



*Government of India
Institute of Secretariat Training and
Management
(Department of Personnel & Training)*

.....

Reading Material

ORIENTATION TRAINING PROGRAMME
of
**ASSISTANTS, SECTION OFFICERS, UNDER
SECRETARIES**
of
MINISTRY OF WATER RESOURCES

Sponsored by
DEPARTMENT OF ADMINISTRATIVE REFORMS & PUBLIC GRIEVANCES
As part of the
DFID funded Capacity Building for Poverty Reduction Programme

September 2009

Reading Material

Prepared by

.....

CONSULTANCY TEAM

- Sh. M.S. Kasana, Joint Director, ISTM
- Sh. P.S. Sareen, Deputy Director, ISTM
- Sh. S.K. Dasgupta, (Former Director, Government of India), External Consultant

Staff Members

- Smt. R. Mahalakshmi, PA
- Smt. Smitha Viju, PA
- Sh. Ravi Shankar, Peon

MENTOR

DR. KHWAJA M. SHAHID, DIRECTOR, ISTM

FOREWORD

The utility and need for training in any organization is universally accepted. This is more so in Ministries and Departments of Government of India, where apart from rules and regulations on various subjects, policies in the area of social welfare at National, State and grass-root level are formulated and implemented.

2. The focus of training is generally directed towards foundational level, where the newly recruited officials are required to undergo intensive training on various aspects of administration. Also, the concept of in-service training at various levels focusing on requirements as and when such officials move up on promotion is also firmly established.

3. However, one aspect, which generally goes un-noticed, is when officials are moved from one Ministry/Department to another, as a result of routine transfer policy or on promotion and also, officials directly recruited are allotted Ministries/Departments and join after receiving Foundational Training on general subjects. Such officials are faced with the problem of familiarizing and learning the working of the new Ministry/Department. The concept of any kind of Orientation training, focusing on the need of the Ministry/Department, is by and large not in place. The problem of such officers is more acute in Ministries/Departments implementing National Level policies in various critical sectors like water resources, where the policies/schemes are formulated at National Level but implemented through States at District, Block and Panchayat level. The problem is also acute in Ministries dealing with technical subjects like Ministry of Water Resources. The newly posted officers have to handle technical subjects without any familiarization training.

4. The newly posted officials find it extremely difficult to learn about the important policy/schemes and also their implementation mechanism at the block and village level.

5. DARPG as part of the DFID funded Capacity Building for Poverty Reduction Programme has taken initiative to bridge this gap by providing Orientation Training to the officials posted to a ministry on promotion, transfer, deputation or direct recruitment. The task of identifying training needs for such

orientation training programme and based on the same, designing training and development of training material has been assigned to ISTM as Consultant.

6. To undertake the task assigned, ISTM has constituted a consultancy team consisting of Sh. M.S. Kasana, Joint Director, Sh. P.S. Sareen, Deputy Director and Sh. S.K. Dasgupta, former Director, DOPT (as External Consultant).

7. It gives me great pleasure that the consultancy team has conducted extensive research and studies to conduct Training Needs Analysis, design training programme and develop qualitative training material to enable the participants to master the organisation structure and co-ordination mechanisms for activities of various departments within the ministry, appreciate the sectoral scenario and major policies and programme in operation, etc.

8. I am confident that this training material prepared by the consultancy team for orientation training programme for the target group (Chapters 1 to 14) will prove to be useful reference material for the capacity building initiative in the area which has remained unattended till now.

(KHWAJA M. SHAHID)
DIRECTOR

September 2009

PREFACE

This reading material is an outcome of DARPG initiative as implementing agency for DFID funded Capacity Building for Poverty Reduction Programme to operationalise Orientation Training Programme for Assistants, Section Officers and Under Secretaries on their posting to the Ministry of Water Resources. DARPG assigned the task to ISTM as Consultant, which in turn constituted a consultancy team consisting of the undersigned along with Sh. P.S. Sareen, Deputy Director and Sh. S.K. Dasgupta, former Director, DOPT (as External Consultant) to conduct training needs analysis, design training and develop training material. The consultancy team undertook extensive research and studies to conduct training needs analysis by design training programme and develop training material.

2. Subsequent to the training needs identification and design of the programme, task of compiling the reading material pertaining to Ministry of Water Resources was undertaken. This monograph containing 14 chapters is an endeavour in that direction.

3. To begin with, list of abbreviations relating to the ministry has been prepared. Chapter 1 and 2 of the monograph provides the overview of the Ministry of Water Resources and its major programmes.

4. Chapters 3, 4 and 5 covers inter-state river issues, international cooperation and external assistance in water resource sector.

5. Chapter 6 elaborates the research and development activity in the sector. Chapter 7 to 12 provides an overview of various authorities under the Ministry of Water Resources, viz., Central Water Commission, Central Ground Water Board, National Water Development Agency, Central Water & Power Research Stations, Central Soil and Material Research Station and National Institute of Hydrology.

6. Chapter 13 covers other important boards and commissions working under the Ministry of Water Resources, whereas Chapter 14 provides details about various activities undertaken by Water and Power Consultancy Services (India) Limited.

7. The members of the Consultancy Team have scanned substantive amount of literature made available by the ministry and have compiled this reading

material with the objective that the learning of the participants is supplemented in providing domain specific knowledge and skills.

8. We look forward to constructive suggestions / comments for making this monograph richer both in content and context. Please feel free to give us feedback on this monograph.

(M.S. KASANA)
JOINT DIRECTOR
Email: ms.kasana@nic.in
011-26180589

September 2009

ACKNOWLEDGEMENT

The initiative taken by Department of Administrative Reforms and Public Grievances to institutionalize a system of Orientation Training as a pilot project in five Ministries will go a long way in increasing efficiency and productivity of the concerned Ministries. The Institute of Secretariat Training and Management (ISTM) and the Consultancy Team express their deep gratitude to Department of Administrative Reforms and Public Grievances for entrusting this responsibility to them, which involves the entire gamut of collection of data, identification of training needs, design of training and also preparing the training material.

2. The Consultancy team is grateful to Secretary, Department of Administrative Reforms and Public Grievances and all other officers of the Department for their guidance and assistance extended to the team from time to time.

3. The Consultancy Team is grateful to Mrs. Preeti Pant, Deputy Secretary, and Sh. Ram Saran, Deputy Secretary, Ministry of Water Resources for coordinating the visit of the team to the Ministry for collection of data and for facilitating meeting with other officers to ascertain their views. The Team is also grateful to Shri Ram Saran and all the officers of his Division for providing relevant material pertaining to the Ministry and also, copies of various circulars issued by the Ministry from time to time.

4. The Consultancy Team is grateful to Shri Yogender Singh, Director and Shri S.V. Singh, Deputy Secretary, Sh. K. Vohra, Senior Joint Commissioner and Sh. N.K. Gupta, Under Secretary, for sparing their valuable time for interacting with the Team and providing valuable suggestions and information relating to Orientation Training in the Ministry.

5. Dr. Khwaja M. Shahid, Director, ISTM has been a great source of strength and morale-booster by providing necessary guidance and assistance to the Consultancy Team as and when required. The Team is grateful to Dr. Shahid for guidance in undertaking the task.

6. Finally, the Consultancy Team acknowledges the contribution and assistance provided by the supporting staff consisting of Smt. R. Mahalakshmi, PA, Smt. Smitha Viju, PA. and Shri Ravi Shankar, Peon. It was due to their untiring efforts, the Team could proceed for submitting this monograph.

M. S. Kasana,
P.S. Sareen and
S.K. Dasgupta

LIST OF ABBREVIATIONS

1.	AIBP	Accelerated Irrigation Benefits Programme
2.	ERM	Extension, Renovation and Modernization projects
3.	mha	Million hectare
4.	CAD	Command Area Development Programme
5.	CADWM	Command Area Development and Water Management Programme
6.	OFD	On-farm development
7.	PIM	Participatory Irrigation Management
8.	WUA	Water Users' Associations
9.	CSS	Centrally Sponsored Scheme
10.	SS	State Sector Scheme
11.	RMIS	Rationalization of Minor Irrigation Statistics
12.	HIS	Hydrological Information System
13.	NLSC	National Level Steering Committee
14.	HISMG	Hydrological Information System Management Groups
15.	ISRWD	Inter-State River Water Disputes
16.	KWDT	Krishna Water Disputes Tribunal
17.	CWDT	Cauvery Water Disputes Tribunal
18.	JET	Joint Expert Team
19.	DPR	Detailed Project Report
20.	PDA	Pancheshwar Development Authority
21.	JPO	Joint Project Office
22.	SCEC	Standing Committee on Embankment Construction
23.	JBIC	Japan Bank for International Cooperation
24.	JICA	Japan International Co-operation Agency
25.	CWPRS	Central Water and Power Research Station
26.	CSMRS	Central Soil and Materials Research Station
27.	INC	Indian National Committees
28.	INCH	Indian National Committee on Hydraulic Research
29.	IHP	International Hydrological Programme
30.	UNESCO	United Nations Educational, Scientific and Cultural Organisation
31.	INCID	Indian National Committee on Irrigation and Drainage
32.	ICID	International Commission on Irrigation and Drainage
33.	INCGE	National Committee on Geotechnical Engineering
34.	INCCMS	Indian National Committee on Construction Materials & Structures
35.	WQAA	Water Quality Assessment Authority

36.	WQMC	Water Quality Monitoring Committee
37.	CPDAC	Coastal Protection and Development Advisory Committee
38.	DRIP	Dam Rehabilitation and Improvement Project
39.	NWDA	National Water Development Agency
40.	ESCAP	Economic and Social Committee for Asia and Pacific
41.	NGI	Norwegian Geotechnical Institute
42.	SSP	Sardar Sarovar Project
43.	RCNCA	Review Committee for Narmada Control Authority
44.	NHDC	Narmada Hydro-electric Development Corporation
45.	EMC	Energy Management Centre
46.	SSP	Sardar Sarovar Power
47.	WRPC	Western Regional Power Committee
48.	WRPLDC	Western Regional Load Despatch Centre
49.	CEA	Central Electricity Authority
50.	BRB	Betwa River Board
51.	UYRC	Upper Yamuna Review Committee

TABLE OF CONTENTS

S.No.	Topic	Page No.
	List of abbreviations	i - ii
1	Overview of the Ministry of Water Resources	1- 3
2	Major Programmes	4 - 13
3	Inter-State River Issues	14 - 18
4	International Cooperation	19 - 23
5	External Assistance in Water Resources Sector	24 - 26
6	Research and Development	27 - 31
7	Central Water Commission	32 - 37
8	Central Ground Water Board	38 - 41
9	National Water Development Agency	42 - 44
10	Central Water & Power Research Station	45
11	Central Soil and Material Research Station	46 - 47
12	National Institute of Hydrology	48 - 49
13	Other Important Boards / Commissions	50 - 57
14	Water and Power Consultancy Services (India) Ltd	58 - 59

1. *Overview*

1.1 The Ministry of Water Resources in the Government of India is responsible for:-

- (a) Development, conservation and management of water as a national resource; overall national perspective of water planning and co-ordination in relation to diverse uses of water.
- (b) General policy, technical assistance, research and development, training, matters relating to irrigation, including multi-purpose, major, medium, minor and emergency irrigation works; hydraulic structures for navigation and hydropower; tube wells and groundwater exploration and exploitation; protection and preservation of ground water resources; conjunctive use of surface and ground water, irrigation for agricultural purposes, water management, command area development; management of reservoirs and reservoir sedimentation; flood control and management, drainage, drought-proofing, water logging and sea erosion problems; dam safety.
- (c) Regulation and development of inter-State rivers and river valleys.
- (d) Implementation of awards of Tribunals.
- (e) Water quality assessment.
- (f) Water Laws, legislation including International Water Law.
- (g) International organisations, commissions and conferences relating to water resources development and management, drainage and flood control.
- (h) Matters relating to rivers common to India and neighbouring countries; the Joint Rivers Commission with Bangladesh, the Indus Waters Treaty, 1960; the Permanent Indus Commission.
- (i) Bilateral and external assistance and co-operation programmes in the field of water resources development.

1.2 The Ministry has 3 Research Stations under its control:-

1. Central Water & Power Research Station, Pune

2. Central Soil & Materials Research Station, New Delhi
3. National Institute of Hydrology, Roorkee

1.3 Organizations under the Ministry of Water Resources

The Ministry has 17 Organizations indicated below to assist it in carrying out its mandate, activities and programmes:-

1.3.1 Attached Offices

1. Central Water Commission
2. Central Soil and Materials Research Station

1.3.2 Subordinate Offices

1. Farakka Barrage Project
2. Ganga Flood Control Commission
3. Central Water & Power Research Station
4. Central Ground Water Board / Central Ground Water Authority
5. Bansagar Control Board
6. Sardar Sarovar Construction Advisory Committee
7. Upper Yamuna River Board

1.3.3 Public Sector Undertakings

1. Water and Power Consultancy Services (India) Ltd
2. National Projects Construction Corporation Limited

1.3.4 Registered Societies

1. National Institute of Hydrology
2. National Water Development Agency

1.3.5 Statutory Bodies

1. Narmada Control Authority
2. Brahmaputra Board
3. Betwa River Board
4. Tungabhadra Board

2. Major Programmes

2.1 Accelerated Irrigation Benefits Programme (AIBP)

Accelerated Irrigation Benefits Programme (AIBP) was conceived in 1996 to provide financial assistance to the States to complete various ongoing projects in the country so that the envisaged irrigation potential of the projects could be created urgently. Since its formulation, the scope and coverage of the programme have been widened and liberalized over time.

Under Accelerated Irrigation Benefits Programme (AIBP), financial assistance is extended to the States for creation of irrigation potential by completion of identified ongoing irrigation projects. As per the present pattern of assistance under the AIBP, the Central Government provide grant to the irrigation projects as an incentive to the States for creating irrigation infrastructure in the country. AIBP has to meet the targets of the Bharat Nirman programme under which a major thrust is being given to irrigation and financial assistance is also provided to the irrigation projects under the Prime Minister's package for agrarian distressed districts.

As on date, major, medium and Extension, Renovation and Modernization (ERM) projects are eligible for central assistance under AIBP. The surface water minor irrigation schemes of special category States as well as schemes in drought prone and tribal areas in non-special category States are also eligible for central assistance under AIBP. A total of 233 major and medium irrigation projects have been included under AIBP for which central assistance in the form of loan/grant amounting to Rs.24747.4 crore has been released till December, 2007. This also includes central assistance of Rs.1077.13 crore released to the north eastern States. State-wise details of central assistance released under AIBP till December, 2007 are given in Table-I. Out of these 233 projects, 91 projects have been completed by July, 2007. Of the ultimate irrigation potential of 82.76 lakh ha to be created under AIBP assisted major and medium projects, irrigation potential created up to March, 2007 was 43.56 lakh ha which is about 53% of the ultimate potential of these projects. During 2006-07, irrigation potential created under AIBP from major/medium/minor irrigation projects/schemes was 9.36 lakh ha against the targeted potential of 9.00 lakh ha.

Up to March, 2007, 6205 surface water minor irrigation schemes were provided assistance under AIBP, out of which 4418 schemes have been completed. The ultimate irrigation potential of minor irrigation schemes included in AIBP was 3.85 lakh ha of which irrigation potential of 1.87 lakh ha has been created up to

March, 2007. The performance has been satisfactory in respect of AIBP assisted minor irrigation schemes as these are having low gestation period.

So far, 30 out of 65 projects under the Prime Minister's Relief Package for agrarian distress districts in the States of Andhra Pradesh, Maharashtra, Karnataka and Kerala have been provided central assistance under AIBP. The grant released under the Prime Minister's Relief Package during 2006-07 was Rs.885.0885 crore while during 2007-08, total grant of Rs.886.555 crore has been released till December, 2007.

An evaluation of the AIBP has been carried out by the Ministry of Statistics and Programme Implementation (MOSPI). In their evaluation report of December, 2007, the MOSPI has observed that central assistance under AIBP projects has helped in accelerating project implementation, creation and utilization of irrigation potential. It has also led to the provision of quality irrigation in time leading to higher crop intensity, crop productivity, employment and income generation in the command areas. AIBP intervention has minimized drought impacts, protected areas from floods, provided drinking water and hydro electricity in multi purpose projects. In many projects, irrigation has recharged aquifers in and around the command areas increasing ground water levels for additional irrigation and other uses.

BHARAT NIRMAN : IRRIGATION SECTOR

Irrigation is one of the six components for development of rural infrastructure under Bharat Nirman. The irrigation component of Bharat Nirman aims at creation of irrigation potential of 10 million hectare (mha) in four years i.e., from 2005-06 to 2008-09.

The ultimate irrigation potential for the country has been estimated as 139.88 million hectare (mha) which includes potential through major and medium irrigation projects (58.46 mha), surface water based minor irrigation schemes (17.42 mha) and ground water development (64.00 mha). Irrigation potential of 102.77 mha is reported to have been created upto March, 2007.

Keeping in view the present status, the target for creation of irrigation potential under 'Bharat Nirman' is proposed to be met largely through completion of on going major and medium irrigation projects. Due emphasis has also been given to enhancing the utilization of completed projects / schemes. Further, development of new projects of minor irrigation to cater to the requirement of specific areas particularly to provide benefit to small and marginal farmers and tribals has also been included in Bharat Nirman.

Targets under Bharat Nirman

The targets and achievements under irrigation component of Bharat Nirman are given as below:

·	Total target for 2005-09	10.00 mha
·	Component-wise targets	
-	Major and Medium Irrigation Projects	4.20 mha
-	ERM of Major and Medium Irrigation Projects	1.00 mha
-	Minor Irrigation (Surface Water)	1.00 mha
-	Repair Renovation Restoration of Water Bodies	1.00 mha
-	Minor Irrigation (Ground Water)	2.80 mha

2.3 NATIONAL PROJECT FOR REPAIR, RENOVATION AND RESTORATION OF WATER BODIES

The Government of India sanctioned a Pilot scheme of 'National Project for Repair, Renovation and Restoration (RRR) of Water Bodies directly linked to Agriculture' finances to be shared by Centre and States in the ratio of 3:1.

2.4 PROJECTS ON "ARTIFICIAL RECHARGE TO GROUND WATER & RAIN AFTER HARVESTING"

A demonstrative scheme on "Rain Water Harvesting and Artificial Recharge to Ground Water" has been taken up in the following areas:

- i. **Lingala, Pulivendula Vemula and Vemalli blocks** in Kadapa district, Andhra Pradesh.
- ii. **Gangavalli block** in Salem district, Tamil Nadu
- iii. **Mallur block** in Kolar district, Karnataka
- iv. **Bel watershed, Amla & Multai blocks** in Betul District, Madhya Pradesh.
- v. **Upper reaches of Choti Kali Sindh river** in parts of Sonkatch and Bagli blocks in Dewas District, Madhya Pradesh. Under the scheme, recharge structures in over-exploited area were approved for implementation by the respective State departments under the overall technical guidance of CGWB with 100% funding by the Government of India. The approved cost of construction of recharge structures in cluster mode is Rs. 5.95 crores. The norms adopted in the implementation of National Rural Employment Guarantee Scheme (NREGS) by the Ministry of Rural Development are followed in the implementation of civil works under the present scheme. Demonstrative recharge projects on Artificial Recharge of Ground Water and Rain Water Harvesting are being implemented in the States of Karnataka, Tamil Nadu, Andhra Pradesh and Madhya Pradesh.

2.5 Scheme on “Artificial Recharge to Ground Water and Rain Water Harvesting”

Demonstrative projects on Artificial Recharge to Ground Water and Rain Water Harvesting are proposed to be taken up during XI Plan under the central sector scheme of Ground Water Management Regulation by CGWB, at an estimated cost of Rs.100 crores with 100% funding by the Central Government. Under the scheme, it is proposed to construct structures for artificial recharge and rain water harvesting through the implementing agencies / beneficiaries and panchayats.

2.6 COMMAND AREA DEVELOPMENT AND WATER MANAGEMENT

2.6.1 Background

The centrally sponsored Command Area Development (CAD) Programme was launched in 1974- 75 with the objective of bridging the gap between irrigation potential created and utilized through micro level infrastructure development and efficient farm water management. The programme aimed at integrating all activities related to irrigated agriculture in a co-ordinated manner with the assistance of multi-disciplinary teams under an Area Development Authority. The programme was restructured and renamed as Command Area Development and Water Management (CADWM) Programme with effect from 1st April, 2004.

2.6.2 Coverage

Initially 60 major and medium irrigation projects were taken up under the CAD Programme, covering a Culturable Command Area (CCA) of about 15 million hectare. Since 1974-75 till now 314 projects with a CCA of 28.65 mha have been included under the programme out of which 6 and 8 projects have been included during 2006-07 and 2007-08 respectively. After inclusion of new projects, deletion of completed projects and clubbing of some projects, there are 136 projects under implementation.

2.6.3 Programme Components

The components of the CADWM Programme are as follows:

- a) Survey, planning and designing of on-farm development (OFD) works;
- b) Construction of field channels with a minimum 10% beneficiary contribution;

- c) Full package OFD works including construction of field channels, realignment of field boundaries, land leveling and shaping (also with a minimum 10% beneficiary contribution);
- d) Construction of field drains, intermediate and link drains for letting out surplus water;
- e) Correction of system deficiencies above the outlet up to distributaries of 150 cusec capacity;
- f) Renovation and desilting of existing irrigation tanks including the irrigation system and control structures within the designated irrigation commands with a minimum 10% beneficiary contribution as maintenance fund, the interest from which has to be used for maintenance in future;
- g) Reclamation of waterlogged areas (with a minimum 10% beneficiary contribution) including use of location specific bio-drainage techniques to supplement conventional techniques for reclamation of waterlogged area;
- h) Warabandi (without any central assistance);
- i) Trainings/adaptive trials/ demonstrations through Water and Land Management Institutes (WALMI) and other institutions and monitoring and evaluation of the programme with 75% funding from the Government of India;
- j) Institutional support to Water Users' Associations;
- k) Establishment cost-limited to 20 % of OFD work items.
- l) R & D activities.

2.6.4 Under the restructured programme, the thrust is on Participatory Irrigation Management (PIM) and, therefore, following features have been made mandatory for programme implementation:

- i) Water Users' Associations (WUAs) have to be in position before project components are taken up so that beneficiaries are involved in the implementation of the programme activities;
- ii) A minimum 10% beneficiary contribution has been made mandatory in the construction of field channels, reclamation of waterlogged areas and renovation of minor irrigation tanks to ensure increased beneficiary participation and thereby improve the quality of works;

Central assistance for correction of system deficiencies up to distributaries of 150 cusec capacity has been linked to the formation of Distributaries Committees and handing over of the distributaries to such Committees for maintenance in future.

2.6.5 Programme Implementation

The Command Area Development and Water Management Wing of the Ministry of Water Resources co-ordinates and monitors the implementation of the

Command Area Development Programme at the National level. Proposals received from the States for inclusion of new projects examined and, if found techno-economically feasible, are included under the programme. Progress of the projects is monitored through physical and financial progress reports of the programme received from the States. The quality of work is ensured through monitoring, including field visits. Moreover, technical guidelines and manuals have been circulated to the States in this regard. Functionaries are trained on specific subjects from time to time, besides holding various meetings, workshops and seminars on different technical and managerial aspects.

2.6.6 Funding Pattern

The funding pattern for the programme is 50:50 on sharing basis between Centre and State/farmers for all the components. However, for State sponsored software components such as trainings of farmers and field functionaries and officials, adaptive trials and demonstrations, action research for Participatory Irrigation Management, seminars/ conferences/workshops, monitoring and evaluation of the programme etc. the funding pattern is 75:25 basis between the Centre and States. Apart from the above, national level training courses for senior level officers and monitoring and evaluation of the programme are sponsored by Central Government and full expenditure is borne by the Central Government.

2.6.7 Renovation of Minor Irrigation Tanks

This component was included under the restructured CADWM programme with a view to augment water supplies in the command by integrating the renovated MI tanks with the main irrigation system. The Ministry of Water Resources also launched a separate scheme on restoration of water bodies with 75:25 funding pattern between the centre and the States as against the funding pattern of 50:50 under the CADWM programme. The financing pattern under the scheme being more attractive, the State Governments preferred to avail of central assistance under the scheme of restoration of water bodies and hence there has been no offtake of funds under this component of CADWM Programme.

The First meeting of the HLG was held in December, 2006. It was decided to prepare feasibility studies in respect of ten projects. Study reports in respect of 5 projects have been completed.

2.6.8 Important works in North East Region

The Ministry of Water Resources is executing a number of schemes and projects for the development of north east region. Some of the projects are indicated below:-

A. Pagladiya Dam Project: The preliminary works of Pagladiya Dam Project were initiated as approved by the Government of India at Rs. 542.85 crores (2000 price level).

The project envisages assured irrigation to a gross command area of 54,160 ha. flood benefit to 40,000 ha and incidental hydro power generation of 3 MW (I.C). In addition, 956 ha of land was acquired against 3238 ha for rehabilitation and resettlement purposes.

B. Harang Drainage Development Scheme: The scheme was cleared during 9th Plan and revised to Rs. 30.49 crores during 10th Plan. On completion, it will benefit 11850 ha of chronically drainage congested areas in Barak Valley, Assam. The present progress is 97% and the balance works will be completed in due course.

C. Anti-Erosion work at Dhola-Hatighuli: An avulsion of River Dibang and Lohit jointly with Noa-Dehing had taken place near Dhola-Hatighuli area of Assam and resulted in large scale erosion on the left bank. The work of diversion of the river Dibang to its original course was taken up at a cost of Rs. 10.47 crores. (Phase-I) and also diversion of Lohit (combined with Noa- Dehing) at a cost of Rs. 5.22 crores. (Phase-II). The works were planned in phased manner as per morphological studies and have been completed.

D. Protection of Majuli Island, Assam: Majuli island is a chronically flood and erosion affected island in river Brahmaputra. The protection works of the island were taken up by the Board as approved by the Government. of India on the request of Government of Assam.

2.7 FLOOD MANAGEMENT

Although flood management falls within the purview of State Governments, the Central Government has initiated various measures including provision of financial assistance to the States for flood management and anti erosion schemes. The details of Major Plan Schemes of Flood Control Sector for XI plan are given below.

2.7.1 Flood Management Programme – a State Sector Scheme

A restructured scheme namely, “Flood Management Programme” amounting to Rs. 8,000 crore only has been ‘in principle’ approved by the Cabinet, under the State Sector in XI Plan by amalgamating following four on-going schemes of X Plan.

- Critical anti-erosion works in Ganga basin States – a Centrally Sponsored Scheme (CSS)
- Flood Control works in Brahmaputra Valley states – a State Sector Scheme (SS)
- Critical anti-erosion works in coastal and other than Ganga Basin States – a State Sector Scheme (SS)
- Improvement of Drainage in the critical areas of the country – a State Sector Scheme (SS).

The re-structured scheme of central assistance would cover all on-going and new works related to river management, flood control anti-erosion, drainage development and flood proofing including flood prone area development programme to be implemented by the state governments. Central Assistance to the state governments has also been proposed for the first time for restoration of damaged flood management works, based upon the recommendations of Task Force on Flood Management/Erosion Control-2004.

2.8 River Management Activities and Works related to Border Areas – a Central Sector Scheme

A central sector scheme has been formulated to cover 10 on-going works/schemes of X plan (with 100% central assistance) along with some new works detailed as under:

1. Survey & Investigations of Kosi High Dam.
2. Pancheshwar Multipurpose Project.
3. Maintenance of food protection works of Kosi & Gandak Project.
4. Extension of embankments on Lalbakeya, Kamla, Bagmati & Khando rivers.
5. Hydrological Observations of rivers originating from Bhutan.

6. Joint Observations on rivers common to Bangladesh and neighbouring countries.
7. Flood forecasting on rivers common to India and Nepal.
8. Ganga Flood Control Commission.
9. Grant in aid to Brahmaputra Board.
10. New Scheme for Majuli Island in Assam, Dibang Project etc.

In addition to above works, new works on common/ border rivers comprising river management, flood control and minor irrigation works, especially with Bangladesh are proposed under the scheme. It will also include any new works proposed on common/border rivers on the western sector i.e. Indus river system in XI Plan. Such works are proposed to be funded with 100% central assistance.

2.9 RATIONALISATION OF MINOR IRRIGATION STATISTICS (RMIS) SCHEME

A centrally sponsored plan scheme “Rationalisation of Minor Irrigation Statistics (RMIS)” is under implementation since VII five year plan. The main aim of RMIS scheme is to build up a comprehensive and reliable database in the minor irrigation sector for future planning. Under the RMIS scheme there is provision for conduct of census of minor irrigation schemes on quinquennial basis. For regular reporting and co-ordination of activities in respect of statistical data compilation on minor irrigation in States /UTs, statistical cells are functioning in the nodal departments of States /UTs with 100% grant in aid under the scheme. Three censuses on minor irrigation projects have so far been conducted in the country. The third census of minor irrigation schemes with reference year 2000-01 is placed on website <http://mowr.gov.in>. The 4th census of minor irrigation projects is proposed to be conducted with reference year 2005-06 and was launched in 2007. The States /UTs are in the process of training of the staff and field data collection.

2.10 FLOOD FORECASTING

The scheme has been prepared by amalgamating two on-going schemes of X plan namely, ‘Establishment and modernization of flood forecasting network in india including inflow forecast’ and ‘Strengthening and modernization of flood forecasting and hydrological observation network in the Brahmaputra and Barak basin’ of Central water Commission. Under the new scheme, it is proposed (i) to modernize the flood forecasting network by installing automatic water level and rainfall sensors at all the observation sites and satellite based transmission system for getting real time flood data expeditiously and (ii) to develop appropriate software/models for flood/ inflow forecasting to reduce the time for

analysis of data. It is also proposed to extend the flood forecasting network in uncovered areas and integrate with the network of State Governments/ Projects Authorities/ National Disaster Management Authority (MHA).

2.11 HYDROLOGY PROJECT II

The Hydrology Project (Phase-I) was implemented with International Development Association (World Bank) assistance of SDR 75.1 million under a credit agreement with the Government of India. The Government of Netherlands provided a grant-in aid of Euro 14.64 million in the form of technical assistance under a bilateral Indo-Dutch agreement. This phase of the Project was implemented by nine States viz. Andhra Pradesh, Chhattisgarh, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa and Tamil Nadu and six Central agencies.

Hydrology Project Phase-II has been taken up with the assistance of International Bank for Reconstruction and Development (World Bank). The objective is to extend and promote the sustained and effective use of Hydrological Information System(HIS) by all potential users concerned with water resources planning and management, public and private, thereby contributing to improved productivity and cost-effectiveness of water related investments in 13 States viz. Andhra Pradesh, Chhattisgarh, Gujarat, Karnataka, Madhya Pradesh, Kerala, Maharashtra, Orissa, Tamil Nadu, Goa, Punjab, Puducherry and Himachal Pradesh and 8 central agencies viz. Central Water Commission, Central Ground Water Board, India Meteorological Department, National Institute of Hydrology, Central Water and Power Research Station, Ministry of Water Resources, Central Pollution Control Board and Bhakra Beas Management Board which are participating in this phase of the Project.

Agreement for Hydrology Project Phase-II between International Bank for Reconstruction and Development (World Bank) and Government of India was signed on 19th January, 2006. The project has become effective from 5th April, 2006. The duration of the project would be 6 years and is estimated to cost Rs.631.83 crores supported with a loan of 104.98 million US \$ from IBRD.

The project is being implemented with the support of National Level Steering Committee (NLSC) headed by Secretary, MoWR and three Hydrological Information System Management Groups (HISMGs), namely HISMG (Technical), HISMG (Data & Data Dissemination) and HISMG (Institutional Strengthening & Training). The overall administrative, management and coordination role rests with the MoWR.

3. *Inter-State River Issues*

Inter-State Water Disputes (Amendment) Act, 2002

Inter-State Water Disputes Act, 2002 was originally enacted by the Parliament in 1956 for adjudication of disputes relating to waters of inter-state rivers and river valleys. In view of the Sarkaria Commission recommendations, Inter-State Water Disputes Act, 1956 has been amended and "The Inter-State Water Disputes (Amendment) Act, 2002" (No. 14 of 2002 dated 28th March, 2002) has been enacted. The Act came into force from 6th August, 2002. The amendments include time frame for constitution of the Inter-State Water Disputes Tribunals and prescribes time limit for the tribunals to give their awards. As per the amendment, Central Government will have to constitute a Tribunal within a period of one year from the date of receipt of a request from any State Government. The award of the Tribunal shall have the force of decree of Supreme Court.

3.1 Inter-State Water Disputes Tribunals

3.1.1 Mahadayi/Mandovi River Water Dispute

In July, 2002, the State Government of Goa made a request under Section 3 of the Inter-State River Water Disputes Act, 1956 (as amended) for the constitution of the Tribunal under the said Act and refer the matter for adjudication and decision of dispute relating to Mandovi river. The issues mentioned in the request included the assessment of available utilisable water resources in the basin at Various points and allocation of this water to the 3 basin States keeping in view priority of the use of water within basin as also to decide the machinery to implement the decision of the tribunal etc. The Hon'ble Union Minister for Water Resources convened an inter-State meeting on 4.4.2006 at the level of Chief Ministers of the States of Goa, Karnataka and Maharashtra. The Government of Goa wanted constitution of tribunal and reference of the dispute to the Tribunal. Accordingly, the Central Government in the MoWR concluded that the dispute contained in the request of State of Goa of July, 2002 cannot be resolved by negotiation and initiated further action in the matter as per the provisions of Inter-State River Water Disputes Act., 1956.

Meanwhile, Govt. of Goa filed a Suit in the Supreme Court for setting up of Water Disputes Tribunal for adjudication of the above river water dispute and an Interlocutory Application (IA) for stay in the construction activities in September 2006. The Suit with the Application has been listed on four occasions before the Court i.e. 28th September, 19th October, 27th November 2006 and

5.09.2007. During its hearing on 27th November 2006, the learned Solicitor General prayed to the Court to file additional affidavit on behalf of Union of India (UOI) to take a specific stand on the issue mentioned in the order dated 19.10.06 and 5.9.2007. The issue in the said order is the contention of the state Govt. of Karnataka that the approval of Central Govt. is not required when the project is undertaken by the State from its own fund. Affidavit, indicating the stand of UoI in this regard based upon the comments received from Ministry of Finance, Planning Commission and Ministry of Environment & Forests has been sent to the Government Counsel on 01.02.2008 for taking necessary action.

3.1.2 Vansadhara River Water dispute

The State of Orissa ' sent a complaint to the Central Government under Section 3 of the Inter-State River Water Disputes (ISRWD) Act, 1956 regarding water disputes between the Government of Orissa and Government of Andhra Pradesh pertaining to Inter-State River Vansadhara for constitution of a Inter-State Water Disputes Tribunal for adjudication. The main grievance of the State of Orissa in the complaint sent to the Central Government is basically adverse effect of the executive action of Govt. of Andhra Pradesh in undertaking the construction of the aforesaid flood flow canal at Katragada and failure of Govt. of Andhra Pradesh to implement the terms of inter-State agreement understanding etc. relating to use, distribution and control of waters of inter-State river Vansadhara and its valley. It has also raised the issue of scientific assessment of available water in Vansadhara at Katragada and Gotta Barrage and the basis for sharing the available water. Accordingly, Secretary(WR) convened an inter- State meeting on 24.4.2006 at New Delhi to explore the possibility of finding out negotiated settlement of the dispute. In the meeting, both the States agreed that yield of the river is to be shared between Orissa and Andhra Pradesh on 50 - 50 basis. Both States also agreed that CWC will reassess the yield of the Vansadhara basin by utilizing the yield series upto 2005 for which necessary utilization data shall be furnished by the concerned State Government expeditiously. Based on the conclusions reached in the meeting, Central Government is hopeful of finding the negotiated settlement of the dispute. In continuation of this process, another inter-State meeting at the level of Additional Secretary, MoWR was convened on 5th -6th December, 2006 in which the follow-up action taken on the decision of the previous Inter-State meeting was reviewed. In the meeting, both States agreed to resume the dialogue process among themselves.

Another Inter-State meeting at the level of Principal Secretaries of the States was convened on 2.3.2007 under the Chairmanship of Additional Secretary, MoWR. Divergent views emerged the meeting and it was felt appropriate to request Secretary, MoWR to hold another meeting with the Chief Secretaries of the States. Meanwhile, a writ petition was filed by Orissa in this

regard which came up in for hearing on 30.4.2007 before Hon'ble Supreme Court. Supreme Court adjourned the matter for filing Counter Affidavits. During the hearing Additional Solicitor General informed the Court that the same may be adjourned for a longer period and meanwhile Central Government will once again try for negotiated settlement. Therefore, Secretary, MoWR proposed meeting with the Chief Secretaries of two States on 18.5.2007 which was rescheduled to 15.6.2007 and again to 05.07.2007 due to inability expressed by the Chief Secretary Government of Orissa to attend the same. However, the meeting finally could not be held as Chief Secretary, Government of Orissa informed that he was unable to attend the meeting as no useful purpose will be served to hold the meeting till Government of Andhra Pradesh stops construction of the project. Thus the matter is now subjudice.

3.1.3 Krishna Water Disputes Tribunal

3.1.4 Constitution of the Tribunal

The Krishna Water Disputes Tribunal (KWDT) was constituted on 2nd April, 2004 for adjudication of the dispute relating to sharing of waters of Inter-State River Krishna and river valleys thereof.

3.1.5 Progress in adjudication of the dispute

The KWDT passed orders on June 9, 2006 on the Interim Relief Application filed by the party States of Maharashtra, Karnataka and Andhra Pradesh declining to give interim relief as sought in the application and at the same time indicating certain norm with a view to facilitate adjudication of the dispute before the Tribunal. Subsequently, State of Andhra Pradesh filed Interlocutory Application under Section 5(3) of the ISRWD Act, 1956 seeking further explanation/guidance on the Order of the Tribunal of June 9, 2006 which is pending. The Tribunal in its hearing held in September and October, 2006 has framed 29 issues adjudication of the dispute before it. Further hearings of the Tribunal are continuing on monthly basis.

Party States, have so far filed 75 Interlocutory Applications (IAs) All the 75 IAs filed so far have been disposed of by passing necessary orders and placing the documents/reports/data on record. After hearing all the Party States, orders were pronounced on 27th April, 2007 on three review applications (I.A. No.26/06, 27/06 and 28/06) filed by the State of Andhra Pradesh against the orders passed by the Tribunal in respect of I.A. No. 5/2005, I.A. No. 7 of 2005 and I.A. No. 8 of 2006.

Oral evidence of the Witnesses started during the current year beginning with the State of Karnataka followed by the State of Maharashtra. Evidence of the two witnesses of the State of Karnataka and four witnesses of the State of Maharashtra has so far been recorded. Evidence of the witnesses of the State of Andhra Pradesh is continuing. After conclusion of the evidence on behalf of all the Parties, final arguments on the issues framed earlier would begin clearing any other matter that may arise in between during the course of the proceedings.

3.1.6 Cauvery Water Disputes Tribunal (CWDT)

Constitution of the Tribunal

The Cauvery Water Disputes Tribunal (CWDT) was constituted by the Government of India on 2 June 1990 to adjudicate the water dispute regarding inter-state river Cauvery and the river valley thereof.

Progress in adjudication of the dispute before CWDT

The Cauvery Water Disputes Tribunal has submitted its reports and decision under section 5 (2) of Inter State River Water Dispute Act,1956 to Government on 5th February,2007. Under Section 5(3) of the Inter State River Water Dispute Act, 1956, the Central Government as well as party States have sought further clarification/ guidance in this regard.

The Tribunal took up the petitions of the Party States for consideration on 10th July, 2007. In its order the Tribunal inter-alia observed as under :-

“It appears that the State of Karnataka, the State of Tamil Nadu and the State of Kerala filed Special Leave Petitions against the aforesaid decision of this Tribunal dated 5th February, 2007 before the Supreme Court. The Supreme Court has granted Special Leave. The appeals are pending. According to us, in this background, these applications under Section 5(3) of the said Act should be listed for orders after disposal of the appeals by the Supreme Court”.

Monitoring of the Implementation of Interim Order of CWDT

Under the provisions of Section 6 A of the ISWD Act, 1956, the Central Government has notified a Scheme called Cauvery Water (implementation of the Order of 1991 and all subsequent Related Orders of the Tribunal) Scheme, 1998, consisting of Cauvery River Authority and Monitoring Committee. The Cauvery River Authority consists of the Prime Minister as Chairperson and Chief Ministers of the basin States as members. The Monitoring Committee consists of Secretary, MOWR as Chairperson, Chief Secretaries and Chief Engineers of the

basin States as Members and Chairman, Central Water Commission as Member. The Authority is required to give effect to the implementation of the Interim Order dated 25th June 1991 of the Tribunal and its related subsequent orders. During the Water Year 2007-08, starting from June, 2007, as per the Interim Order, an inflow of 196.10 TMC was required at Mettur upto January, 2008. Against this an inflow of 322.80 TMC has been received at Mettur upto January,2008.

3.1.7 Ravi and Beas Waters Tribunal

The Ravi and Beas Tribunal which was constituted on 2nd April, 1986 had submitted its report on 30th January, 1987. The report was circulated in May, 1987. A reference was made to the Tribunal in August, 1987 comprising reference from the Central Government and references received from Governments of Punjab, Haryana and Rajasthan, seeking guidance on certain points in the report. The period for forwarding of the report by the Tribunal has been extended upto 5th February, 2008. The Tribunal's hearings have become dependent on the outcome of a Presidential reference related to Punjab Termination of Agreement Act, 2004.

4. *International Co-operation*

4.1 Introduction

The three major river systems of India namely Ganga, Brahmaputra and Indus cross international borders. This Ministry is responsible for strengthening international co-operation on matters relating to these rivers by way of negotiations with neighbouring countries concerning river waters, water resources development projects and operation of international treaties relating to water.

4.2 India-Bangladesh Co-operation

4.2.1 Indo-Bangladesh Joint Rivers Commission

An Indo-Bangladesh Joint Rivers Commission (JRC) is functioning since 1972 with a view to maintaining liaison to ensure the most effective joint efforts in maximizing the benefits from common river systems, which is headed by Water Resources Ministers of both the countries. A total of 36 meetings have been held so far. Last meeting was held in September, 2006 followed by field visit. The next meeting is likely to be held at New Delhi shortly.

4.2.2 Treaty on Sharing of Ganga/ Ganges Waters at Farakka

A Treaty was signed by the Prime Ministers of India and Bangladesh on 12th December 1996 for sharing of Ganga/Ganges waters at Farakka during the lean season. As per the Treaty, the Ganges water is being shared at Farakka (which is the last control point on river Ganga in India) during lean period, from 1st January to 31st May every year, on 10-daily basis as per the formula provided in the Treaty. The Treaty is valid for a period of 30 years.

The sharing of water as per the Treaty is monitored by a Joint Committee headed by Members of JRC from both sides. Three meetings of the Joint Committee are held every year. The Treaty is being implemented to the satisfaction of both the countries since 1997. The last meeting was held in September, 2007 at Dhaka in which the Annual Report of 2007 was finalized and approved.

4.2.3 Sharing of Waters of River Teesta

A Secretary level meeting between India and Bangladesh on matters relating to water resources sector was held at New Delhi on 7th and 8th August, 2007. During the meeting both sides agreed 'in principle' on various pending issues and decided that these will be put up for consideration in the next JRC meeting for final decision.

4.2.4 Co-operation in Flood Forecasting

India is providing the flood data of Farakka for Ganga (from 15th June to 15th October), and the flood data on Pandu, Goalpara and Dhubri for Brahmaputra river and of Silchar for Barak river during monsoon period (from 15th May to 15th October) to Bangladesh for the use of their flood forecasting and warning arrangements, besides the data of river Teesta, Manu, Gumti, Jaladhaka and Torsa, etc. The transmission of flood forecasting information from India during the monsoon, being supplied free of cost has enabled the civil and military authorities in Bangladesh to take precautionary measures and shift the population affected by flood to safer places. Data on flood during the monsoon, 2007 was communicated to Bangladesh as per the understanding.

4.3 India-Bhutan Co-operation

A scheme titled "Comprehensive Scheme for Establishment of Hydro-meteorological and Flood Forecasting Network on Rivers Common to India and Bhutan" is in operation. The network consists of 35 hydro-meteorological/meteorological stations located in Bhutan and maintained by the Royal Government of Bhutan with funding from India. The data received from these stations is utilized in India by the Central Water Commission for flood forecasts. A Joint Expert Team (JET) consisting of officials from India and Royal Government of Bhutan continuously reviews the progress and other requirements of the scheme. The 23rd meeting of the JET was held in October, 2007 in Bhutan.

4.4 India-China Co-operation

In 2002, the Government of India had entered into an MOU with China for provision of hydrological information on Yaluzangbu/Brahmaputra river in flood season by China to India. In accordance with the provisions contained in the MOU, China is providing hydrological information (water level, discharge and rainfall) in respect of three stations, namely Nugesha, Yangcun and Nuxia

located on river Yaluzangbu/ Brahmaputra from 1st June to 15th, October every year, which is utilized for flood forecasts by the Central Water Commission.

An agreement regarding the provision of hydrological data of one site on Sutlej (Lanquen Zangbo) was also concluded during the visit of Hon'ble Premier of China in April, 2005 for which an MoU has been signed. Chinese side has provided hydrological information from the monsoon of 2007.

During the visit of Hon'ble President of People's Republic of China to India in November, 2006, it was agreed to set up a expert level mechanism to discuss interaction and co-operation on provision of flood season hydrological data, emergency management and other issues regarding trans-border rivers as agreed between them. The first meeting of Joint Expert Group for Indo-China co-operation on water resources was held at Beijing, China from 19-21 September, 2007. The meeting was useful in understanding each other's position.

4.5 India - Nepal Co-operation

A Treaty on integrated development of Mahakali (Sharda) River including Sharda Barrage, Tanakpur Barrage and Pancheshwar Multipurpose Project was signed between Government of India and Government of Nepal in February, 1996, which came into force in June, 1997 (Mahakali Treaty). The Treaty is valid for a period of 75 years.

4.5.1 Pancheshwar Multipurpose Project

Pancheshwar Multipurpose Project is the central piece of Mahakali Treaty. Required field investigations for the Pancheshwar Multipurpose Project having an installed capacity of 5600 MW at Pancheshwar with irrigation and incidental flood control benefits and a re-regulating structure to meet primarily the irrigation requirements downstream in Uttar Pradesh, have been completed. The Detailed Project Report (DPR) is to be finalized after mutually resolving the pending issues. During the 2nd Inter ministerial meeting on Indo-Nepal matters (IMC), it was decided that a project entity namely, "Pancheshwar Development Authority (PDA)" may be set up in accordance with Mahakali Treaty to expedite the finalization of DPR. A shift in Indian approach to resolve the pending issues was also agreed to.

In order to undertake the joint investigations of Sapta Kosi High Dam Multipurpose Project and Sun Kosi Storage cum Diversion Scheme; a Joint Project Office (JPO) was set up in Nepal in August, 2004 to take up field investigations and preparation of Joint DPR. The preparation of joint DPR was originally scheduled to be completed within a period of 30 months but the work

could not be completed due to various reasons including the increase in scope of work. A CPIB meeting was held on 3rd September, 2007 under the Chairmanship of Secretary (Expenditure), Ministry of Finance. The Committee recommended for approval of revised cost estimates of Rs. 70.55 crore for the project with a revised time frame for completion of works by September, 2008.

4.5.2 Flood and Erosion Control

In order to prevent spilling of flood waters from Lalbakeya, Bagmati, Khando and Kamla rivers from Nepal side into Bihar, India and Nepal have agreed to extend the embankments along these rivers in Indian territory to Nepal and tie to high ground in Nepal with corresponding strengthening of embankments on Indian side. In this connection, a Standing Committee on Embankment Construction (SCEC) has been constituted which is responsible for planning, design and construction of these embankments. Last meeting (9th) of this Committee was held in September, 2007 in Nepal. In the meeting, it was decided that preparation of DPR for extension of embankment along Lalbakeya river upto Phase II may be taken up and the DPR for Khando river should be prepared as soon as possible. It was also decided that both Indian and Nepalese side would provide information to each other regarding the operation of infrastructure such as gate operations, flood levels, discharge along the Lalbakeya, Bagmati, Kamla and Khando rivers and its tributaries.

4.6 Indo-Pakistan Co-operation

Under the Indus Waters Treaty, 1960, India and Pakistan have each created a permanent post of Commissioner for Indus Waters. Each Commissioner is the representative of his Government for all matters arising out of the Treaty and is to serve as the regular channel of communication on all matters relating to implementation of the Treaty. The two Commissioners together form the Permanent Indus Commission.

During 2007- 08, the Commission held its 99th meeting in India in May-June, 2007. Besides, one Secretary level talks on Tulbul Navigation Lock as part of composite dialogue was held in India in August, 2007.

The Neutral Expert, appointed by the World Bank in May, 2005 on Pakistan's request, settled the differences raised by Pakistan on the design of Baglihar HEP (J&K), in February, 2007.

In fulfillment of the requirements of Indus Water Treaty of 1960, the daily data of 280 hydrological sites on six basins, The Indus, The Jhelum, The Chenab,

The Ravi, The Beas and The Sutlej of Indus system was sent to Pakistan every month.

Irrigated cropped area statistics for Indus, Jhelum and Chenab basin has been sent to Pakistan for the crop year 2006-07.

Flood warning communications were sent by India to Pakistan for their benefit through telephones and radio broadcasts during the period from 1st July to 10th October, 2007, for Indus system of rivers.

5. External Assistance in Water Resources Sector

5.1 The World Bank continues to be the primary source of external assistance in the water resources sector. Assistance is also being availed from multilateral/bilateral agencies and countries. A brief account of ongoing 13 externally aided projects being implemented in various States with assistance from the World Bank and other bilateral agencies namely - Japan Bank for International Cooperation (JBIC) and Kreditanstalt für Wiederaufbau (KfW), Germany is as under:-

5.1.1 EXTERNALLY ASSISTED ON-GOING PROJECTS

A. WORLD BANK

S.No	State	Name of Projects
1	Karnataka	Karnataka Community Based Tank Management Project CR.3635-IN
2	Madhya Pradesh	Madhya Pradesh Water Sector Restructuring Project LN 4750-IN
3	Rajasthan	Rajasthan Water Sector Restructuring Project Cr.3603-IN
4	Uttar Pradesh	UP Water Sector Restructuring Project Cr.3602-IN
5	Maharashtra	Maharashtra Water Sector Improvement Project-LN4796-IN
6	Multi State	Hydrology Phase II Cr.4749-IN
7	Tamil Nadu	Tamil Nadu Irrigated Agriculture Modernization and Water Bodies Restoration and Management Projects Cr. 4846-IN & Cr.4255-IN
8	Andhra Pradesh	Andhra Pradesh Community Based Tank Management Project Cr. 4291-IN & Cr.4857-IN
9	Karnataka	Karnataka Community Based Tank Management Project Cr.3631-1-IN

B. ASIAN DEVELOPMENT BANK (ADB)

10	Chattisgarh	Chattisgarh Irrigation Development Sector Project (Loan No. 2159-IND)
----	-------------	---

C. BILATERAL ASSISTANCE (JBIC JAPAN - LOAN)

11	Andhra Pradesh	Modernization of Kurnool-Cuddapah Canal
12	Orissa	Rengali Irrigation Project
13	Rajasthan	Rajasthan Minor Irrigation Improvement Project
14	Andhra Pradesh	Andhra Pradesh irrigation Livelihood Improvement Project

D. GERMANY

15	Maharashtra	Minor Irrigation Project
16	Himachal Pradesh	Minor Irrigation & Rural Water Supply Project

A Scheme for development of Bihar Flood Management Information System is also being implemented by the Government of Bihar through grant of US\$ 0.557 Million under DFID Trust Fund.

5.2 Japan International Co-operation Agency (JICA)

The “Development of Ground Water in Uttar Pradesh” is under implementation with assistance from JICA. In addition, the “Integrated Water Resources Management for Poverty Eradication and Sustainable Development” in Andhra Pradesh has been recommended to the Japanese side for consideration of JICA.

During the financial year 2007-08, an amount of Rs. 44.270 crores has been received from the external funding agencies and utilized till October, 2007 by the Central/State Governments for implementation of various externally aided projects in water resources sector.

5.3 PROJECTS UNDER CONSIDERATION

A. WORLD BANK ASSISTANCE

S.No	Name of Project
1	Dam Safety Assurance, Rehabilitation and Disaster Management Project Phase-II(Multi-state)
2	Andhra Pradesh Water Sector Development Project, Modernization and Rehabilitation of Nagarjuna Sagar Project.
3	Mahanadi Basin Development Plan

B. ASIAN DEVELOPMENT BANK

S.No	Name of the Project
1	Orissa Integrated Irrigation Agriculture & Water Management Project
2	Integrated Coastal Zone Management and Related Investment Project
3	Sustainable Coastal Protection and Management Project
4	Flood Control and Mitigation Project (Assam) & Flood Control and Mitigation Project (Arunachal Pradesh)

C. World Bank Assistance for Dam Rehabilitation and Improvement Project

For Dam Rehabilitation and Improvement Project, the World Bank has suggested the need to create dam rehabilitation and improvement fund for long term sustainability of the dams. A National Level Steering Committee has been constituted under the Chairmanship of Secretary (WR) to look into various aspects and give policy directions in formulation and implementation of the projects. A Technical Committee headed by Member (D&R), Central Water Commission has also been constituted for providing technical inputs to the Steering Committee and finalisation of the technical details of the project. The national Level Steering Committee met last on 20th April 2007. In pursuance of decision taken in the meeting of Steering Committee, matter has been taken up with the World Bank for appropriate action. The State Government has been asked to identify the dams and the mode of funding the project.

6. *Research and Development*

6.1 Research and Development Programme

The Ministry of Water Resources has three organizations viz; Central Water and Power Research Station (CWPRS), Central Soil and Materials Research Station (CSMRS) and National Institute of Hydrology (NIH) which are fully devoted to research and development in the water sector. CWPRS is the premier national institute for research in the area of hydraulics of water resources structures related to irrigation, hydropower, navigation, coastal works and related instrumentation. CSMRS is involved in research related to construction materials, concrete technology, geophysics, rock mechanics, soil mechanics and rockfill testing technology. NIH is devoted to systematic and scientific studies in all aspects of hydrology with the objective of improving the present practices in planning, design and operation of water resources projects.

6.2 Promotion of Research in Water Sector

The Ministry of Water Resources provides financial assistance to promote research work in the field of water resources sector. The assistance is provided by way of grants to academicians / experts in the Universities, IITs, recognised research and development laboratories / institutes, Water Resources / Irrigation Departments of the Central and State Governments in the country and NGOs for carrying out research and studies related to water resources sector. Research proposals of applied nature as well as basic research are considered for financial assistance.

The co-ordination of the programme for providing financial assistance for research and development is done by Research & Development Division under the Policy & Planning Wing of the Ministry. Considering wide range of topics covered under water resources engineering, five Indian National Committees (INCs) namely INCH (Hydraulics), INCOH (Hydrology), INCID (Irrigation & Drainage), INCGE (Geo-Technical Engineering) and INCCMS (Construction Materials & Structures) have been constituted to provide necessary technical and advisory support for the implementation of R&D programme. The Members of these Committees are drawn from various Central and State Government Agencies as well as experts from academic and research organisations.

6.3 Indian National Committee on Hydraulic Research

The Indian National Committee on Hydraulic Research (INCH) was constituted in the year 1990, the apex body in hydraulics with the responsibility

of co-ordinating various research activities in the field of management of floods, hydraulic structures, river and estuarine hydraulics, river morphology, ground water hydraulics, instrumentation for seismic and geophysical measurements, open channel flow, pipe flow, hydraulic machinery, city water supply and ports and harbours. During the year 2007-08, 21 research schemes were under implementation.

6.4 Indian National Committee on Hydrology

The Indian National Committee on Hydrology (INCOH) constituted in the year 1982, the apex body in hydrology, both surface and ground water, with the responsibility of co-ordinating various research activities in the field of meteorology, surface water hydrology, evaporation control, ground water hydrology and management, instrumentation, real time systems, application of GIS and remote sensing. The secretariat of INCOH is located at National Institute of Hydrology, Roorkee.

In pursuance of its objectives, the Committee has brought out 26 state-of-art reports in hydrology in the country. The Committee has also provided financial support for organising seminars, conferences etc. for dissemination of knowledge and promoting education and training in hydrology.

The Committee is participating in the activities of International Hydrological Programme (IHP) of United Nations Educational, Scientific and Cultural Organisation (UNESCO) by organizing regional courses and workshops.

During the year 2007-08 35 research schemes were under implementation, out of which 3 research schemes have been completed. The Research & development session of INCOH was held in September, 2007 at Udaipur.

6.5 Indian National Committee on Irrigation and Drainage

The Indian National Committee on Irrigation and Drainage (INCID) was constituted in the year 1990, the apex body in irrigation and drainage with the responsibility of co-ordinating various research activities in the field of irrigation, drainage, agronomy, water management, environmental impact and socio-economic aspect of water resources projects, plasticulture development, geotextiles. This is working as National Committee for India for the International Commission on Irrigation and Drainage (ICID). INCID contributes to various ICID meetings/ workshops/ conferences and to other international conferences. INCID is also involved in bringing out technical publications in the form of manuals, reports, bulletins, seminar proceedings etc. during the year

2007-08, 38 research schemes were under implementation out of which 5 schemes have been completed. The research and development session of INCID was held in February, 2008 at Hyderabad.

6.6 Indian National Committee on Geotechnical Engineering

The Indian National Committee on Geotechnical Engineering (INCGE) was constituted in the year 1991, the apex body in geotechnical engineering with the responsibility of co-ordinating various research activities in the field of rock mechanics and tunneling technology; soil mechanics and foundation engineering; and instrumentation and measurement techniques. Its secretariat is located at CSMRS, New Delhi. During the year 2007-08, 38 research schemes were under implementation under the supervision of INCGE. Out of this 2 schemes has been completed. The research and development session of INCGE was held in February, 2008 at New Delhi. In pursuance of its objectives, the Committee has published 3 state-of-art reports in geotechnical engineering in the country.

6.7 Indian National Committee on Construction Materials & Structures

The Indian National Committee on Construction Materials & Structures (INCCMS) was constituted in the year 1992, the apex body in construction materials and structures with the responsibility of coordinating various research activities in the field of management of construction materials, concrete technology and structures. Like INCGE, its secretariat is also located in CSMRS, New Delhi. During the year 2007-08, 11 research schemes were under implementation under the supervision of INCCMS, out of which 2 schemes have been completed. The research and development session of INCCMS was held in February, 2008 at New Delhi.

6.8 Status of Research and Development Schemes

Since 1992, 275 research schemes have been sanctioned by various academic and research institutions of the Ministry of Water Resources. Out of which 157 schemes have been successfully completed, six schemes foreclosed and 112 schemes are under progress in various academic and research institutions. About 15 new research proposals are under consideration of the Ministry for funding under the research and development programme.

6.9 Study regarding Gaps in Irrigation Potential Created and Utilised

The Ministry of Water Resources has awarded a study to examine the various issues related to the gap between irrigation potential created and utilised

and for suggesting measures for reducing the gap in the country to four Indian Institutes of Management (IIMs), namely IIM Ahmedabad, IIM Bangalore, IIM Lucknow and IIM Calcutta. Memorandum of Understanding for the study was signed between the IIMs and the Ministry in August, 2007. The study is scheduled to be completed within a period of 8 months.

6.10 New Activities Proposed during XI Plan

With a view to addressing the research problems in proper perspective, the State Government institutions such as engineering/irrigation research institutions, water and land management institutes are being actively involved in (a) efficiency studies for completed major and medium irrigation projects; (b) effect of climate change on water resources and studies in respect of vulnerability assessment and adaptation; (c) reservoir sedimentation studies; (d) post-facto evaluation and management plan for optimal benefit from the resources; and (e) initiation of benchmarking of irrigation projects for performance improvement.

6.11 Water Quality Assessment Authority

The Water Quality Assessment Authority (WQAA) was constituted in May, 2001 with the powers and functions to improve the quality of national water resources, has been continued during the XI Plan period (2007-12). The Authority is headed by the Secretary, Ministry of Environment and Forests as the Chairman and the Commissioner (B&B), Ministry of Water Resources as the Member Secretary. The Authority has 12 Members.

The main achievements of the Authority so far are as follows:

- 9th and 10th meetings of the Water Quality Monitoring Committee (WQMC) were held on 2nd April, 2007 and 10th August, 2007 respectively and follow up action on the decisions taken in the meetings on the water quality issues was taken up.
- State Level Water Quality Review Committees have been constituted in 34 States/UTs to coordinate works assigned to them in respect of water quality such as water quality monitoring network, identification of problem areas etc.
- The WQAA has decided that while approving water quality related projects, a holistic view about water quality management aspect needs to be adopted and considered for funding.

- Inter-action among all the States and the concerned central agencies was organized in which the role of water quality review committees in water 'quality management, identification of problem areas and hot spots, evaluation of existing system of monitoring network and implementation of awareness and graded training were emphasized.
- The Water Quality Monitoring Committee (WQMC) has been constituted by WQAA for reviewing water quality related matters on a continuous basis with the help of three Standing Groups.
- A National Level Workshop on Development of Water Quality Management Plan for State level water quality review committees was organized at Lucknow (U.P.) by CPCB under the aegis of WQAA .The guidelines for Water Quality Management Plan were deliberated in the workshop.

7. *Central Water Commission*

7.1 Introduction

Central Water Commission at New Delhi is an attached office of the Ministry of Water Resources. It is a premier technical organisation in the country in the field of water resources since 1945. The Commission is entrusted with the general responsibility of initiating, coordinating and furthering, in consultation with the State Governments, schemes for control, conservation and utilization of water resources throughout the country for the purpose of flood control, irrigation, drinking water supply and power development.

7.2 Organisational Setup

Central Water Commission is headed by a Chairman with the status of an Ex-Officio Secretary to the Government of India. The Commission has three technical wings, namely:

- Designs and Research Wing
- Water Planning and Projects Wing
- River Management Wing

Each wing is headed by a Member with the status of an Ex-Officio Additional Secretary to the Government of India. The activities of the wings are carried out by 18 units at the headquarters, each headed by a Chief Engineer. The National Water Academy, Pune headed by a Chief Engineer is also a part of the Commission. Besides, the Commission also has 13 regional organisations, each headed by a Chief Engineer.

7.3 MAJOR ACTIVITIES

Hydrological Observations

Central Water Commission at present operates a national network of about 878 hydrological observation stations covering gauge, discharge, silt and water quality. The basic data collected by field units are processed and validated at sub-divisions, divisions and circle level and authenticated data in the form of Water Year Book, Sediment Year Book and Water Quality Year Book is then transmitted to CWC (HQ) for storage, updating and retrieval. The dissemination of data to bonafide users are processed as per the data request received in regional offices of CWC as well as at Head Quarters by P&D Unit as per norms and guidelines. Under Hydrology Project, five regional data centres have been

set up at Nagpur, Bhubaneswar, Hyderabad, Gandhinagar and Coimbatore for storage of data. At National Surface Data Storage Centre, data of the above regions of CWC is stored and combined catalogue of metadata is hosted on the website.

7.4 Water Quality Monitoring

Central Water Commission is monitoring water quality at 371 key locations covering all the major river basins of India. It has a three-tier laboratory system for analysis of the parameters. The level-I laboratories are located at 258 field water quality monitoring stations on major rivers of India where physical parameters such as temperature, colour, odour, specific conductivity, total dissolved solids, pH and dissolved oxygen of river water are observed. There are 24 level-II laboratories located at selected Divisional Headquarters to analyse 25 types of physico-chemical characteristics and bacteriological parameters of river water. 4 Level-III/II+ laboratories are functioning at Varanasi, Delhi, Hyderabad and Coimbatore where 41 parameters including heavy elements/toxic parameters and pesticides are analysed periodically. The data generated are computerized in the database system and disseminated in the form of hydrological yearbook, status reports and bulletins. Water quality year books are published and water quality bulletins are issued regularly.

The Ministry of Environment and Forests constituted the Water Quality Assessment Authority (WQAA) at national level vide the extraordinary notification in the Gazette of India dated 22nd June 2001 under the provisions of Environment (Protection) Act 1986, for co-ordinated efforts in maintaining the quality of work of national water resources. The notification issued by the Ministry of Environment and Forests while constituting WQAA, envisaged the setting up of State Level Water Quality Review Committee (SLWQRC), a State representative body, comprising members from the Central and State Water Quality Monitoring agencies, selected educational/research institutes and user agencies which have demonstrated interest in water quality monitoring.

7.5 Flood Forecasting and Inflow Forecasting

Flood forecasting activities of CWC cover almost all major flood prone inter-State river basins of India. At present there are 147 level forecasting stations on major rivers and 28 inflow forecasting stations on major dam/barrages. It covers 9 major river systems in the country, including 70 river sub-basins pertaining to 15 States. Normally forecasts are issued 12 to 48 hours in advance, depending upon the river terrain, the location of the flood forecasting sites and base stations. During the flood season (May to October, 2007), 8159

flood forecasts (6477 level forecasts and 1682 inflow forecasts) were issued, out of which 7922 (97.1%) forecasts were within the accuracy limits.

7.6 Survey and Investigation

More than 200 irrigation and hydro-electric projects have been investigated by CWC and the Detailed Project Reports (DPR) have been prepared and submitted to the concerned authorities. At present 14 projects (12 in India and 2 in Nepal) are under investigation by CWC.

CWC has also carried out investigations of more than 30 projects in the neighbouring countries in Bhutan, Myanmar and Nepal. Pancheshwar Multi Purpose Project has been investigated by the Joint Project Office - Pancheshwar Investigation (JPO-PI). Joint Project Office for survey and investigation of Sapta Kosi High Dam Multipurpose Project and Sun Kosi Storage-cum-Diversion Dam, has also been opened in Nepal.

7.7 Morphological Studies

The study of river morphology and implementation of suitable river training works as appropriate has become imperative for the nation as large areas of the country are affected by floods every year causing severe damage to life and property in spite of existing flood control measures taken both by Central and State Governments. Problems are aggregating mainly due to large quantity of silt/sediment being carried and deposited in its down stream reaches. The special behaviour of the river needs to be thoroughly investigated for evolving effective strategies to overcome the problems posed by it. Considering the seriousness of the problems, CWC has taken up the morphological studies of 6 flood prone rivers viz. Brahmaputra, Kosi, Gandak, Ghaghra, Sutlej, Ganga in reach from Allahabad to Baxar using remote sensing techniques in addition to field surveys and collection of related data during the Xth Five Year Plan.

Morphological study of rivers deals with aggradation/degradation, shifting of the river course, erosion of banks, etc. and remedial measures against erosion and other related problems. 18 morphological studies of rivers, 8 volumes of morphological atlas of rivers and 17 other monitoring status/sedimentation/mathematical model reports of rivers have been done by CWC based on data collected by field survey. Among Himalayan rivers, morphological studies of rivers Ghaghra, Sutlej and Gandak using remote sensing techniques are under progress. Among Himalayan rivers, studies of rivers Ghagra, Sutlej and Gandak using remote sensing techniques have been prepared and examination of reports are under progress and have spilled over to the 11th Five Year Plan.

7.8 Coastal Erosion

The Indian coastline is 7516.60 km long out of which about 1450 km is affected by sea erosion. Almost all the maritime States/UTs are facing erosion problems of varying magnitudes.

Realizing the need of overall planning and cost effective solution to the coastal problems, the Govt. of India constituted Beach Erosion Board in the year 1966, under the Chairmanship of Chairman CWC with the objective of ensuring development in the protected coastal zone. The Beach Erosion Board was reconstituted and renamed as Coastal Protection and Development Advisory Committee (CPDAC) by the Ministry of Water Resources, Govt. of India, in April 1995, under the Chairmanship of Member (RM) CWC, with representatives of all coastal States and related central departments. The Beach Erosion Board has held 24 meetings in all, while the CPDAC has held 10 meetings.

7.9 Hydrological Studies

Detailed hydrological studies are carried out by the Central Water Commission at various stages of the projects for assessment of quantities of available water and its time distribution, estimation of design flood, sediment rate and its distribution pattern in the reservoir. These details are essentially required to:

- (i) Carry out optimum planning for the available water resources;
- (ii) Design the structure from safety consideration;
- (i) Estimate the life of reservoir.

Hydrological studies are made in connection with Detailed Project Reports prepared by CWC. 103 projects were dealt by CWC during the year 2007-08 from hydrological point of view, out of which 12 projects were dealt as consultancy work and 91 projects were dealt for hydrological studies/review work.

CWC has come up with an Indian version of regional models for rational estimation of design flood. The country has been divided into 7 zones and further 26 hydro meteorologically homogeneous sub-zones. So far 21 flood estimation reports covering 24 sub-zones have been published. The periodic revision/updating of these reports are carried out whenever additional data is received.

Work for preparation of PMP atlas for Ganga, Brahmaputra, Barak, Indus and Krishna Basins has been taken up through consultancy. Development of hydrological design aids is being handled in CWC under World Bank aided Hydrology Project - II.

7.10 Design

The Central Water Commission is actively associated with design of mega water resource projects in India and neighbouring countries viz. Nepal, Bhutan and Afghanistan by way of design consultancy / technical appraisal of the projects. Four design units are functioning to cater to specific requirements and to attend to special design related problems of different regions. These units have specialized directorates for hydel civil design, concrete & masonry dam design, embankment design, gates design, barrage and canal design.

At present, CWC is carrying out design consultancy in respect of 110 projects out of which 78 projects, including 18 from north eastern region are at construction stage while the remaining 32 projects (including 11 from north eastern region) are either at investigation or at DPR stage. In addition to above, special studies have been carried out in respect of 5 projects.

7.11 Dam Safety

There are 4050 existing large dams in the country. In addition 475 large dams are under construction. About 60% of these dams are more than 20 years old. Appropriate measures for the maintenance of such structures are critical for their safety. Dam Safety Organization of CWC acted as nodal agency in the implementation of the World Bank assisted "Dam Safety Assurance and Rehabilitation Project (DSARP)" in which 4 States i.e. Madhya Pradesh, Rajasthan, Orissa and Tamil Nadu participated. Basic dam safety measures were provided for 182 dams, while 55 dams were taken up for rehabilitation and rectification works. The success of this project led to the framing of a fresh proposal named as "Dam Safety Assurance, Rehabilitation and Disaster Management Project (DSARDMP)" now renamed as "Dam Rehabilitation and Improvement Project (DRIP)". This project aims to improve the safety and optimum sustainable performance of selected existing dams and associated appurtenances by setting up a Dam Safety and Improvement Fund (DSIF) with the participation of World Bank, Central/State Governments and other institutional funding agencies. The project aims to cover 13 States namely Andhra Pradesh, Bihar, Chattisgarh, Gujarat, Jharkhand, Kerala, Madhya Pradesh, Maharashtra, Orissa, Tamilnadu, Uttar Pradesh, Uttarakhand and West Bengal.

7.12 Project Monitoring

Central Water Commission monitors the progress of selected ongoing irrigation projects. Each project under general monitoring is visited by the monitoring team at least once a year and detailed monitoring report is prepared and issued to all concerned for necessary action. At present during 2007-08, CWC is carrying out general monitoring of 104 ongoing major, medium and extension, renovation and modernization (ERM) projects.

The major, medium and selected minor surface water irrigation projects receiving Central Loan Assistance under Accelerated Irrigation Benefits Programme (AIBP) are also monitored by CWC. As part of AIBP monitoring, the projects are inspected twice a year and monthly expenditure reports and the Management Information System Reports giving physical and financial status of AIBP projects on quarterly basis are obtained from the project authorities for review. The recommendations of CWC form the basis for release of funds by the Ministry of Water Resources/ Ministry of Finance. CWC is monitoring 126 major and medium projects under AIBP.

7.13 Application of Remote Sensing Technique in Water Resources Sector

During the 11th Five Year Plan, it has been proposed to take up following projects/ studies.

- (1) Satellite remote sensing based reservoir sedimentation assessment studies for 100 reservoirs (out of which 80 studies will be carried out by the out-source agencies and 20 in-house)
- (2) Development of water resources information system for the entire country has been taken up along with ISRO/DOS
- (3) Completion of spill over reservoir sedimentation assessment studies (15 nos.)

A study with the objective to assess the irrigation potential created up to March, 2005 using high-resolution data by identification and mapping of the irrigation network in two selected AIBP irrigation projects namely Upper Krishna and Teesta Command taken up as per the advice of the Planning Commission have been completed.

8. *Central Ground Water Board*

8.1 Organisation

The Central Ground Water Board is entrusted with the responsibilities of scientific management studies, exploration, monitoring, assessment, augmentation and regulation of ground water resources of the country. The data generated from various studies provide a scientific base for user agencies for water resource planning. Besides advising states and other user agencies on planning and management of ground water schemes, the Board is also taking up special studies on R&D, artificial recharge, conjunctive use of surface & ground water, water balance and geogenic contamination, etc. It also organizes various training courses for personnel of its own as well as Central/ state government organizations engaged in ground water related activities.

The Central Ground Water Board is headed by the Chairman and has four main wings namely- i) Sustainable Management & Liaison, ii) Survey, Assessment & Monitoring, iii) Exploratory Drilling & Materials Management and iv) Training and Technology Transfer. Each wing is headed by a Member. The Board has 18 Regional offices, each headed by a Regional Director, supported by 17 Engineering Divisions and 11 unit offices for undertaking various field activities.

8.2 Achievements

8.2.1 Ground Water Management Studies

Ground Water Management Studies are being carried out to have first hand information on the changes in the ground water scenario with reference to time, due to changes in various input and output parameters and due to human interference. This forms the base for developmental activities and policy making. Special priority is being given for such studies in hilly areas, valley fill areas, tribal areas, drought areas, urban areas, over-exploited areas, low ground water development areas, mining areas, industrial areas, naturally contaminated areas, farmers distress areas, coastal areas, canal command areas, water logged areas and areas having problems of water quality due to geogenic sources. A target of 1.64 Lakh sq.km. was assigned in the Annual Action Plan 2007-08. During 2007-08 an area of 1.58 Lakh sq. km was covered during premonsoon period and post-monsoon studies have been completed in 1.59 Lakh sq. km .

8.2.2 Ground Water Exploration

Ground Water Exploration is being carried out to study the sub-surface hydrogeological setup and to evaluate various aquifer parameters of different aquifer systems. The entire exercise is aimed at quantitative & qualitative evaluation of ground water in the area. It is being carried out by the Board through a fleet of 87 drilling rigs (33 Direct Rotary, 41 Down the Hole and 13 Percussion Combination types) and also through outsourcing. During 2007-08 699 wells have been constructed against a target of 817 wells.

Exploratory wells have also been constructed in the arsenic affected areas of Bihar, U.P & West Bengal. Exploration has also been done in fluoride infested area of Madhya Pradesh where fluoride free zones have been delineated. High yielding wells with discharge ranging from 7200 lph to 234,000 lph have been constructed in the states of Andhra Pradesh, Himachal Pradesh, Jammu & Kashmir, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa and Tamil Nadu. This is expected to help in identifying ground water sources and in guiding the states to take action with regard to ground water development for drinking water supply.

8.2.3 Monitoring of Ground Water Regime

The Board is monitoring the ground water levels in the country four times a year (in the month of January, May, August and November) through a network of 15142 Ground Water Observation Wells. The ground water samples collected during the pre-monsoon monitoring are analysed for the purpose of ascertaining the changes in chemical quality of ground water. Monitoring of ground water observation wells for May, August, November 2007 & January 2008 have been completed and reports describing fluctuation of water levels during each measurement compared to monitoring of previous year, decadal average and premonsoon period have been compiled to have detailed information regarding short term and long term changes in the ground water regime.

8.2.4 Geophysical Studies

The Board undertakes geophysical studies as an integral part of its activities to support and supplement ground water management studies, ground water exploration and short-term water supply investigations to demarcate bedrock configuration and thickness of overburden, saline-fresh water interface etc. During 2007-08, 1336 Vertical Electrical Soundings, and geophysical logging of 147 bore holes have been conducted in various parts of the country.

8.2.5 Water Quality Analysis

There are 16 Regional Chemical Laboratories in the Regional offices of the Board. Chemical analysis of water samples collected during various studies are analyzed in these laboratories. All the Laboratories are equipped with Atomic Absorption Spectrophotometer in order to carry out the analysis of toxic elements and heavy metals. Four chemical laboratories are also equipped with Gas Chromatograph (GC) to take up the analysis of organic pollutants (Pesticides etc). Thirteen laboratories are equipped to carry out bacteriological analysis. 17530 samples have been analyzed, out of which 15304 samples were analysed for basic constituents, 1961 samples for heavy metals such as Cu, Zn, Fe, Mn, CO, Cd, Cr, Ni, Pb etc, 103 samples for organic constituents and 162 samples for specific chemical constituents during 2007-08.

8.2.6 Short Term Water Supply Investigations

Central Ground Water Board assists various organizations in the country to solve their immediate water supply problems. It also provides estimation of water supply against the projected demand. It helps defense establishments on priority basis, in the selection of sites for tubewells and solving water supply related problems. Besides, it assist Urban, Railways, industrial establishments and other organizations of the government in locating industrial water supplies. During 2007-08, 178 investigations have been carried out for augmentation of water supply to such establishments.

8.2.7 Technical Scrutiny of Major and Medium Irrigation Schemes / Proposals

As per the directives of the Planning Commission, the Board is scrutinizing the major and medium irrigation project reports/proposals sent by the State Governments / Central Water Commission / Command Area Development & Water Management Wing of the Ministry of Water Resources. During the year 2007-08, 19 major irrigation project proposals of Central Water Commission were examined and area specific recommendations were made.

The Board also scrutinizes Research & Development proposals submitted to the Indian National Committee on Irrigation and Drainage (INCID) for funding from the point of view of its necessity, quality and cost. During the year 2007-08 following 2 R&D proposals were received from INCID and were examined.

- i. "Estimation of Irrigation Return Flow in parts of the selected Canal Command areas in Uttarakhand & Haryana"

- ii. "Environment impact, Socio-economic aspects and Policy issues for managing water resources in hot arid region".

8.3 Scheme on "Artificial Recharge to Ground Water & Rain Water Harvesting" Under Surveys, Exploration & Investigation Scheme Of CGWB

Demonstrative projects on Artificial Recharge to Ground Water and Rain Water Harvesting are proposed to be taken up during XI Plan under central sector scheme of "Ground water Management Regulation" by CGWB, at an estimated cost of Rs.100 crores with 100% funding by the Central Government. Under the scheme, it is proposed to construct structures for artificial recharge and rainwater harvesting through implementing agencies / beneficiaries and panchayats. The scheme will demonstrate the efficacy of artificial recharge and rain water harvesting techniques in identified areas selected on scientific basis in different hydrogeological situations and encourage implementing agencies to replicate successful models in similar set ups.

Central Ground Water Board, in coordination with concerned State Government departments takes up recharge and rain water-harvesting projects in following areas on priority basis:

- i. Over-exploited / Critical Blocks
- ii. Urban areas showing steep decline in ground water levels
- iii. Drought prone & water scarcity area
- iv. Coastal areas
- v. Sub-mountainous / hilly areas
- vi. Area with geo-genic contamination of ground water.

Central Ground Water Board. During the period 2007-08, 44 industries have been accorded NOC's.

9. *National Water Development Agency*

9.1 National Water Development Agency (NWDA) was established in July, 1982 as a registered society under the Societies Registration Act, 1860 with head quarter at New Delhi and is fully funded by the Government of India through grants-in-aid.

9.2 The main functions of the agency are:

- (a) To carry out detailed surveys and investigation of possible reservoir sites and inter-connecting links in order to establish feasibility of the proposal of Peninsular Rivers Development and Himalayan Rivers Development Components forming part of the National Perspective for Water Resources Development prepared by the then Ministry of Irrigation, now the Ministry of Water Resources.
- (b) To carry out detailed surveys about the quantum of water in various Peninsular and Himalayan River systems which can be transferred to other basins/States after meeting the reasonable needs of the basin/States in the foreseeable future.
- (c) To prepare feasibility reports of the various components of the scheme relating to Peninsular and Himalayan Rivers development.
- (d) To prepare detailed project reports of river link proposals under National Perspective Plan for Water Resources Development after concurrence of the concerned States.
- (e) To prepare pre-feasibility/feasibility reports of the intra-state links as may be proposed by the States.
- (f) To undertake all such other activities which the Society may consider necessary, incidental, supplementary or conducive to the attainment of the above objectives.

9.3 Organisational Setup

The NWDA is headed by the Director General of the rank of Additional Secretary to Government of India. He is the Principal Executive Officer of the Society, responsible for the proper administration of the affairs and funds of the Society assisted by Chief Engineer (HQ) and Directors and is also responsible for coordination and general supervision of the activities of the Society. NWDA has

2 field organisations each headed by a Chief Engineer, 5 Circles each headed by a Superintending Engineer, 15 Divisions each headed by an Executive Engineer and 10 Sub-Divisions each headed by an Assistant Executive Engineer/ Assistant Engineer.

9.4 MAJOR ACTIVITIES

9.4.1 Inter Basin Water Transfer

The National Water Development Agency has been carrying out studies of National Perspective Plan for water resources development. It comprises of two components, namely;

- (a) Peninsular Rivers Development Component and
- (b) Himalayan Rivers Development Component.

9.4.2 Peninsular Rivers Development Component

National Water Development Agency has completed collection of data and water balance studies of all 137 basins/sub-basins and 52 identified diversion points (including 3 additional studies), 58 reservoir studies, toposheet studies of 18 links including 1 additional study and all 18 pre-feasibility reports. Based on these studies, NWDA has identified 16 water transfer links under Peninsular Component for surveys and investigations and preparation of feasibility reports(FRs). So far FRs of 14 links in the Peninsular component have been completed and FR of another one link is in progress. Detailed Project Report (DPR) of one link namely Ken- Betwa has also been taken up which is likely to be completed during 2008.

9.4.3 Himalayan Rivers Development Component

The studies in respect of Himalayan Rivers Development Component were started by NWDA during the year 1991-92. The Himalayan Component envisages construction of storage reservoirs on the principal tributaries of the Ganga and the Brahmaputra in India, Nepal and Bhutan, along with interlinking the canal systems to transfer surplus flows of the eastern tributaries of the Ganga to the west, apart from linking of the main Brahmaputra and its tributaries with the Ganga and Ganga with Mahanadi.

9.4.4 Benefits from Inter Basin Water Transfer Link Schemes

The National Perspective Plan would give additional benefits of 25 mha of irrigation from surface waters, 10 mha by increased use of ground waters, raising the ultimate irrigation potential from 140 mha to 175 mha and generation of 34000 MW of power, apart from the incidental benefits of flood control, navigation, water supply, fisheries development, salinity and pollution control etc. in various States.

9.5 National Water Development Agency has identified the States which are to be benefited from the inter-basin water transfer links and assessed the annual irrigation benefits likely to accrue to the concerned States from these link schemes. While the Himalayan Component of the inter-basin water transfer proposal will benefit directly Uttar Pradesh, Uttrakhand, Haryana, Rajasthan, Gujarat, Assam, West Bengal, Bihar, Jharkhand and Orissa and enrich the Peninsular Component from the surplus waters of Brahmaputra, the Peninsular Component will benefit Andhra Pradesh, Orissa, Karnataka, Tamil Nadu, Kerala, Puducherry, Madhya Pradesh, Rajasthan, Maharashtra and Gujarat.

9.6 Other Initiatives

(a) Preparation of Detailed Project Report of Ken-Betwa Link Project

After signing a tripartite Memorandum of Understanding (MoU) by the Union Minister of Water Resources, Chief Minister of Madhya Pradesh and Uttar Pradesh on 25th August, 2005 for preparation of Detailed Project Report (DPR) of Ken-Betwa link by the Central Government, the preparation of Detailed Project Report (DPR) of the Ken-Betwa link project is being done by NWDA. The survey and investigation works for preparation of DPR of this link project have been started.

(b) Consensus Group Headed by Chairman, CWC

The objective of the Consensus Group headed by Chairman, CWC is to discuss and expedite the process of arriving at consensus amongst the States regarding sharing of surplus water in river basins/sub-basins and quantum of surplus water to be transferred from surplus basins to deficit basins/areas as per the proposals of interbasin water transfer of NWDA and helping the States.

10. Central Water & Power Research Station

10.1 Central Water and Power Research Station (CWPRS), established in 1916, is the premier hydraulic research institute offering comprehensive research and development support to a variety of projects dealing with water, energy resources development and water-borne transport; disseminating expertise and research findings amongst hydraulic research fraternity; and aiding and promoting research activities at various institutions besides training of research manpower. CWPRS is recognized as the Regional Laboratory for Economic and Social Committee for Asia and Pacific (ESCAP) since 1971.

10.2 For providing solutions to complex problems referred to CWPRS, the methodologies adopted include – investigations using physical and mathematical models, field investigations, desk studies and/ or a combination of these. CWPRS also undertakes allied works such as collection of field data, site investigations using seismic reflection/ refraction surveys, evaluation of site-specific seismic parameters and testing of civil engineering materials and water samples. Another area of activity is calibration of flow meters/ current meters. CWPRS has made significant strides in the application of remote sensing techniques for providing solutions to river and coastal engineering problems. The requirements of accurate and reliable instrumentation for data acquisition and control systems for physical model studies/ prototype measurements are met by in-house developments. CWPRS, with an interdisciplinary approach in its activities, thus provides unique services to the country and the ESCAP region.

10.3 CWPRS provides specialised services through physical and mathematical model studies in river training and flood control, hydraulic structures, harbours, coastal protection, foundation engineering, construction materials, pumps and turbines, ship hydrodynamics, hydraulic design of bridges, environmental studies, earth sciences and cooling water intakes. The major laboratories of CWPRS are given below:-

- Hydrology and Water Resources Analysis
- River Engineering
- Reservoir and Appurtenant Structures
- Coastal and Offshore Engineering
- Ship Hydrodynamics
- Hydraulic Machinery
- Earth Sciences
- Mathematical Modelling
- Instrumentation and Control Engineering
- Foundations and Structures

11. Central Soil and Materials Research Station

11.1 The Central Soil and Materials Research Station (CSMRS), an attached office of the Ministry of Water Resources, is a premier institute in the country located at New Delhi which deals with field and laboratory investigations, basic and applied research on problems in geomechanics, concrete technology, construction materials and associated environment issues, having direct bearing on the development of irrigation and power in the country and functions as an adviser and consultant in the above fields to various projects and organizations in India and abroad.

11.2 Broadly, the spheres of activities of CSMRS encompass the following disciplines: -

- Soil mechanics and foundation engineering including soil dynamics, geotextiles, soil chemistry and rockfill technology
- Concrete technology, drilling technology for sub-surface characterisation and construction materials
- Rock mechanics including instrumentation, engineering geophysics and numerical modelling
- Concrete chemistry, electronics and information technology

11.3 Ongoing Plan Schemes

CSMRS is implementing plan scheme named "Geotechnical Investigation and Research for River Valley Projects." The following activities under the scheme are on hand:

- Testing concrete cores from various existing dams in order to evaluate the health and to suggest appropriate remedial measures accordingly.
- Installing various instruments such as stress meters, strain meters, deflection measuring instruments, crack meter, pressure cells etc. at project sites.
- Analysis of instruments/test data using latest software.
- Submission of feasibility reports to the project authorities based on indepth investigations.
- Monitoring alkali-silica reaction in concrete in the prototype and determining the residual alkali-aggregate reaction expansion potential of concrete in the laboratory.
- Studies for evaluation of effectiveness of various grout materials.
- Safety and environmental aspects with particular reference to water resources projects.
- Numerical modelling and analysis.

- Implementation of information strategy plan in respect of Information Technology related works in CSMRS
- Establishment of calibration unit at CSMRS.
- Institutional co-operation programme between CSMRS and Norwegian Geotechnical Institute (NGI) in the field of safety evaluation and risk assessment for ageing dams in India.

11.4 Self Sponsored Research Projects

Some of the important areas of research are:-

- Effect of fines on liquefaction potential of soils
- Correlation of ultrasonic pulse velocity and strength characteristics of concrete
- Correlation between point load test index and compressive strength
- Effect of settlement and strength properties of soils by addition of Indian jute/coir membranes.
- Effect of pH on physical and engineering properties of soils.
- Development of advanced chemical method for characterisation of aggregate.

12. *National Institute of Hydrology*

12.1 Introduction

The National Institute of Hydrology, a Society, established in December 1978, is conducting basic, applied and strategic research in the fields of hydrology and water resources development. The Institute is fully aided by the Ministry of Water Resources, Government of India.

12.2 Objectives

- To undertake, aid, promote and co-ordinate systematic and scientific work on all aspects of hydrology;
- To co-operate and collaborate with other national and international organisations in the field of hydrology;
- To establish and maintain a research and reference library in pursuance of the objectives of the Society and equip the same with books, reviews, magazines and other relevant publications;
- To carry out activities that the Society may consider necessary, incidental or conducive to the attainment of the objectives for which the Institute has been established.

12.3 Organisation

The Union Minister of Water Resources is the President of the NIH Society and the Union Minister of State of Water Resources is its Vice-President. The Ministers-in-Charge of Irrigation / Water Resources in the States (ten States to be nominated for every three years by the President of the Society), the Secretaries of the Ministries in the Government of India concerned with water and related areas, and eminent experts in hydrology and water resources are Members of the Society. The Secretary, Ministry of Water Resources, Government of India, is the Chairman of the Governing Body. The Director of the Institute is appointed by the Government of India and is the Principal Executive Officer of the Society.

The Institute has set up six regional centers to deal with the area specific hydrological issues of different regions in the country and for providing effective interaction with the States in the region. These centres are: Hard Rock Regional Centre, Belgaum; Centre for Flood Management Studies for Brahmaputra, Guwahati; Western Himalayan Regional Centre, Jammu; Centre for Flood Management Studies for Ganga, Patna; Deltaic and East Coast Regional Centre, Kakinada; and Ganga Plains (South) Regional Centre, Sagar. The studies and research in the Institute are carried out under five scientific themes at the

Headquarters, two centers for flood management studies at Guwahati and Patna and four regional centers at Belgaum, Jammu, Kakinada and Sagar. The scientific themes are: (i) Surface Water Hydrology (ii) Ground Water Hydrology (iii) Environmental Hydrology (iv) Water Resource Systems and (v) Hydrological Investigations.

12.4 Major Research Areas

- Hydrology of extremes
- Impact of climate change on water resources
- Groundwater modeling and management
- Sustainable water systems management
- Surface water modelling and regional hydrology
- Environmental hydrology

Studies and Research

The studies and research in the Institute are being carried out broadly under the following major categories:

- Basic studies and research
- Applied studies and research
- Software development
- Field and Laboratory oriented and strategic research
- Sponsored research

13. Other Important Boards / Commissions

13.1 Brahmaputra Board

The Brahmaputra Board is a statutory body set up by an Act of Parliament called Brahmaputra Board Act (Act 46 of 1980) under Ministry of Water Resources. The Board functions from Guwahati. The jurisdiction of the Board covers the entire area of the seven States in the North Eastern Region falling under Brahmaputra and Barak Valley. The limits of Brahmaputra Board were extended to cover the entire area of Sikkim and Northern part of West Bengal falling within Brahmaputra and Barak Basin.

The main functions assigned to the Board are to carry out survey and investigation and to prepare Master Plan for the control of floods, bank erosion and improvement of drainage congestion, giving due importance to the development and utilization of Water Resources of the Brahmaputra and Barak Valleys for irrigation, hydropower, navigation and other beneficial purposes. Its assignment also includes preparation of detailed Project Report of the dams and other Projects identified in the Master Plan as approved by Central Government and to take up construction & Maintenance of the projects approved by the Central Government.

Since inception, the Brahmaputra Board has been performing its statutory functions like preparation of Master Plans for flood moderation, improvement of drainage congestion along with integrated development of the basin to ensure proper utilization of vast water resources of the North.-Eastern Region. These Master Plans are of immense utility for water user agencies of the region.

Organization

The Board consists of 4 full time Members comprising of the Chairman, Vice-Chairman, General Manager and the Financial Adviser and 17 part time Members representing 7 States of the North Eastern Region, North Eastern Council, concerned Ministries namely Water Resources, Finance, Agriculture, Power, Surface Transport and Organisation of Government of India, namely Central Water Commission, Central Electricity Authority, Indian Meteorological Department and Geological Survey of India.

Activities of Brahmaputra Board

The Master Plan preparation has been taken up in 3 parts.

Part-I : Main Stem of Brahmaputra

Part- II : Barak and its tributaries and

Part-III : Tributaries of the river Brahmaputra & Barak and the rivers in Tripura (52 Nos)

13.2 GANGA FLOOD CONTROL COMMISSION

Ganga Flood Control Commission is a subordinate office of the Ministry of Water Resources 'established in 1972 with its headquarters at Patna.

Organisation

The Commission has been assigned the task of preparing comprehensive plans for flood management of the river systems in the Ganga basin, phasing/sequencing of programme of implementation, monitoring, performance evaluation etc. of various flood management schemes, assessment of adequacy of waterways under road and rail bridges and providing technical guidance to the basin states namely West Bengal, Bihar, Jharkhand, Uttar Pradesh, Uttaranchal, Chhattisgarh, Madhya Pradesh, Delhi, Haryana and Rajasthan on flood management. The Commission also accords technical clearance of flood management schemes of the Ganga basin. The Commission is headed by a Chairman with two full time Members and other supporting officers and staff. The representatives of concerned central ministries and departments as well as the Engineer-in-Chief/Chief Engineers of the basin states are part time members / permanent invitees.

Monitoring of important flood management schemes

GFCC is monitoring the following flood management schemes:

- Ghea-Kunti Drainage scheme, West Bengal
- Tamluk basin drainage scheme ,West Bengal
- Urgent Development work in the Sunderbans in West Bengal
- Maniram Domingarh Embankment scheme, U.P.
- In addition, the following centrally sponsored schemes are also being monitored:
- Critical anti-erosion schemes being executed by the states of West Bengal, Bihar, Jharkhand, Uttar Pradesh and Uttaranchal.
- Extension of embankments along Lalbakeya, Kamla, Bagmati and Khando rivers

- Maintenance of flood protection works of Kosi and Gandak Projects.

13.3 FARAKKA BARRAGE PROJECT

The principal components of Farakka Barrage Project are :

- A 2245 metre long Barrage across river Ganga with 109 No. bays and Head Regulator of 11 No. bays.
- A 213 metre long Barrage across river Bhagirathi at Jangipur with 15 No. bays.
- 38.38 Km. long Feeder Canal with 1133 cumecs (40,000 cusecs) carrying capacity
- Navigation locks at Farakka, Jangipur and Kalindri, Lock Channels, Shelter Basins, Navigation Lights and other infrastructures.
- Left Afflux Bundh of Farakka Barrage of 33.79 Km. in right bank and 7 Km. in left bank and 16.31 Km. of Afflux Bundh of Jangipur Barrage.
- Two road-cum-rail bridges and two road bridges across the Feeder Canal.
- A number of Regulators at different locations in both Murshidabad and Malda Districts of West Bengal.
- Bhagmari Syphon at RD. 48.00 of Feeder Canal and Jetties shelter basin at RD. 62.532 of Feeder Canal.

Objective Achieved

- The increased upland supplies from Ganga at Farakka into Bhagirathi have improved navigability, reduced salinity in the system and ensured sweet water supply to Kolkata and surrounding areas from Farakka since its commissioning in 1975.
- The road-cum-rail bridges built across river Ganga at Farakka had established direct communication link to the North-Eastern States, Sikkim, Bhutan and Nepal.
- The Hooghly-Bhagirathi, the Feeder Canal and the navigation Lock at Farakka is now a part of the Haldia-Allahabad Inland Waterway (National Waterways No. 1) which has opened a new era of inland Navigation in Eastern India.
- Water supply needs to NTPC, 2,000 MW Thermal Station has been met from Feeder Canal of FBP successfully.

In addition Farakka Barrage Project has been entrusted with responsibility of executing anti erosion works on river Ganga in a stretch of 120 Km. (40 Km.

up-stream and 80 Km. down-stream of Farakka Barrage) and on various tributaries of river Ganga in North Bengal. These anti erosion works have been successfully executed by Farakka Barrage Project and as a result of the same, lives and property of millions of inhabitants located along the banks and its tributaries in North Bengal have been saved. As a result of successful implementation of anti erosion works; during XIth Five Year Plan; an amount of Rs. 415.17 crores have been earmarked for taking up additional anti-erosion works on river Ganga and its tributaries at various vulnerable locations which have been decided and approved by various Committees constituted by MoWR as under :-

- Farakka Barrage Project Advisory Committee (PAC) under the Chairmanship of Additional Secretary, MoWR, Govt. of India.
- Technical Advisory Committee (TAC) under the Chairmanship of Member, Design & Research, CWC and Ex. Officio Additional Secretary to Govt. of India.

Farakka Barrage Project has over the years provided uninterrupted water diversion from Ganga into Bhagirathi with inter-alia improved navigability, reduction in salinity to ensure sweet water to Kolkata and its surrounding areas and also ensuring smooth navigation in Haldia - Allahabad waterways. The road cum rail bridge constructed downstream of barrage on river Ganga at Farakka has been safeguarded and maintained successfully over the years considering this to be an important communication link between North- East part of India. This project has also been instrumental in attracting the establishment of Super Thermal Power Station by NTPC and setting up of various large industries by the private sector near Farakka due to assured water supply from this project.

13.4 NARMADA CONTROL AUTHORITY

In pursuance of the decision of the Narmada Water Disputes Tribunal (NWDT) under Clause-XIV of its final order, the Government of India framed the Narmada Water Scheme, which, inter-alia, constituted the Narmada Control Authority and Review Committee, in 1980 for proper implementation of the decisions and directions of the Tribunal. The Narmada Control Authority (NCA) has been vested with powers for the implementation of the orders of the Tribunal with respect to the storage, apportionment, regulation and control of the Narmada water, sharing of power benefits from Sardar Sarovar Project (SSP), regulated release of water by Madhya Pradesh, acquisition of land likely to be submerged under the Sardar Sarovar Project by the concerned States, compensation, resettlement/rehabilitation of the oustees, and sharing of costs and implementation of the environmental safeguard measures.

Organisation

The Authority is headed by the Secretary, Ministry of Water Resources, Government of India, as its Chairman, with Secretaries of the Union Ministries of Power, Environment and Forests, Social Justice & Empowerment, and Tribal Welfare, Chief Secretaries of the four party States, one Executive Member and three full time Members appointed by the Central Government, and four part time Members nominated by the party States, as Members.

The Review Committee for Narmada Control Authority (RCNCA), headed by the Union Minister of Water Resources comprises of the Union Minister for Environment and Forests and Chief Ministers of four party States viz. Madhya Pradesh, Rajasthan, Maharashtra and Gujarat as Members, who can suo-moto or on the application of any party State or Secretary to the Government of India, Ministry of Environment & Forests, review any decision of the Authority. The expenditure of NCA is borne by the party States.

(A) Sardar Sarovar Project (SSP)

The R&R progress is being monitored effectively by the monitoring machinery, i.e., Resettlement and Rehabilitation (R&R) sub-group of the Narmada Control Authority chaired by the Secretary to the Government of India, Ministry of Social Justice and Empowerment and also by a Task Force constituted by the NCA in its 72nd meeting. In addition, Chairperson of R&R sub-group and NCA's officials undertake field visits as and when required to the submergence villages and R&R sites.

(B) Indira Sagar Project (ISP)

In compliance to the decision taken by the R&R sub-group of NCA in its 67th, 68th and 70th meetings, the NCA Secretariat pursued Narmada Hydro-electric Development Corporation (NHDC) for furnishing information related to 250 villages involving declared 40026 PAFs upto FRL and also details about the additional PAFs related to Tapu Land, error in survey at FRL, and backwater of FRL. Out of 250 villages/towns, the NHDC has furnished information related to 149 villages and one Town and the information related to 42 R&R sites developed so far includes 34 R&R sites developed by NHDC/Government of Madhya Pradesh and 8 R&R sites developed by PAFs themselves.

Energy Management Centre (EMC) OF NCA

Energy Management Centre (EMC) is co-ordinating activities of power generation of Sardar Sarovar Power (SSP) complex (6x200 + 50x50 MW) in consultation with Western Regional Power Committee (WRPC), Western Regional Load Despatch Centre (WRPLDC), Central Electricity Authority (CEA) and beneficiary States and concerned State Electricity Boards for power generation planning, daily scheduling, monitoring of generation, transmission and energy accounting etc. During the year 2007-08 (April, to October, 2007), the total energy generation of SSP complex was 3253.44 MU which was shared among the party States in the ratio prescribed under the provisions of NWDT Award.

13.5 BANSAGAR CONTROL BOARD

Organisation and Composition

The Bansagar Control Board was set up by the Government of India through a resolution in January, 1976. The resolution was amended in 1990. The resolution was in accordance with an agreement reached between the Governments of Madhya Pradesh Uttar Pradesh and Bihar on the 16th September, 1973 for sharing the waters of River Sone and the cost of the Bansagar Dam. The main features of the resolution are as below:

“In consultation with the Governments of Madhya Pradesh, Bihar and Uttar Pradesh, it has been decided to set up the Bansagar Control Board with a view to ensuring the efficient, economical and early execution of Bansagar Dam including all connected works in Madhya Pradesh, but excluding the canal systems which will be executed by respective States namely, Madhya Pradesh, Uttar Pradesh and Bihar. The Bansagar Control Board will be in overall charge of the project including its technical and financial aspects.”

The Union Minister of Water Resources is the Chairman of the Board and the Minister of State for Water Resources, Union Minister of Power, Chief Ministers, Ministers-in-charge of Irrigation and Finance of the three States and Minister-in-charge of Electricity Department of Madhya Pradesh are its Members.

13.6 BETWA RIVER BOARD

Organisation and its Composition

A decision to harness the available water resources of Betwa River was taken in a meeting held on 22nd July, 1972 between the Chief Ministers of Uttar Pradesh and Madhya Pradesh. Further Uttar Pradesh and Madhya Pradesh in a meeting held on 9th December, 1973 agreed for setting up of a tripartite control board for the speedy, smooth and efficient execution of the various inter-state projects of both the States. Betwa River Board (B.R.B.) was constituted in 1976 by an Act of Parliament to execute the Rajghat Dam Project and Power House. The project authority started construction of the project under the overall guidance of Betwa River Board after promulgation of Betwa River Board Act, 1976. The benefits and cost of the above projects are being shared equally by both the State Governments.

The Union Minister of Water Resources is the Chairman of the Board. Union Minister of Power, Union Minister of State for Water Resources, Chief Ministers and Ministers-in-charge of Finance, Irrigation and Power of the two States are its Members. An Executive Committee of the Board headed by Chairman, Central Water Commission manages the activities of the Board.

13.7 Rajghat Dam Project

The Rajghat Dam with appurtenant structures has been constructed across river Betwa to provide irrigation facilities to 1.38 lakh ha. in Uttar Pradesh and 1.21 lakh ha in Madhya Pradesh with power generation of 45 MW through Rajghat Hydro Electric Project at the toe of dam on left flank. The costs as well as benefits of the project are to be shared equally by both the States. Construction work of dam and power house is almost complete. The project is under O & M stage from October, 2005.

13.8 TUNGABHADRA BOARD

The Tungabhadra Board was constituted by the the President of India in exercise of the powers vested under sub section (4), section 66 of the Andhra State Act, 1953 for completion of the Tungabhadra Project and for its operation and maintenance. The Board is regulating water for irrigation, hydro power generation and other uses from the reservoir.

Organization

The Board consists of a Chairman, appointed by the Government of India, and three Members, one each representing the States of Andhra Pradesh, Karnataka and the Government of India. In the discharge of its assigned functions, the Board exercises powers of a State Government. It makes rules for the conduct of its own business. The Government of Andhra Pradesh and the Government of Karnataka provide funds in agreed proportions and also depute staff to man the various specified posts, as per an agreed proportion. The working table for canal-wise distribution of water to the States is prepared every year by the Tungabhadra Board in consultation with the State Government, and is reviewed from time to time during the water year. The regulation of water is carried out in accordance with the agreed working table.

13.9 UPPER YAMUNA RIVER BOARD

“Upper Yamuna” refers to the reach of Yamuna from its origin at Yamunotri to Okhla Barrage at Delhi. An MoU was signed on 12th May, 1994 amongst the basin States of Himachal Pradesh, Uttar Pradesh, Haryana, Rajasthan and Delhi, for sharing the utilisable surface flows of river Yamuna up to Okhla. The MoU also provided for creation of a “Upper Yamuna River Board” to implement the said agreement.

Accordingly, the Central Government constituted the Upper Yamuna River Board in 1995 as a subordinate office under the Ministry of Water Resources. After creation of Uttaranchal State in 2000, the resolution was modified to include Uttaranchal also in the Board. The resolution also provides for constitution of a Review Committee, to be known as the Upper Yamuna Review Committee (UYRC), comprising the Chief Ministers (Governor in case of President’s rule) of the co-basin States as Members and Union Minister/Minister of State for Water Resources as Chairman, to supervise the working of the Upper Yamuna River Board (UYRB).

Functions of UYRB

The functions of the Board include all aspects of water management in the Upper Yamuna basin, viz. implementation of the water sharing agreement; water allocation; water accounting and data warehousing; monitoring and upgrading the quality of surface and ground water; controlling the ground water extraction; co-ordination of the construction of all projects in the basin, integrated operation of all the projects, watershed development and catchment area treatment plans.

14. Water and Power Consultancy Services (India) Ltd

14.1.1 Introduction

WAPCOS Limited, Government of India undertaking, is a premier international consultancy organization. Formally, incorporated as a Company in 1969, WAPCOS has been providing to various domestic and overseas clients, consultancy in a diverse range of engineering services dealing with water resources, power and infrastructure development. WAPCOS is now recognized amongst the top ranking consultancy organizations of the world. WAPCOS has a well knit team of dedicated professionals, with total backup from State and national level organizations operating in relevant fields, and it provides a wide range of comprehensive technical services.

14.1.2 Recognition

WAPCOS has been rated as “excellent” by the Department of Public Enterprises during the last four years in succession and has been awarded Prime Minister’s “MOU Award for Excellence in Performance” for the year 2005-2006. The Department of Public Enterprises, Ministry of Heavy Industries and Public Enterprises, Government of India have selected WAPCOS amongst the top ten central public enterprises for this award. The Company has also received “MOU Excellence Certificate” for the year 2004-05. WAPCOS has received “EEPC All India Export Award” under the category of “Star Performer in 2005-2006: Engineering Services: Large Enterprises” and “EEPC (Northern Region) Award” under the category of “Project Export/Consultancy Services- Large Enterprises in 2004-2005”.

14.1.3 Fields of Specialisation

Main fields of specialisation of the Company cover- irrigation and drainage, flood control and land reclamation, river management, dams, reservoir engineering and barrages, integrated agriculture development, watershed management, hydropower and thermal power generation, power transmission and distribution, rural electrification, ground water exploration, minor irrigation, water supply and sanitation (rural and urban), environmental engineering including environmental impact assessments and environmental audit, ports and harbours and inland waterways, rain water harvesting; survey and investigations, etc. The Company has recently amended its Articles of Association to provide for developmental projects in India and abroad.

14.1.4 Spectrum of Services

WAPCOS' spectrum of services covers a wide range of activities e.g. pre-feasibility studies, feasibility studies, simulation studies, diagnostic studies, socio-economic studies, master plans and regional development plans, field investigations, detailed engineering including designs, detailed specifications, tendering process, contract and construction management, commissioning and testing, operation and maintenance, quality assurance and management, software development and human resource development.

14.1.5 Business Development

WAPCOS has identified new thrust areas for focused attention. Some of the new fields of services identified are - rural electrification; water harvesting; low cost sanitation; lakes and wetlands; roads; information, education and communication; capacity building/institutional strengthening; water quality monitoring; city development plans, tribal areas development, storm water drainage and rural development. Liberalized and competitive business environment demands constant liaisoning and interaction with organizations having market interests allied to Company's nature of services. For initial introductions and to get foothold in new areas, the Company entered into joint ventures with national and international consultancy organizations. In order to provide state-of-the-art technology for consultancy services in India, WAPCOS associated with DHI (Danish Hydraulics Institute, Denmark) and Hydro Tasmania, Australia for submission of proposals under international competitive bidding. Similarly, for projects abroad, WAPCOS has entered into strategic alliances with consultants already having base in other countries. The efforts are bearing fruits and WAPCOS has secured/ likely to secure some prestigious projects in Cambodia, Bhutan, Ethiopia, Sudan, Laos, Myanmar, Mozambique, Lesotho, Ghana, Afghanistan and Royal Kingdom of Saudi Arabia. The Company's main strength lies in its technical expertise, knowledge and presence in business areas, image as a "technical consultancy" organization, experience of working in India and Asian / African region, top management orientation and ability to improve its business performance and productivity.