows of perforated Hollow piles.
2. Two single row of perforated hollow piles.
3. Single row of suspended perforated hollow piles.
4. Single row of suspended porous piles.
5. Semi-submerged perforated piles.

Findings:

A field investigation has been conducted near KREC open beach of Dakshina Kannada District (D.K.) to study the mechanism of beach erosion along D.K. coast and to monitor the effect of construction of sea walls on adjacent beaches as well as in front of it. The bottom profiles were taken by a sea sled which is fabricated in the Department of Applied Mechanics and Hydraulics, KREC, Surathkal. The profiles were taken both during pre-monsoon and post-monsoon seasons of 1995 and 1996 at selected locations.

Based on the investigation on beach profiles, the following conclusions are drawn:

1. The beach considered for present study is under dynamic equilibrium. Though there are seasonal changes, there is no net erosion or deposition along the stretch.
2. The sea wall properly constructed and located neither accelerates the erosion in front of it nor causes erosion in the neighbouring beaches.
3. The movement of sediment is predominantly on-shore off-shore and the beaches in the coast are under dynamic equilibrium.

15

Title of scheme	:	Studies on under water bodies in the combined wave and current field
Name of PI	:	Dr. M.L. Narsimham
Institute	:	College of Engineering, K. Rangarao University, Visakhapatnam
Sanctioned Cost	:	Rs. 7,50,000

Objectives:

To study the stability criteria for under water bodies in the combined wave and current field through experiments and theory.

Findings:

- Pipes of smaller size experience lower force when positioned in the middle of a three pipe array configuration compared to the pipe facing the wave and the extreme pipe. However the pipe of largest diameter tested experiences a greater force for higher waves. Pipes facing the wave are subjected to greater force when their diameter is large.
- Pipe of 0.115 m has resulted in the extreme values of C_m and C_d when located at mid-position when the current is in line with the wave.
- The curve fitting (2nd order) has resulted in lower values of regression coefficient (r^2) for pipes of larger size corresponding to the variation of the force coefficients with KC number and Reynolds number. Inconsistent correlation has been observed when these variations are analysed by considering the pipe size.
- Mean values of C_m when current is inline with the wave increases in the range $55 < KC < 75$ for lower wave heights and currents of higher magnitudes. For highest wave generated (0.25) the mean value of C_m increases continuously with KC number for the largest current (2.0 m/s) and decreases slightly in the range of $45 < KC < 70$ followed by a slight increase for the current of moderate magnitude (1.5 m/s) beyond KC equal to 70 when the current waves are in the same direction.

- When the current is opposing the wave, the mean value of C_m decreases in the range $20 < KC < 30$ for waves of larger heights generated under to currents of least magnitude. For waves of least height mean inertia coefficient increases initially followed by a decrease beyond KC number of 35. For moderate currents the mean value of C_m increases gradually within a small range for waves of larger heights and the range of variation of C_m under this current for waves of lowest height is larger. No consistent trend of variation of current of height magnitude has been noted in this regard.
- Several limitations do exist in the study which made the investigation very complex and as such it has been realized that there exists a lot of scope for further research in the area of combined wave-current interaction studies.

16

Title of scheme	: Scale effect in a mixed flow pump
Name of PI	: Dr. T.K. Saha
Institute	: Jadhavpur University, Calcutta
Sanctioned Cost	: Rs. 6,53,000

Objectives:

1. To develop appropriate test rig involved in the development of hydraulic machines, particularly, mixed flow machines, about which information available in literature are few and scanty.
2. To study the appropriate Scale Model Law as required for the above and to suggest appropriate modifications, of the Scale Model Law particularly for mixed flow machines on the basis of physical observations to be collected after the completion of (1) above.
3. To make use of the potential expertise of the Department for the benefits of the manufacturers of hydraulic machines who quite often approach for technical help.

Findings:

The effect of increasing tip clearance is to reduce the efficiency all along the span. The efficiency is also lower for larger flow rates. As

the flow rate is decreased the efficiency steadily increases for the flow rates presented. The decrease in flow rate increases the pressure rise across the blades causing thickening of the boundary layer. The reduction in skin friction as the boundary layer thickens would contribute to lowering of the losses. In addition the blade force increasing with drop in flow coefficient, thus increasing the effective lift to drag ratio which in turn increases the efficiency. Presumably the losses would increase sharply if flow separation takes place. This has not occurred in the range of test.

The overall efficiency and head rise very linearly with flow coefficient in the region not far removed from the designed point. The efficiency and head rise also vary linearly with flow coefficient. The variation of efficiency with Reynolds' Number appears to be well described by a scale up formula of the Hutton—Ackeret type but with slightly different value for the Reynolds' Number dependent and independent fraction of loss.

17

Title of Scheme : Scour protection around bridge piers and abutments
Name of PI : Sh. T. Gangadhariah
Institute : Indian Institute of Technology, Kanpur
Sanctioned Cost : Rs. 6,95,000

Objectives:

1. To explore the details of mechanism of local scour and to study the characteristics of primary horseshoe vortex under dynamics of flow.
2. To conduct a comprehensive experimental investigation on the scour reduction capabilities of four different types of scour prevention devices as well as various combinations thereof.

Findings:

The cause of local scour around a bridge pier is a horseshoe vortex induced by three dimensional separation of the upstream flow. The vortex acts as a scraper in dislodging the sediment from upstream of the pier and transporting and ejecting it into turbulent wake at the downstream of the pier.

An analysis of the combined laboratory and field data were carried out and an enveloping curve fitted to the data predicts the maximum scour depth for a given discharge intensity, depth of the flow, size of the obstruction and sediment characteristics. It was amply evident that all efforts aimed at scour protection must be aimed at proper handling, *i.e.*, by weakening, arresting or modifying the horseshoe vortex.

Performance potential, *i.e.*, effectiveness in reducing scour for various devices have been worked out and it is observed that collar plate is the best suited for situations with varying angles of attack of flow. In two device combination, performance of the combination is better than the individual performances of either of the two devices involved, even though it is not a linear combination. Collar plate with slot appear to be most effective combination in reducing the scouring. Similarly, three device combination formed a superior composite device to any two device combination of the constituent devices. The overall factor of safety of a composite device is much higher than that of any of the individual devices, though the elements of risk and the conditions warranting susceptibility to failure of a device do not get eliminated in combination. A simple method to estimate the combined performance of a number of devices, given the individual performance of a number of devices has been suggested.

The results of the present studies provides insight into the basic causes of local scour, which helps in focusing remedial efforts towards mitigating the menace of the horseshoe vortex. The efficacy of a scour protection device is a measure of its ability to weaken, arrest or modify the scouring horseshoe vortex. The evolved comparative rating of various suggested scour protection devices, their combinations along with their favoured situations are expected to provide suitable guidelines in selecting appropriate scour protection devices for safer performance and economical design of pier foundations.

18

Title of scheme : Remote sensing aided idealisation of space time variant behaviour of channel geometry of river Brahmaputra
Name of PI : Dr. Nayan Sharma
Institute : Indian Institute of Technology, Roorkee
Sanctioned Cost : Rs. 13,25,280

Objectives:

1. To correlate river cross-section with respect to time.
2. To correlate river cross-section with respect to space.

3. To study the river shift patterns with respect to time and space using satellite data.
4. Generation of cross-section, shift pattern, top width with respect to space and time using input from satellite and hydrographic survey data, resulting in development of spatio-temporal model.

Findings:

The results predicted by ANN models showed that it is capable of handling imprecise, imperfect and incomplete data and has the facility for its periodic upgradation with new additional data input.

The application of ANN technique for spatio-temporal modeling of channel cross-section profile of the highly braided Brahmaputra river has indicated that its deployment is quite encouraging.

The predictive capacity of ANN model for simulation of bankline migration behaviour of the Brahmaputra is seen to be promising and accuracy can be further improved by incorporation of year-wise satellite data since 1990 in the model till data.

It could be seen that the ANN based models can reasonably simulate past, present and future cross-section profiles and top-widths of a braided alluvial stream with complex channel geometry like the Brahmaputra.

The remote sensing data analysis of bankline shift showed that the Brahmaputra river has a mixed trend of channel boundary migration towards North and South directions depending upon nature of river bank and local flow pattern. However, it is observed that the general tendency of river migration is somewhat towards south.

Remote sensing data analysis has also focused on the ongoing major shifting processes of the confluence zone of mainstreams of the Brahmaputra near Sadiya, which is presently undergoing radical change in channel pattern, similar to a case of river avulsion.

Remote sensing tool offers one of the efficient data sets facilitating repetitive synoptic coverage of data, which can help in understanding and analyzing complex changes of river dynamics with confidence and more accuracy.

Flume experiment has corroborated the incidence of ongoing erosion process along southern bank of the Brahmaputra near Majuli.

The present maiden endeavour on development on an ANN-based spatio-temporal model for the river Brahmaputra showed promising and critical findings, which undoubtedly warrant further research into this gray area.

19

Title of scheme	:	Preparation of a critical note on Lacey's method for predicting scour and updating of state-of-art report on scour around bridge piers
Name of PI	:	Dr. U.C. Kothyari
Institute	:	Indian Institute of Technology, Roorkee
Sanctioned Cost	:	Rs. 25,000

Objectives:

To update state-of-art report on "Scour around bridge piers" prepared by CBIP.

Findings:

1. Several equations proposed in the past three decades for predicting scour depth at bridge piers needs to be verified with the help of detailed field data from sandy rivers. The available scour data collected in India by Inglis and RDSO are not complete.
2. Automatic scour measuring systems have been developed abroad and are being used there. But these are not available in India. Some details of Iowa Scour Meter, HR-Wallingford Scour Meter, and DHL Scour Meter that are available are mentioned in the report. Taking ideas from this, a concerted effort needs to be made to develop indigenous scour meter.
3. The recent advances made in research related to bridge pier scour gives more emphasis on computation of temporal variation of scour depth for determining the design scour

depth. The main logic behind such a philosophy being that for given discharge in the river the time required to develop equilibrium scour depth may be very large (more than 3 to 4 days). The design flood flows do not last this much long therefore, they are not able to scour upto their maximum potential.

4. Adequate information is not available for rational determination of scour depth in cohesive soils. It is necessary to collect and analyse the data in clayey materials in laboratory and in the field. The methods proposed by Kand and Namjoshi and Ansari *et al* as well as other methods developed recently needs further checking with additional data before they can be recommended for use.
5. There is a great paucity of scour data in gravel-bed rivers and hence concerted effort should be made to collect such data in India. For such scour, Lacey-Inglis equation should not be used. Melville-Sutherland, and Kothyari-Garde-Ranga Raju's methods are more appropriate. However, for the same condition, these methods give varying results. Hence, further verification needs to be carried out using additional data.

20

Title of scheme	:	A reviewing on the scour protection methods around bridges piers and abutments
Name of PI	:	Dr. T. Gangadharaiah
Institute	:	Indian Institute of Technology, Kanpur
Sanctioned Cost	:	Rs. 40,000

Objectives:

1. To present the details of mechanism of local scour and the characteristics of primary horseshoe vortex under dynamics of flow.
2. To present estimation on construction scour in bridge passages and grip length for piers.
3. To give estimation on the scour reduction capabilities of different types of scour prevention devices as well as various combinations thereof.

4. To present the vortex mechanism for scouring around abutments and their scour protection.

Findings:

Knowledge of the extent of scour area and the equilibrium scour depth is very important in the safe and economic design of foundation of bridge piers and abutments. Design considerations for fixing the free board height, depth of flow before construction of bridges, constructions scour depth of flow in bridge during flood passage, local scour depth around piers and abutments and grip length to hold the pier against the hydrodynamic force are needed to be thoroughly understood. Proper selection of scour protection method to arrest the action of horseshoe vortex on the sediment bed is very essential. Several research works by different institutions in the world has been carried out in the field and guiding equations have been developed for knowing the extent of scour area, equilibrium scour depth and appropriate scour protection methods. This state-of-art report reviews the research works carried out and presents the mechanism of scouring process and provides design/construction methods for knowing the extent of scour area, equilibrium scour depth and appropriate scour protection measures. This review is very useful for working professionals for understanding the genesis and rationale of equations for estimation of the scour area and equilibrium scour depth as well as for design of scour protection methods under different river flow and sediment bed conditions.

21

Title of scheme	:	Development of Coastal Protective Structure in Tamil Nadu
Name of PI	:	Dr. J.S. Mani
Institute	:	Indian Institute of Technology, Madras
Sanctioned Cost	:	Rs. 17,88,000/-

Objectives:

1. To study the wave attenuation characteristics of the submerged pipe breakwater under both regular and random waves and present the results in a non-dimensional form as a function of relative depth/wave steepness parameter.

2. To study wave structure interaction characteristics by the measurement of velocity, close to the structure and to present the results in non-dimensional form as a function of wave steepness parameter.
3. Development of a new field concept for protective work based on the laboratory investigations and conduct field trials.

Findings:

1. By adopting, a unit of pipe breakwater (an assembly of three pipes) it is possible to control transmission coefficient by about 20%. However in order to reduce the force experienced by the pipe breakwater, it would be advisable to adopt $ds/d > 0.6$
2. By adopting two units of pipe breakwater 30 to 40% reduction in transmission coefficient can be achieved for $ds/d > 0.6$. The studies indicate that the change in spacing between the two units does not influence significantly the transmission characteristics.
3. Studies conducted with random waves for single unit indicate that K is of the order of 0.6 for $H_i/gT^2 > 0.008$. In case of two units of pipe breakwater K as low as 0.5 can be achieved by adopting 50% submergence for the structures.
4. By placing the single unit of pipe breakwater on the shore, it is found that substantial reduction in wave reflection can be achieved by adopting $D/d = 0.178$. The force ratio is in general constant and is of the order of 0.6 irrespective of D/d ranging between 0.178 and 0.256.
5. Field measurements carried out with the single unit of pipe breakwater placed on the shore indicate that the structure is capable of retaining sediment on the up drift side and on the rear of the structure. Shoreline recession on the north of the structure is minimal, thus ensuring the stability of the coastline. Survey carried out under different phases of the study indicate that over a period of six months, beach erosion on the north reached a stable value of about 25% compared to the initial volume of sand. During the same period, accretion on the south has also reached stable conditions with the percentage of accretion of the order of 300% compared to the initial value.

22

Title of scheme	:	Developing Drip Irrigation System for Field Scale Implementation for Orchard and Field Crops.
Name of PI	:	Dr. H.S. Uppal
Institute	:	Punjab Agricultural University, Ludhiana
Sanctioned Cost	:	Rs. 6,47,000

Objectives:

To develop drip irrigation with suitable agro-techniques for adoption in field to minimize the cost and increase its operational efficiency.

Findings:

- Crop - Brassica napus L. (Hybrid Gobhi Sarson): Lesser amount of irrigation water was applied which subsequently resulted in lesser amount of water use by the crop which reduced the seed yield of Brassica napus significantly as compared to higher amount of water use by the crop. Water use efficiency was also reduced where the water use was less.
- Crop - Brassica carinata A. Br. (American Sarson): The results of one year investigation indicated that lesser amount of irrigation water applied, reduced the seed yield of Brassica carinata significantly as compared with the treatment of higher amount of irrigation water applied. Similar was the trend for growth characters of plant height, periodic dry matter production.
- Crop - Wheat: Reduced total amount of irrigation water reduced the grain and straw yield, plant height, ear bearing number of tillers.
- Studies on Brassica napus, Brassica carinata, Triticum durum and Triticum aestivum spp. of wheat suggest lesser amount of irrigation application may be applied through any irrigation method *viz.* surface irrigation or drip irrigation may prove detrimental to growth and yield of these crops.

23

Title of scheme	:	Geographic Information System Design for Environmental Impact Assessment of Irrigation Project. A case study of Nagarjunasagar right bank canal command area
Name of PI	:	Sh. I.V. Murali Krishna
Institute	:	Jawaharlal Nehru Technological University, Hyderabad, A.P.
Sanctioned Cost	:	Rs. 9,25,000

Objectives:

- Environmental Impacts and socio-economic aspects of water resources projects.
- To design GIS as a methodology for environmental impact assessment and database establishment.
- To quantify the micro-climatic changes, if any, in general due to the Nagarjunasagar Project within the study region.
- To evaluate the impact of the project on environmental parameters.
- To provide a decision support system in terms of GIS, so that socio-economic analysis can be carried out.
- To provide data (within the study region of the part of Nagarjunasagar Right Bank Canal Command (Area) pertaining to the natural resources environment and socio-economic conditions in a database at mandal/village level.
- To attempt to evaluate the cost benefit ratio of water usage.
- To assess and diagnose the irrigation system performance.
- To evaluate the adequacy of the irrigation system to meet demands of farmers and match cropping plans and calendars.

Findings:

Satellite data, environmental attributes, socio-economic data and topographic information have been used to conceptualize, define,

formulate and demonstrate a Geographic Information System (GIS) for irrigation management and environmental impact assessment of Nagarjunasagar Right Bank Canal Command Area.

Prior to Nagarjunasagar Project (NSP) the entire command area was dependent on monsoon for crop production. With the irrigation through NSP, the overall socio-economic status of farmers has improved considerably. Various socio-economic impacts of irrigation due to the project, such as impact of irrigation on farm economy and household economy, cropping pattern, yields of principal crops, have been examined. Various problems such as salinisation, alkalization, Waterlogging, increased incidence of water related diseases, water quality, ecological degradation, groundwater table changes, etc. have been identified and mitigation measures suggested.

24

Title of scheme	:	Studies for combating salinity problem in the Upper Krishna Project (UKP) area
Name of PI	:	Dr. G.R. Naik
Institute	:	Gulbarga University, Gulbarga
Sanctioned Cost	:	Rs. 6,02,000

Objectives:

To take action for combating salinity problem at the initial stage of the irrigation of lands under Upper Krishna Project. Salt tolerance studies in local plant species, their field performance and influence on combating salinity problem (crops sugarcane, mulberry, soybean, groundnut, banana and grapes). Experiment using tree species like Sesbania and Prosopis for reducing salinity in the fields, Bringing awareness amongst the farmers on salinity problems. Development of Bio-drainage concept with suitable bio-drainage agent for improving productivity of desired crops to be grown in the UKP region.

Findings:

1. UKP area is prone to develop severe salinity and alkalinity problem in case the water management is not properly followed.
2. The presence of salts such as Na, Ca, Mg, SO₄ and Cl makes it difficult to solve the problem by engineering approach and hence the best strategies are to develop or select salt

tolerant cultivars and use of newer technologies like bio-drainage and microbial desalinization.

3. The screening for salt tolerance at laboratory and field level has helped in identifying the genotypes/varieties of local crops, which can be grown under moderate salinity condition.
4. Biodrainage using *Moringa oleifera* and desalinizing using VAM looks profitable approach for combating salinity problem in the field conditions.

25

Title of scheme : Performance Studies of Sprinkler Drip and Surface Irrigation Methods
Name of PI : Dr. N.K. Narda
Institute : Punjab Agricultural University, Ludhiana
Sanctioned Cost : Rs. 4,58,000

Objectives:

1. To study the influence of design variables on water distribution pattern and other performance parameters under different operating conditions for sprinkler and drip irrigation systems.
2. To quantify the various water losses occurring during sprinkler and drip irrigation and correlate them with prevailing weather conditions.
3. To study the effect of quality of irrigation water on salt distribution in soil profile and crop yields using drip irrigation system.
4. To evaluate and compare the water use efficiency, water economy and yield using sprinkler, drip and surface irrigation systems.

Findings:

- evaporation losses increased with the increase in wind speed, solar radiation, wetted radius, riser heights and operating pressure and vice versa. The losses were found to decrease with increase in nozzle size, sprinkler discharge. Regression

equations of evaporation losses on individual as well as different combinations of meteorological parameters and sprinkler system parameters, were computed.

- To minimize operation losses, the sprinkler should be operated at low values of wind speed, air temperature, solar radiation, which implies that the sprinkler should be operated either in the late evenings or early mornings.
- Rectangular pattern of sprinklers was found to be comparatively better than square and triangular pattern for reduced evaporation losses.
- The drip irrigated tomato plants had higher specific water uptake during the early stages of growth, as compared to furrow irrigated for the 0-15 cm and 15-30 cm soil depths. Later these values tapered off towards the end of the season, to become identical with furrow irrigated ones.
- Trickle irrigation resulted in enhanced crop yields (22.26-56.09%) over furrow irrigation schemes. Near potential yield for Punjab Kesri variety of tomatoes can be achieved by placing laterals along the crop row and applying water equivalent to 1.00 (PET).
- Water use efficiency for water application 0.80 (PET), when laterals were placed along the crop row and at a distance of 20 cm from the crop row, was highest amongst all the treatments.
- Greater number of fruits per plant (47) and yield per plant (1314 g) were recorded for treatment having laterals placed along the crop row and water applied equivalent to 1.00 (PET).

26

Title of scheme : Development of Simulation Model for Dynamic Regulation of Canal Network
Name of PI : Sh. P.M. Modi
Institute : Water Resources Engineering and Management Institute, Samiala
Sanctioned Cost : Rs. 3,25,000

Objectives:

To develop a model for evaluating hydraulic response of a conveyance and distribution network to change in inflow, type and

setting of control structures and channel physical features as well as for determining the best combination of controllable parameters to meet predetermined system performance goals.

Findings:

A mathematical model was developed using Borland C++ language and compiled on PC computer under DOS environment. This model takes into account all the three types of operational methods namely, constant downstream depth, constant upstream depth and control volume.

The model was applied to study the different operation scenarios for initial reaches of Sardar Sarovar Main Canal. For this model application study purpose, all the three operational concepts control volume method, constant upstream depth method and constant downstream depth method are applied though Sardar Sarovar Main Canal is planned to be operated on “Controlled Volume Concept” only.

27

Title of scheme	:	Determination of Optimal Cropping Pattern and Release Policy for a Conjunctive use of Surface and ground water by linear programming
Name of PI	:	Sh. D.T. Shete
Institute	:	Water Resources Engineering and Management Institute, Samiala
Sanctioned Cost	:	Rs. 2,94,000

Objectives:

To develop optimal management decisions regarding the use of surface and groundwater for the existing cropping pattern of selected command area under Vaghodia Branch Canal of Deo Irrigation Scheme. To formulate a mathematical model for the system which could be solved using simplex algorithm of linear programming.

Findings:

- At present 40% to 100% irrigation intensity is achieved in the command area. Therefore by optimization technique in different strategies (Strategy-I Considering unit costs of surface and groundwater; Strategy-2 Considering space

integration; Strategy-3 Considering space time integration) the irrigation intensities from 100% to 170% can be achieved.

- For space-time integration the maximum irrigation intensity can be achieved and the water (either surface water and groundwater or both) is also available in any month and hence, this strategy is recommended.
- Results suggests that the change in 20% increase in selling price/yield gives maximum benefits and the change in 20% decrease in selling price yield gives minimum benefits to whatsoever minor or strategy is being considered.
- The benefits for space integration are comparatively less than space-time integration which have the maximum benefits.

28

Title of scheme	:	Status Report on History of Irrigation for Andhra Pradesh & Tamil Nadu
Name of PI	:	Sh. A. Narayana Rao
Institute	:	INCID, Bhikaji Cama Palace, New Delhi
Sanctioned Cost	:	Rs. 3,38,000

Objectives:

To prepare documents bringing out the irrigation practices and management adopted in the different periods from pre-historic times up to late eighties in the States of Andhra Pradesh and Tamil Nadu.

Findings:

Two documents namely "History of Irrigation Development in Tamil Nadu" and History of Irrigation Development in Andhra Pradesh were prepared and published.

The publication on "History of Irrigation Development in Tamil Nadu" contains seven chapters and covers irrigated agriculture in Sangam age, development of irrigation during pre-British rule *i.e.*, during the periods of Cheras, Cholas, Pandyas and Pallavas, during British rule and after Indian independence. The report also covers future perspectives of irrigation development in Tamil Nadu.

The publication on “History of Irrigation Development in Andhra Pradesh” contains seventeen chapters covering the development of irrigated agriculture right from the pre-Mughal period, through the British period and the period after independence. The report also covers future perspectives of irrigation development in Andhra Pradesh.

29

Title of scheme : Improving water use efficiency of crops and cropping system
Name of PI : Sh. B.R. Sharma
Institute : Water Technology Centre, Indian Agricultural Research Institute, New Delhi
Sanctioned Cost : Rs. 56,000

Objectives:

The main objective of the scheme is to collect, collate, synthesize and prepare a state-of the art report on “Efficiency of Crops and Cropping System”. The publication will show different alternative for improving water use efficiency under diverse agro-climatic conditions for the benefit of practicing engineers, irrigation managers and project planners.

Findings:

A State-of-Art report on “Improving Water Use Efficiency of Crops and Cropping System” has been prepared. The report contains five chapters describing various aspect and concepts related to Water Use Efficiency. The report also provides detailed description on measures required for increasing water use efficiency through crop management as well as through modifications in Agronomic practices.

30

Title of scheme : Fabric based material for canal lining
Name of PI : Prof. B.L. Deopura
Institute : Indian Institute of Technology, Delhi
Sanctioned Cost : Rs. 38,96,000

Objectives:

- To develop HDPE fabric based lining which are puncture and tear resistant, in order to reduce the loss of water through seepage.

- To analyse the new lining developed (using Finite Element Methods) for failure of material.

Findings:

A fabric-based shear material has been developed for water lining applications. Generally LDPE films are used in India for lining in canals and water ponds, but these films get punctured during construction itself and hence serve little purpose in controlling water seepage. Internationally, HDPE sheets with thickness of around 2mm are used. However, as these are thick sheets, there is significant cost of transportation and installation. Geomembrance developed at IIT, Delhi is of around 0.5 mm thickness with puncture and other properties comparable to the ones used internationally. The cost of this product is in the range of Rs. 80/- to Rs. 150/- sq. meter. These sheets are typically used in buried versions to protect from (a) stealing/vandalism and (b) direct sunrays to increase the life. These sheets supports all type of protective layers like soil cover, stone pithcing, brick layer with or without mortar, concrete layer etc.

These sheets have been used successfully to line a channel at Water Technology Centre, Indian Agriculture Research Institute (IARI) New Delhi, a pond at IIT, Delhi, as well as at Water Technology Centre for Eastern Region (WTCER), Bhubaneswar.

The results show that the seepage is significantly controlled with these sheets. IARI experience demonstrated that there is increased flow of water in the channel and the sheets could be reused. Thus, the geomembranes developed at IIT, Delhi are useful for seepage control of a range of applications *i.e.* canal, tanks, dams and other water bodies. These could also be used in rehabilitation of canals, dams, etc. These may prove most effective in expansive soils where concrete lining would result into cracks.

31

Title of scheme	: Solar power trickle irrigation system for sandy tracts of coastal Andhra Pradesh
Name of PI	: K. Yella Reddy
Institute	: College of Agriculture, Andhra Pradesh Agricultural University
Sanctioned Cost	: Rs. 6,97,400

Objectives:

- installation of solar pumping unit in a shallow well and study of its performance.

- Installation of trickle irrigation system and study of hydraulic performance of micro sprinklers and inline drip/biwall tube. (Design variables: spacing pressure, discharge, size of micro sprinklers).
- To test the unit performance on nursery and vegetable crops in farmers field.

Findings:

- The SPV pump discharge was in the range of 1.31 to 1.82 lps during the experimentation. Average pumping volume of water per day was about 52.4 m³.
- The water table depths remained shallow in the range of 0.55 to 2.16 m and use of shallow wel SPV pumpset is justifiable for pumping water in caartal areas around Bapatla.
- At operating pressure of 0.515 kg/cm², the droplet sizes of micro sprinkler was in the range of 0.56 to 0.70 mm. This indicates that the droplet sizes are comparatively finer and hence micro sprinklers can be used for raising nursery and vegetable crops, as the impact will not cause damage to tender leaves.
- The SPV pumping system is capable of irrigating a tomato crop in an area of 4800 sq.m. with the requirement of 12 mm lateral of 3200 m length, 36 mm sub-main and main of 120 m and 42 m lengths respectively are required with 4 flow control valves.
- Banana crop in an area of 7200 sq.m. can be grown under the existing SPV pumping system with the requirement of 12 mm lateral of 3600 m length, 40 mm submain and main pipes of 160 m and 47 m lengths respectively and 4 flow control valves are required.
- The economic analysis indicated that the daily cost of owning 900 watt SPV pumping system comes to Rs. 17.70 only.

32

Title of scheme	: Modelling of Diffusion in Concrete Parameters and Determination
Name of PI	: Dr. Bishwajit Bhattacharjee
Institute	: Indian Institute of Technology, Delhi
Sanctioned Cost	: Rs. 4,42,000

Objectives:

To investigate how does the diffusion co-efficient of chloride ion and moisture vary with the fundamental control parameters of concrete,

namely, water-cement ratio, cement-content and curing conditions. The type of cement and the aggregate type remaining invariant.

To relate diffusion co-efficient of chloride ion and moisture to the pore structure of concrete by measuring the pore structure of the identical concrete where diffusion measurement has been performed.

To investigate the interaction of concentration of sulphate ions present in water on the diffusion co-efficient of chloride.

Findings:

In the present research work, firstly, general model that takes care of chloride and moisture diffusion through unsaturated concrete considering the dominant mechanism involved (capillary suction in addition to diffusion) has been presented together with a simple experimental set-up. Also a finite difference calculation procedure has been presented through which the transport coefficients in unsaturated as well as saturated concrete can be estimated.

Chloride transport properties are governed mainly by the porosity and pore size distribution. The porosity and pore size distribution again are governed by the mix parameters on the transport coefficients, 9 mixes with 3 cement content and 3 water-cement ratio have been adopted. Triplicate specimens have been used in all cases. Two periods of curing have been adopted.

Solutions of different concentrations have been adopted to study the effect of concentration of the penetrating solution on the transport. NaCl and CaCl₂ solutions have been used to study the effect of action type. Two initial specimen conditioning regime has been adopted. As the characteristics of concrete, it is necessary to know the variation of chloride transport with concrete pore structure (*i.e.* porosity and pore size distribution of concrete). A limited micro-structural study has been carried out, using Mercury Intrusion porosimeter to study the variability of the transport coefficients with the micro-structure of concrete and also a model has been presented with pore size distribution data as input to determine the transport coefficients.

The relevant conclusions drawn include utility of the model and the experimental method, conclusions regarding the dependence of transport coefficients with the concentration inside the concrete, the dependence of transport coefficients on the microstructure of concrete.

33

Title of scheme	:	Software development for 3-D finite element analysis of sub-structures in water charged rock masses for River Valley Projects
Name of PI	:	Dr. P.N. Godbole
Institute	:	Indian Institute of Technology Roorkee
Sanctioned Cost	:	Rs. 12,00,000

Objectives:

- To propose suitable constitutive relationship for dry jointed rock masses.
- To modify these constitutive relationships for the case of saturated jointed rock masses.
- To propose constitutive relationship for reinforced jointed rock masses.
- To suggest a suitable constitutive relationship for the material in the discontinuity zone.
- To propose a fully Three Dimensional Finite Element Formulation for finding the stress distribution around any of the structures irrespective of whether the rock mass is in a dry or whether it is in saturated state.
- Development of a general purpose finite element analysis package which takes into account all the above features of geology.

Findings:

Derivation of general constitutive relationship for reinforced/un-reinforced, jointed rock mass in dry/saturated state has been done. An empirical method for design of support system for underground excavation has been devised. 3-D Finite Element Analysis package for analysis of underground excavation in jointed rock mass has been prepared (and also tested with some of the available results). A pre-processor to support the main program for mesh data generation and graphical checking of the input has also been developed.

34

Title of scheme	:	Nonlinear Finite Element Analysis for Design of Underground Openings
Name of PI	:	Dr. Prabhat Kumar
Institute	:	Central Building Research Institute, Roorkee
Sanctioned Cost	:	Rs. 9,84,000

Objectives:

The objective of the scheme is to develop a finite element method based mathematical model for simulation of underground medium and its excavation. The emphasis will be placed on the accuracy of modeling as well as on speed of computation. The mathematical model shall be verified against the benchmark problems, the solution which is available in literature. The solution of some actual problem will then be taken up to establish the mathematical model as well as to identify future research needs.

Findings:

Analytical and numerical elasto-visco-plastic solution of underground opening located in an initially stressed medium are compared, where the mathematical model of the opening comprises finite and infinite elements. There is satisfactory agreement between analytical and numerical results. Some important problems such as sequential excavation and slip zone construction in a jointed medium are also considered.

35

Title of scheme	:	Evaluation of Compaction Control Method
Name of PI	:	Dr. Manoj Dutta
Institute	:	Indian Institute of Technology, Delhi
Sanctioned Cost	:	Rs. 9,71,000

Objectives:

The objective of the scheme is to assess the characteristics of different compaction control methods and indicate which method are most suited for in-situ determination of density in different soil types using following criteria (a) Rapidity—on the basis of time taken for

performing the test on field, (b) Accuracy—on the basis of comparison of values of density obtained at different points in tank to the tank density, (c) sensitivity—on the basis of the ability of the test to clearly identify small variations in test (d) Ease of interpretation—on the basis of skill required in evaluating the density from the result obtained.

Findings:

In the light of five parameter, *i.e.*, accuracy, precision, sensitivity, rapidity and ease of interpretation, different techniques for in-situ density measurement are compared. The results show that the Dynamic Cone Penetration method is the most suited and the Nuclear Density method is the least suited method for measurement of in-situ density in sand.

APPENDIX II

MINUTES OF THE FIFTH SITTING OF THE STANDING COMMITTEE ON WATER RESOURCES (2007-2008) HELD ON FRIDAY, 02 NOVEMBER 2007

The Committee sat from 1500 hours to 1545 hours in Committee Room 'D', Ground Floor, Parliament House Annexe, New Delhi.

PRESENT

Shri R. Sambasiva Rao – *Chairman*

MEMBERS

Lok Sabha

2. Shri Bhanwar Singh Dangawas
3. Shri Bikram Keshari Deo
4. Shri Rajen Gohain
5. Shri Prakash B. Jadhav
6. Shri Raghuv eer Singh Kaushal
7. Smt. Manorama Madhavraj
8. Shri Shankhlal Majhi
9. Shri Abu Ayes Mondal
10. Shri Lonappan Nambadan
11. Dr. Arun Kumar Sarma
12. Smt. Minati Sen

Rajya Sabha

13. Shri K.E. Ismail
14. Dr. Gyan Prakash Pilia
15. Shri Tiruchi Siva
16. Shri Nandi Yellaiah

SECRETARIAT

1. Shri N.K. Sapra — *Joint Secretary*
2. Shri C.S. Joon — *Director*
3. Shri P.V.L.N. Murthy — *Deputy Secretary*

At the outset, the Hon'ble Chairman welcomed the Members to the sitting of the Committee.

2. Thereafter, the Committee took up for consideration Memorandum No.2 and the Draft Report on Action Taken by the Government on the Recommendations/Observations contained in their Seventh Report (Fourteenth Lok Sabha) on Demands for Grants (2007-2008) of the Ministry of Water Resources. After some discussion, the Committee adopted the Report without any amendment/modification.

3. The Committee then authorized the Chairman to have the above draft Action Taken Report finalized on the basis of factual verification from the Ministry of Water Resources and to present the same to both the Houses of Parliament.

4. ***

The Committee then adjourned.

APPENDIX III

[Vide Para 4 of the Introduction]

ANALYSIS OF ACTION TAKEN BY THE GOVERNMENT ON THE RECOMMENDATIONS/OBSERVATIONS CONTAINED IN THE SEVENTH REPORT (FOURTEENTH LOK SABHA) OF THE COMMITTEE

(i)	Total number of Recommendations/Observations	20
(ii)	Recommendations/Observations which have been accepted by the Government Para Nos. 1.18, 1.19, 1.26, 1.31, 2.14, 2.33, 2.37, 3.22, 4.14, 5.13, 5.24 and 6.26	
	Total	12
	Percentage	60%
(iii)	Recommendations/Observations which the Committee do not desire to pursue in view of the Government's replies Para Nos. 2.25 and 6.33	
	Total	2
	Percentage	10%
(iv)	Recommendations/Observations in respect of which replies of the Government have not been accepted by the Committee Para No. 7.18	
	Total	1
	Percentage	5%
(v)	Recommendations/Observations in respect of which final replies of the Government are still awaited Para Nos. 2.26, 3.23, 4.15, 6.27 and 7.19	
	Total	5
	Percentage	25%